**Working notes:**

| | Mine A | Mine B |
|---|---|---|
| 1. Total operated time taken per trip | | |
| Running time to and fro | 40 minutes $\left(20 \text{ kms} \times \frac{60 \text{ minuts}}{30 \text{ kms}}\right)$ | 60 minutes $\left(30 \text{ kms} \times \frac{60 \text{ minuts}}{30 \text{ kms}}\right)$ |
| Unloading time | 10 minutes | 10 minutes |
| Loading time | 30 minutes | 20 minutes |
| Total operated time | 80 minutes or 1 hour 20 minutes | 90 minutes or 1 hour 30 minutes |
| 2. Effective tonnes-kms | 50 (5 tonnes × 10 kms) | 75 (5 tonnes × 15 kms) |

## THEORY QUESTIONS

1. What do you understand by operating costing? In what industries is this costing applied?
2. Write notes an (i) Transport-costing (ii) Power house costing and (iii) Canteen costing.

## PROBLEMS

1. The road transport Co. which keeps a fleet of lorries shows the following information:

| | |
|---|---|
| Kms run for April | 30,000 |
| Wages for April | Rs 2,000 |
| Petrol, Oil etc. for April | Rs 4,000 |
| Original cost of vehicles | Rs 1,00,000 |
| Depreciation to be allowed | @ 25% p.a. on original cost |
| Repairs for the month of April | Rs 6,000 |
| Garage rent etc. for April | Rs 1,000 |
| Licence, insurance etc. for the year | Rs 6,000 |

Prepare operating cost sheet for April showing the fixed cost, variable and total cost per running km.

*Ans:* Total cost per km Re 0.483.

2. Mr Ahuja runs a tempo service in the town and has two vehicles. He furnishes you the following data and wants you to compute the cost per running mile.

| | *Vehicle A* Rs | *Vehicle B* Rs |
|---|---|---|
| Cost of vehicle | 25,000 | 15,000 |
| Road licence fee per year | 750 | 750 |
| Supervision and salary (Yearly) | 1,800 | 1,200 |
| Driver's wage per hour | 4 | 4 |
| Cost of fuel per litre | 1.50 | 1.50 |
| Repairs and maintenance per mile | 1.50 | 2.00 |

*(Contd.)*

| | *Vehicle A* *Rs* | *Vehicle B* *Rs* |
|---|---|---|
| Tyre cost per mile | 1.00 | 0.80 |
| Garage rent per year | 1,600 | 550 |
| Insurance premium yearly | 850 | 500 |
| Miles run per litre | 6 | 5 |
| Mileage run during the year | 15,000 | 6,000 |
| Estimated life of vehicles | 1,00,000 miles | 75,000 miles |

Charge interest at 10% p.a. on the cost of vehicle. The vehicles run 20 miles per hour on an average. *(CA Inter)*

*Ans:* Operating cost per mile vehicle A Rs 3.70, B Rs 4.25.

3. Mr. X owns a bus which runs according to the following schedule:

| | |
|---|---|
| (i) Delhi to Chandigarh and back the same day: | |
| Distance covered | 150 km one way |
| Days run | 10 |
| Seating capacity occupied | 90 % |
| (ii) Delhi to Agra and back the same day: | |
| Distance covered | 120 km one way |
| Days run | 10 |
| Seating capacity occupied | 80 % |
| (iii) Delhi local: | |
| Distance covered per day | 40 km |
| Days run | 4 |
| Seating capacity occupied | 100% |
| (iv) Following are other details: | |
| Cost of the bus | Rs 60,000 |
| Depreciation @ 20% p.a. | |
| Salary of driver | 350 p.m. |
| Salary of conductor | 350 p.m. |
| Salary to part-time accountant | 160 p.m. |
| Insurance | 5% p.a. |
| Diesel consumption 4 km/litre @ Rs 1 per litre | |
| Road tax | 600 p.a. |
| Lubricant oil | 10 per 100 km |
| Repairs and maintenance | 500 per month |
| Permit fee | 284 per month |

The bus has a capacity of 50 persons. Passenger tax is 20% of the total takings. Calculate the bus fare to be charged from each passenger to earn a profit of 33 1/3% on total takings. *(CA Inter)*

*Ans:* Total takings Rs 10,243

4. From the following data calculate the cost per mile of a vehicle.

| | Rs |
|---|---|
| Value of vehicle | 15,000 |
| Road licence for the year | 500 |
| Insurance charges per year | 100 |
| Garage rent per year | 600 |
| Driver's wage per month | 200 |

| | |
|---|---|
| Cost of petrol per litre | 0.80 |
| Miles per litre | 8 |
| Proportional charge for tyre and maintenance per mile | 0.20 |
| Estimated life | 1,50,000 miles |
| Estimated annual mileage | 6,000 miles |
| Ignore interest on capital | |

*(ICWA Inter)*

*Ans:* Running cost per mile Re 1.00

5. The following cost data pertaining to the year 2001 has been collected from the books of ABC Power Co. Ltd. Prepare a cost sheet showing the cost of generation of power per unit of kilowatt hour.

Total units generated 15,00,000 units.

| | Rs |
|---|---|
| Operating labour | 16,500 |
| Plant supervision | 5,250 |
| Lubricant and supplies | 10,500 |
| Repairs and maintenance | 21,000 |
| Administrative overhead | 9,000 |
| Capital cost | 1,50,000 |

Coal consumed per kwh is 1.5 lb and cost of coal delivered to the power station is Rs 33.06 per metric tonne. Depreciation rate chargeable is 4% per annum and interest on capital is to be taken at 7%.

*(CA Inter)*

6. A city municipality arranges for the removal of its garbage by means of motor vehicle transport. The following vehicles are maintained;

| *No. of vehicles* | *Specifications* |
|---|---|
| 20 | 5 tonne lorries |
| 30 | 4 tonne lorries |
| 50 | 3 tonne lorries |
| 40 | 2 tonne lorries |

On an average each lorry makes six trips a day and in each trip covers an average distance of five kilometres. Each lorry carries garbage weighing only 60% of its capacity. Taking an annual average, 20% of the lorries are laid up for repairs every day. The conservancy work is carried on daily.

The following are the monthly charge incurred on the conservancy transport:

| *Items of cost* | *Monthly charges* *Rs* |
|---|---|
| Salary of the superintendent, motor Vehicles Department | 2,000 |
| Salaries of three transport foreman | 500 each |
| Wages of drivers | 150 each per 140 drivers |
| Wages of mazdoor (labourers) | 75 each for 280 mazdoors |

| | *Rs* |
|---|---|
| Consumable stores | 16,000 |
| Petrol | 60,000 |
| Lubricants | 15,000 |
| Replacement of tyres, tubes and other parts and accessories | 5,000 |
| Garage rent and rates (adjusted in the books of the municipality) | 3,000 |
| Gas and electric charges | 1,000 |
| Miscellaneous expenses | 12,000 |

There is a repair workshop attached to the Motor Vehicles Department which also carries out repairs of office cars and other vans and vehicles. Fifty per cent of the superintendent's salary is debited to the workshop, and the stipulated charges to be borne by the conservancy transport deptt. for the services of the workshop are Rs 10,000 a month.

Assuming that a month consists of 30 days, calculate the cost per tonne-km for removal of garage.

*(CA)*

*Ans:* Standing and fixed charges 2,500
Maintenance charges 19,000
Running 1,45,000

1,66,500

Total km carried 1,94,400

= cost per tonne km Re 0.856

**Note:** 1 Tonne km carried are ascertained as follows:

No. of vehicles used × Tonnes carried × Average km × No. of trips × Days of month.

or $20 \times \frac{80}{100} \times 5 \times \frac{60}{100} \times 5 \times 6 \times 30 = 43,200$

$30 \times \frac{80}{100} \times 4 \times \frac{60}{100} \times 5 \times 6 \times 30 = 51,840$

$50 \times \frac{80}{100} \times 3 \times \frac{60}{100} \times 5 \times 6 \times 30 = 64,800$

$40 \times \frac{80}{100} \times 2 \times \frac{60}{100} \times 5 \times 6 \times 30 = 34,560$

Total 1,94,000 tonne kms

12

# Cost Control Accounts

## NON-INTEGRATED SYSTEM

In cost accounting the cost books are basically maintained under the following two systems:

1. Non-integral or non-integrated cost accounting.
2. Integral or integrated cost accounting.

The system is called non-integral when cost and financial transactions are kept separately. On the contrary, when cost and financial transactions are integrated, the accounting system is known as integrated or integral. Under the system of non-integral accounting, separate ledgers are maintained for cost and financial transaction. The financial accountants look after financial transactions and the cost accountants are responsible for cost accounting transactions. The financial accounting department maintains the following financial ledgers:

1. *General ledger* It contains all real, nominal and personal accounts except trade debtors and creditors account.
2. *Debtors ledger* It has personal accounts of trade debtors.
3. *Creditors ledger* It has personal accounts of trade creditors.

The cost accounting department maintains the following cost ledgers:

1. *Stores ledger* This ledger contains all stores accounts.
2. *Work-in-progress ledger* All costs of material, wages and overhead for each job or manufacturing in progress are posted to the respective job accounts in this ledger.
3. *Finished goods/stock ledger* This ledger records details of finished goods and jobs.
4. *Cost ledger* This is main ledger and records impersonal accounts, i.e. accounts relating to income and expenditure. The following accounts are maintained in cost ledger.
   (i) Cost Control Accounts—These accounts are maintained to exercise control over the three subsidiary ledgers discussed above and also to complete double entry in cost accounts. They summarise all detailed information contained in the subsidiary ledgers and also help in reconciliation of cost and financial accounts.

The important cost control accounts are as follows:

(a) Stores ledger control account—The purpose of stores ledger is to maintain item-wise record of raw materials and other stores. In cost ledger, a Stores Ledger Control Account is prepared

relating to this subsidiary ledger. The total materials received in stores (which can be found in Purchases Journal also) is shown on the debit side of Stores Ledger Control Account and the total materials issued out of Stores (which can be found in Materials Abstract) is credited in the Account. The balance of this account shall tally with the total of the balances of the individual stores account in the Stores Ledger. Sometimes separate ledgers are kept for raw materials and other stores. In that case, there will be two separate control account namely Materials Ledger Control Account and Stores Ledger Control Account.

(b) Work-in-progress ledger control account—For every job, product or process, materials, labour and factory expenses are incurred. All such costs are debited in different accounts relating to different jobs or products. These accounts are kept in a job or work-in-progress ledger. A Work-in-progress Ledger Control Account is prepared in the Cost Ledger. The cost of production of completed jobs will be credited to this account and the total expenses incurred on all the jobs will be debited so as to show the total work-in-progress at any time. The balance of this account must be equal to the total of individual balances of Job or Process accounts in the Job Ledger. The Work-in-progress Ledger Control account is referred to as Work-in-progress Account also.

(c) Finished goods ledger control account—In Finished Goods Ledger, a separate account is opened for recording the quantity and price of each finished product manufactured or job completed. In Cost Ledger, a Finished Goods Ledger Control Account is maintained. It is also known as Stock Ledger Control Account. It gives the total value of finished goods in stock at a particular time.

(d) General ledger adjustment account—In Cost Ledger a General Ledger Adjustment Account is opened to record all items of income and expenditure. This account is also referred to as Cost Ledger Control Account (in costing books). Personal Accounts are shown in financial accounts and not in cost accounts. The General Ledger Adjustment Account completes the double entry in the cost ledger and hence all such accounts which pertain to fixed assets or cash or outsiders are posted to this account. All expenditures are shown on the credit side of this account; and the result (benefits) of such expenditure in the form of sale is shown on the debit side of this account. The balance represents the value of stores, stock-in-hand and the amount of work-in-progress.

Cost Ledger Control Account (in financial books)—Since the Costing Department does not act in isolation from the Financial Department and all the purchases and sales are recorded through financial books, a Cost Ledger Control Account must be opened in the financial books. This is only a memorandum account. In this account all the items of revenue and expenditure affecting Cost Accounts are recorded. This account is just the reverse or contrast of the General Ledger Adjustment Account in the Cost Ledger and, therefore, the balance of this account should tally with the balance of its counterpart in the Cost Ledger.

(ii) Other Accounts—They include all other impersonal accounts (real as well as nominal) which effect costs, e.g., wages control account, factory overhead account, administration overhead account, selling and distribution overhead account, cost of sales account, etc. Sometimes, following additional accounts are also opened:

(a) Overheads suspense account—Sometimes, while valuing semi-finished jobs, factory overheads are not included. Similarly while valuing closing stock of finished goods, office and administrative overheads are not included. In such cases normally, at the end of an accounting period, the estimated amount of such overheads is debited to Works or Office Overheads Suspense Account and credited to Works or Office Overheads Account, as the case may be. In the beginning of next accounting period, the entries are reversed to close the suspense accounts.

(b) Capital orders—For each item of capital nature work to be performed in the factory itself, e.g., producing tools and equipments, certain expenditures shall be incurred in the form of materials, wages and other expenses. Such expenditures should be recorded in Capital Order Account and later on capitalised.

(c) Service orders—If repairs and maintenance work is done in the factory, the cost is debited to Repairs and Maintenance Account and later transferred to various overheads account, because the expenditure might have been incurred on production, administration and selling and distribution departments.

No separate account is maintained for direct expenses since they are directly charged to work-in-progress account.

When the finished goods are sold, they are transferred to Cost of Sales Account. In the last, a Costing Profit and Loss Account can be prepared with the help of all the above accounts.

## ACCOUNTING FOR COST ITEMS

### Materials

Some transactions relating to materials, such as purchase of materials and purchase returns influence both financial and cost ledgers. Some transactions viz., issues of materials from stores, transfer of materials from one job to another, return of excess material to stores, influence cost ledgers only.

### Labour Cost

All wages are recorded in the cost accounting books through the wages control account and the general ledger adjustment account.

### Overhead

The overhead—production, administration and selling and distribution—are absorbed to products or jobs on some equitable basis. Production overhead is absorbed on the basis of direct materials cost, direct labour cost or labour hours or machine hours or rate per unit. The production overhead account is credited with the amount of overhead absorbed and the work-in-progress account is debited. The administration overhead account is credited and the finished goods account is debited to recover administrative overhead for the production. Alternatively, administrative overhead is directly transferred to the profit and loss account and is not charged to production. Similarly, selling and distribution overhead may be charged to production by crediting selling and distribution overhead and debiting the cost of sales account.

The amount of under-absorption and over-absorption is transferred to the costing profit and loss account. Alternatively, it may be carried forward to the next accounting period.

## JOURNAL ENTRIES

The use of double entry system in costing records will help in the preparation of trial balance for the costing transactions. The entries for various transactions which can be made with the help of control accounts are mentioned below:

(1) Receipts of materials into stores (cash and credit purchases)
In Cost books
Cost Ledger: Stores Ledger Control Account Dr.
To General Ledger Adjustment A/c
Stores Ledger: Individual stores accounts shall be debited.
In Financial Books
For credit purchases:
Purchases A/c Dr.
Cost Ledger Control A/c (memorandum)
To Creditors A/c
For cash purchases:
Purchases A/c Dr.
Cost Ledger Control A/c (memorandum)
To Cash A/c

(2) Returns to suppliers
In Cost Books
Cost Ledger: General Ledger Adjustment A/c Dr.
To Stores Ledger Control A/c
Stores Ledger: Individual Stores accounts shall be credited.
In Financial Books
Creditors A/c Dr.
To Purchase Returns A/c
To Cost Ledger Control A/c (memorandum)

(3) Receipt of materials for direct issue
In Cost Books
Cost Ledger: Work-in-progress Ledger Control A/c Dr.
To General Ledger Adjustment A/c
Job Ledger: Debit individual jobs for which materials have been received.
In Financial Books
Purchase A/c Dr.
Cost Ledger Control A/c (memorandum)
To Cash or Suppliers A/c

(4) Wages/salaries paid
In Cost Books Dr.
Cost Ledger: Wages Control A/c
To General Ledger adjustment A/c
In financial Books
Wages/Salaries A/c Dr.
Cost Ledger Control A/c (memorandum)
To Cash

(5) For payment of works, office and selling and distribution expenses
In Cost Books
Cost ledger:
Works Overheads A/c Dr.

Office Overheads A/c Dr.
Selling & Distribution Overheads A/c Dr.
To General Ledger Adjustment A/c
Overheads Ledger: Individual expenses accounts (if maintained) to be debited.

In Financial Books:
Expenses A/c Dr.
Cost Ledger Control A/c (memorandum)
To Cash

The following entries are made in cost books only and the financial account shall not be affected. The entries are merely for the transactions or transfers in Cost Ledger.

(6) For issue of direct material
In Cost Ledger:
Work-in-progress Ledger Control A/c Dr.
To Stores Ledger Control A/c
(Total as per materials abstract)
In Job and Stores Ledgers: Individual jobs for which materials have been received shall be debited and individual stores accounts in stores ledger shall be credited.

(7) For issue of indirect materials charging of indirect wages
In Cost Ledger: Dr.
Works/Office/Selling and Distribution Overheads A/c
To Stores Ledger Control A/c/Wages Control A/c
In Stores Ledger: Credit the individual Stores Accounts.

(8) For returns of materials from production to stores
In Cost Ledger: Dr.
Stores Ledger Control A/c
To Work-in-progress Ledger Control A/c
In Stores Ledger: Debit individual stores accounts.
In Job Ledger: Credit individual job accounts.

(9) Allocation of direct wages to production
In Cost ledger: Dr.
Work-in-progress Ledger Control A/c
To Wages Control A/c
(As per wages abstract)
In Job Ledger: Individual job accounts will be debited.

(10) Materials transferred from job No. 1 to job No. 2
In Job or Work-in-progress Ledger:
Job No. 2 A/c Dr.
To Job No. 1 A/c
(No entry is required in Work-in-progress Control A/c or Stores Ledger Control A/c)

(11) Allocation of overheads to jobs
(a) Works Overheads:
In Cost Ledger:
Work-in-progress Ledger Control A/c Dr.
To Works Overheads A/c

In Job Ledger:
Individual Job accounts to be debited.

(b) Office overheads:
In Cost ledger:
Finished Goods Ledger Control A/c
To Office Overheads A/c Dr.
In Finished Goods Ledger:
Individual Job/product accounts to be debited.

(12) For normal wastage of stores and normal idle time wages
In Cost Ledger: Work Overheads A/c Dr.
To Stores Ledger Control A/c
To Wages Control A/c
In Overheads Ledger: Individual expense accounts (if maintained) to be debited.
In Stores Ledger: Individual stores accounts to be credited.

(13) For abnormal loss of material and abnormal idle time
In Cost Ledger: Costing Profit and Loss A/c Dr.
To Stores Ledger Control A/c
To Wages Control A/c
In stores Ledger: Individual stores accounts to be credited.

(14) For cost of production of finished artcles
In Cost Ledger: Finished Goods Ledger Control A/c Dr.
To Work-in-progress Ledger Control A/c
In Finished Goods Ledger: Individual product accounts to be debited.
In Job Ledger: Individual job accounts to be credited.

(15) For cost of goods sold
In Cost Ledger: Cost of Sales A/c Dr.
To Finished Goods Ledger Control A/c
In Finished Goods Ledger: Credit individual product accounts.
Following entries shall be made only in the Cost Ledger:

(16) For allocation of selling and distribution overheads
Cost of Sales A/c Dr.
To Selling Overheads A/c

(17) For sales
General Ledger Adjustment A/c Dr.
To Cost of Sales A/c

(18) For overhead on incomplete jobs-
Works Overheads Suspense A/c Dr.
Office Overheads Suspense A/c Dr.
To Works Overheads A/c
To Office Overheads A/c.
(or alternatively the balances of works or office overheads may be carried forward)

(19) For transfer of profit
Cost of Sales A/c Dr.
To Costing Profit & Loss A/c

(20) For over-charge of overheads (say, office)
Office Overheads A/c Dr.
To Costing Profit and Loss A/c
(or alternatively, the balance may be carried forward)
However, if it is desired to charge a supplementary rate (negative), the following entry will be passed:
Office Overheads A/c
To Finished Goods Ledger Control A/c
To Cost of Sales A/c
(the two accounts will be credited in proportion to the value of finished goods in hand and cost of goods sold?

(21) For under-charge of overheads (say, works)
Costing Profit and Loss A/c Dr.
To Works Overheads A/c
(or alternatively the balance may be carried forward or treated as in case of Entry 20)

(22) For transfer of net profit
Costing Profit and Loss A/c
To General Ledger Adjustment A/c Dr.

### *Example 12.1*

Pass journal entries in the cost books (non-integrated system) for the following transactions:

(i) Materials worth Rs 25,000 returned to stores from job.

(ii) Gross total wages paid Rs 48,000. Employer's contribution to PF and State Insurance amount to Rs 2,000. Wages analysis book detailed Rs 20,000 direct labour, Rs 12,000 towards indirect factory labour, Rs 10,000 towards salaries to office staff and Rs 8,000 for salaries to selling and distribution staff. *(B.Com. Hons Delhi 1999)*

*Solution*

**Journal Entries**

| *Particulars* | | *Dr.* Rs | *Cr.* Rs |
|---|---|---|---|
| (i) Stores Ledger Control A/c | Dr. | 25,000 | |
| To WIP Ltd., Control A/c | | | 25,000 |
| (Being material returned from stores) | | | |
| (ii) Wages Control A/c | Dr. | 50,000 | |
| To General Ledger and Adjustment A/c | | | 48,000 |
| To Provident Found and Employees' State Insurance Account | | | 2,000 |
| (Being gross total wages paid) | | | |
| Work-in-Progress Control A/c | Dr. | 20,000 | |
| Factory Overheads Control A/c | Dr. | 12,000 | |
| Office Overheads Control A/c | Dr. | 10,000 | |
| Selling Overheads Control A/c | Dr. | 8,000 | |
| To Wages Control A/c | | | 50,000 |
| (Being wages allocated) | | | |

### *Example 12.2*

During the physical verification of stores of X Ltd. it was found that 100 units of raw material 'Wye' returned to the supplier has not been recorded. Its purchase invoice price is Rs 5 per unit while the current standard cost is Rs 4.80 per unit. Pass necessary journal entry to record the adjustment in the cost ledger of X Ltd.

*(C.A. Inter Nov. 1997)*

*Solution*

| | | *Dr.* Rs | *Cr.* Rs |
|---|---|---|---|
| General Ledger adjustment A/c | Dr. | 500 | |
| To Stores Ledger Control A/c | | | 480 |
| To Material Price Variance A/c | | | 20 |
| (Being recording of materials returned to supplier, earlier ignored) | | | |

### *Example 12.3*

Pass journal entries in the cost books, maintained on non-integrated system, for the following:

(i) Issue of materials: Direct Rs 5,50,000; Indirect Rs 1,50,000
(ii) Allocation of wages: Direct Rs 2,00,000; Indirect Rs 40,000
(iii) Under/Over absorbed overheads: Factory (over) Rs 20,000; Administration (under) Rs 10,000

*(C.A. Inter Nov. 2000)*

*Solution*

**Journal Entries in Cost Books maintained on non-integrated system**

| | | | Rs | Rs |
|---|---|---|---|---|
| (i) | Work-in-Progress Ledger Control A/c | Dr. | 5,50,000 | |
| | Factory Overhead Control A/c | Dr. | 1,50,000 | |
| | To Stores Ledger Control A/c | | | 7,00,000 |
| | (Being issue of materials) | | | |
| (ii) | Work-in-Progress Ledger Control A/c | Dr. | 2,00,000 | |
| | Factory Overhead Control A/c | Dr. | 40,000 | |
| | To Wages Control A/c | | | 2,40,000 |
| | (Being allocation of wages and salaries) | | | |
| (iii) | Factory Overhead Control A/c | Dr. | 20,000 | |
| | To Costing Profit & Loss A/c | | | 20,000 |
| | (Being transfer of over absorption of overhead) | | | |
| | Costing Profit & Loss A/c | Dr. | 10,000 | |
| | To Administration overhead Control A/c | | | 10,000 |
| | (Being transfer of under absorption of overhead) | | | |

### *Example 12.4*

During June 2001, the following transactions took place in XYZ Co. Ltd.

| | Rs |
|---|---|
| 1. Materials purchased: | |

| | |
|---|---|
| (a) Credit purchases | 18,000 |
| (b) Credit purchases for special job | 800 |
| (c) Cash purchases | 2,000 |
| 2. Returns to suppliers | 1,000 |
| 3. Direct materials issued to production | 12,000 |
| 4. Indirect materials issued | 1,200 |
| 5. Materials returned from production to stores | 200 |
| 6. Materials transferred from Job No. 20 to Job No. 21 | 400 |

You are required to enter the transactions in the financial and cost books.

*Solution*

*Financial Books*

| | | Rs | Rs |
|---|---|---|---|
| 1. (a) Purchases account | Dr. | 18,000 | |
| Cost ledger control account | Dr. | | |
| (memorandum) | | | |
| To Creditors account | | | 18,000 |
| (being the amount of credit purchases) | | | |
| (b) Purchases account | Dr. | 800 | |
| Cost ledger control account | Dr. | | |
| (memorandum) | | | |
| To Creditors account | | | 800 |
| (being the amount of special purchases) | | | |
| (c) Purchases account | Dr. | 2,000 | |
| Cost ledger control account | Dr. | | |
| (memorandum) | | | |
| To Cash | | | 2,000 |
| 2. Creditors account | Dr. | 1,000 | |
| To Purchases returns | | | 1,000 |
| To Cost ledger control account | | | |
| (memorandum) | | | |
| (being the return of materials) | | | |

One may notice that there is no difference in entering transactions 1 (a) and 1(b). No further entries are to be made in the financial books. From the above entries in the cost ledger control accounts the cost accounting department makes corresponding entries in the cost books as follows:

Cost books:

| | | | |
|---|---|---|---|
| 1. (a) Stores ledger control account | Dr. | 18,000 | |
| To General ledger adjustment account | | | 18,000 |
| (being the credit purchases). | | | |
| (b) Work-in-progress ledger control account | Dr. | 800 | |
| To General ledger adjustment account | | | 800 |
| (being the amount of special purchases) | | | |
| (c) Stores ledger control account | Dr. | 2,000 | |
| To General ledger adjustment account | | | 2,000 |
| (being the amount of purchases in cash) | | | |

It is clear that there is no difference in entries (a) and (c) but compare the entries (a) and (b) in both the books.

2. General ledger adjustment account Dr. 1,000
To Stores ledger control account 1,000
(being the return of materials to suppliers)

The following entries will not affect the general ledger adjustment account and therefore they are known as "internal transaction" in cost books:

3. Work-in progress ledger control account Dr. 12,000
To Stores ledger control account 12,000
(being the issue of direct materials to production)

4. Production overhead account Dr. 1,200
To Stores ledger control account 1,200
(being the issue of indirect materials)

5. Stores ledger control account Dr. 200
To Work-in-progress ledger control account 200
(being the return of materials from production to stores)

6. Job No. 21 account Dr. 400
To Job No. 20 account 400
(being the transfer of material from Job No. 20 to Job No. 21)

***Example 12.5***

The profit and Loss account as shown in the financial books of a company for the year ended, 30.9.2002 together with a statement of reconciliation between the profit as per financial and cost accounts is given below:

**Profit & Loss Account for the Year Ended 30.9.2002**

| | Rs | Rs | | Rs | Rs |
|---|---|---|---|---|---|
| Opening stock: | | | Sales | | 15,00,000 |
| Raw material | 90,000 | | Closing stock: | | |
| Work-in-progress | 50,000 | | Raw material | 98,000 | |
| Finished goods | 70,000 | 2,10,000 | Work-in-progress | 53,000 | |
| Raw material purchases | | 5,00,000 | Finished goods | 72,000 | |
| Direct wages | | 2,00,000 | | | 2,23,000 |
| Factory overheads | | 2,00,000 | Miscellaneous Receipts | | 45,000 |
| Administration Expenses | | 1,70,000 | | | |
| Selling and distribution expenses | | 2,20,000 | | | |
| Preliminary expenses written off | | 75,000 | | | |
| Debenture interest | | 30,000 | | | |
| Net profit | | 1,63,000 | | | |
| | | 17,68,000 | | | 17,68,000 |

**Statement of Reconciliation of Profit as per-Financial and Cost Accounts**

| | Rs | Rs |
|---|---|---|
| Profit as per financial accounts | | 1,63,000 |
| (a) Difference in valuation of stock | | |
| *Add:* Raw materials-closing stock | 1,200 | |
| Work in progress-opening stock | 1,300 | |

| | | | |
|---|---|---|---|
| | Finished goods-opening stock | 2,000 | |
| | closing stock | 1,000 | |
| | Total (A) | 5,500 | |
| *Less:* | Raw materials-opening stock | 1650 | |
| | Work in progress-closing stock | 750 | |
| | Total (B) | 2,400 | |
| | (A)–(B) | | 3,100 |
| (b) | Other items | | |
| *Add:* | Preliminary expenses written off | 75,000 | |
| | Debenture interest | 30,000 | |
| | | 1,05,000 | |
| *Less:* | Miscellaneous receipts | 45,000 | 60,000 |
| | Profit as per Cost Accounts | | 2,26,100 |

You are required to prepare the following accounts as they would appear in the Costing Ledger:

(i) Raw Material Control A/c
(ii) Work-in-progress Control A/c
(iii) Finished Goods Control A/c
(iv) Cost of Sales A/c and
(v) Costing Profit & Loss A/c

*(ICWA Inter)*

*Solution*

**Basic Calculations**
**Computation of Items as per Cost Accounts**

| *Particulars* | *As per financial accounts Rs* | *Valuation difference Rs* | *As per cost accounts Rs* |
|---|---|---|---|
| Raw Materials | | | |
| Opening stock | 90,000 | + 1,650 | 91,650 |
| Closing stock | 98,000 | + 1,200 | 99,200 |
| Work-in-progress | | | |
| Opening stock | 50,000 | – 1,300 | 48,700 |
| Closing stock | 53,000 | – 750 | 52,250 |
| Finished Goods | | | |
| Opening stock | 70,000 | – 2,000 | 68,000 |
| Closing stock | 72,000 | + 1,000 | 73,000 |

**Raw Material Control Account**

| | | | |
|---|---|---|---|
| To Balance b/d | 91,650 | WIP Control A/c | 4,92,450 |
| To G.L. Adj. A/c | 5,00,000 | (balancing figure) | |
| | | By Balance c/d | 99,200 |
| | 5,91,650 | | 5,91,650 |

**WIP Control Account**

| | | | |
|---|---|---|---|
| To Balance b/d | 48,700 | By Finished goods control A/c | 8,88,900 |
| To Raw material control A/c | | (balancing figure) | |
| To Wages control A/c | 4,92,450 | By Balance c/d | 52,250 |
| To Factory overhead control A/c | 2,00,000 | | |
| | 2,00,000 | | |
| | 9,41,150 | | 9,41,150 |

**Finished Good Control Account**

| | Rs | | Rs |
|---|---|---|---|
| To Balance b/d | 68,000 | By Cost of Sales A/c | 10,53,900 |
| To WIP control A/c | 8,88,900 | (balancing figure) | |
| To Admn. overheads control A/c | 1,70,000 | By Balance c/d | 73,000 |
| | 11,26,900 | | 11,26,900 |

**Cost of Sales Account**

| | Rs | | Rs |
|---|---|---|---|
| To Finished good control A/c | 10,53,990 | By General ledger adjustment A/c | 15,00,000 |
| To Selling and distribution control A/c | 2,20,000 | | |
| To Profit taken to costing P & L A/c | 2,26,100 | | |
| | 15,00,000 | | 15,00,000 |

**Costing Profit & Loss Account**

| | Rs | | Rs |
|---|---|---|---|
| To Balance transferred to general ledger adjustment A/c | 2,26,100 | By Cost of sales A/c | 2,26,100 |
| | 2,26,100 | | 2,26,100 |

***Example 12.6***

The following figures have been extracted from the cost records of a manufacturing unit:

| | *Rs* |
|---|---|
| Stores: Opening balance | 30,000 |
| Purchases | 1,60,000 |
| Transfers from work-in-progress | 80,000 |
| Issues to work-in-progress | 1,60,000 |
| Issues to repairs and maintenance | 20,000 |
| Deficiencies found in stock taking | 6,000 |

| | |
|---|---|
| Work-on-progress: | |
| Opening balance | 60,000 |
| Direct wages applied | 60,000 |
| Overheads applied | 2,40,000 |
| Closing balance | 40,000 |

Finished products: Entire output is sold at a profit of 10% on actual cost from work-in-progress.

Other wages incurred Rs 70,000; overhead incurred Rs 2,50,000.

Items not included in Cost Records: Income from investments Rs 10,000; Loss in sale of capital assets Rs 20,000.

Draw up Stores control account, Work-in-progress control account, Costing profit and loss A/c, Profit and loss account and Reconciliation statement.

*(ICWA Inter)*

*Solution:*

**(a) Costing Books**

**(i) Stores Control Account**

| | Rs | | Rs |
|---|---|---|---|
| To Balance b/d | 30,000 | By Work-in-progress control account | 1,60,000 |
| To general ledger adjustment A/c | 1,60,000 | By Works overhead control A/c | 20,000 |
| To Work-in-progress control A/c | 80,000 | By Costing profit and loss c/d | 84,000 |
| | 2,70,000 | | 2,70,000 |

**(ii) Work-in-Progress Control Account**

| | | | |
|---|---|---|---|
| To Balance b/d | 60,000 | By Stores control A/c | 80,000 |
| To Stores control A/c | 160,000 | By Costing profit and loss A/c (Cost of sales) | 4,00,000 |
| To Direct wages control A/c | 60,000 | By Balance c/d | 40,000 |
| To Works overhead control A/c | 2,40,000 | | |
| | 5,20,000 | | 5,20,000 |

**(iii) Costing Profit and Loss Account**

| | | | | |
|---|---|---|---|---|
| To Work-in-progress control A/c | | By General ledger adjustment A/c | | |
| (Cost of sales) | 4,00,000 | (Sales) | 4,00,000 | |
| | | Cost of sales 10% Profit | 40,000 | 4,40,000 |
| To Works overhead control A/c | 30,000 | | | |
| To Stores control A/c (Shortage) | 6,000 | | | |
| To Profit | 4,000 | | | |
| | 4,40,000 | | | 4,40,000 |

**(iv) Works Overhead Control Account**

| | | | |
|---|---|---|---|
| To General ledger adjustment A/c | 2,50,000 | By Work-in-progress control A/c | 2,40,000 |
| To Stores ledger control A/c | 20,000 | By Costing Profit &loss A/c (under-recovery) | 30,000 |
| | 2,70,000 | | 2,70,000 |

*Note:* It has been presumed that under recovery of overheads has been transferred to Costing Profit and Loss A/c.

**(b) Financial Books**
**Profit & Loss Account**

| | | | | | |
|---|---|---|---|---|---|
| To Opening stock | | | By Sales | | 4,40,000 |
| stores | 30,000 | | By Closing stock: | | |
| Work-in-progress | 60,000 | 90,000 | Stores | 84,000 | |
| | | | Work-in-progress | 40,000 | 1,24,000 |
| To Purchases | | 1,60,000 | | | |
| To Wages incurred | | 70,000 | | | |
| To Overhead incurred | | 2,50,000 | By Income from investment | | 10,000 |
| To Loss on sale of capital assets | | 20,000 | By Loss | | 16,000 |
| | | 5,90,000 | | | 5,90,000 |

**Reconciliation Statement**

| | (Rs +) | (Rs –) |
|---|---|---|
| Profit as per costing records | 4,000 | |
| *Less:* Under absorption of wages | | 10,000 |
| Items not included in cost accounts: | | |
| *Add:* Income from investment | 10,000 | |
| *Less:* Loss on sale of capital asset | | 20,000 |
| | 14,000 | |
| Loss as per financial books | 16,000 | |
| | 30,000 | 30,000 |

### *Example 12.17*

As at 31st March, the following balances existed in a company's cost ledger:

| | *Dr.* | *Cr.* |
|---|---|---|
| Raw materials control A/c | Rs 60,287 | |
| Work-in-progress control A/c | 24,473 | |
| Finished stock control A/c | 50,389 | |
| Factory overhead control A/c | — | Rs 2,105 |
| Cost ledger control A/c | — | 1,33,044 |
| | Rs 1,35,149 | Rs 1,35,149 |

During the next three months the following items arose:

| | | |
|---|---|---|
| Finished output (at cost) | | Rs 42,167 |
| Factory overhead incurred | | 18,302 |
| Raw materials purchased | | 24,600 |
| Direct wages payments | Rs 10,106 | |
| Indirect labour (salaries) | 4,333 | |
| | | 14,439 |
| Cost of sales | | 37,178 |
| Materials issued to production | | 25,463 |
| Sales returns (at cost) | | 1,076 |
| Materials returned to and credited by suppliers | | 580 |
| Factory overhead allocated to production | | 15,440 |

You are required to write up the accounts and schedule the closing balances, stating what each balance represents.

*Solution*

**Financial Ledger Control Account**

| | | | |
|---|---|---|---|
| Material returned | Rs 580 | Balance | Rs 133,044 |
| Cost of sales | Rs 37,178 | Material | 24,600 |
| Balance c/d | 1,53,703 | Factory overhead | 18,302 |
| | | Salaries & wages | 14,439 |
| | | Sales returns | 1,076 |
| | 191,461 | | 191,461 |
| | | Balance b/d | 1,53,703 |

**Factory Overhead Control Account**

| | | | |
|---|---|---|---|
| Financial ledger control | Rs 18,302 | Balance | Rs 2,105 |
| Salaries | 4,333 | Work-in-progress | 15,440 |
| | | Balance c/d | 5,090 |
| | 22,635 | | 22,635 |
| | | Balance b/d | 5,090 |

**Raw Material Control Account**

| | | | |
|---|---|---|---|
| Balance | 60,287 | Work-in-progress | Rs 25,463 |
| Financial ledger control | | Returns | 580 |
| | 24,600 | Balance c/d | Rs 58,844 |
| | 84,887 | | 84,887 |
| Balance b/d | | | 58,844 |

**Work-in-Progress Account**

| | Rs | | Rs |
|---|---|---|---|
| Balance | 24,473 | Finished stock | 42,167 |
| Direct wages | 10,106 | Balance c/d | 33,315 |
| Material | 25,463 | | |
| Factory overhead | 15,440 | | |
| | 75,482 | | 75,482 |
| Balance b/d | Rs 33,315 | | |

**Finished Stock Control Account**

| | | | |
|---|---|---|---|
| Balance | 50,389 | Cost of sales | 37,178 |
| Work-in-progress | 42,167 | Balance | 56,454 |
| Returns | 1,076 | | |
| | 93,632 | | 93,632 |
| Balance | 56,454 | | |

**Cost of sales account**

| | | | |
|---|---|---|---|
| Finished stock | 37,178 | Financial ledger control | 37,178 |
| | 37,178 | | 37,178 |

**Trial Balance**

| | Rs | Rs |
|---|---|---|
| (a) Financial Ledger Control Account | | 1,53,703 |
| (b) Raw Material Control Account | 58,844 | |
| (c) Work-in-progress Account | 33,315 | |
| (d) Factory overhead Control Account | 5,090 | |
| (e) Finished Stock Control Account | 56,454 | |
| | 153,703 | 153,703 |

(a) Total of balance of all cost ledger accounts.
(b) Value of raw materials held in stores, being the total balance of all the individual stores accounts.
(c) Value of work in progress, the total of all jobs or processes being worked upon at this date.
(d) Factory overhead under-absorbed.
(e) Value of finished stock held in the warehouse.

***Example 12.8***

The following balance were extracted from a company's ledger as on 31st December, 1997:

| | Rs | Rs |
|---|---|---|
| Raw materials control A/c | 48,836 | |
| Work-in-progress control A/c | 14,745 | |
| Finished stock control A/c | 21,980 | |
| Nominal ledger control A/c | | 85,561 |
| | 85,561 | 85,561 |

Further transactions took place during the following quarter as follows:

| | Rs |
|---|---|
| Factory overhead—allocated to WIP | 11,786 |
| Goods finished—at cost | 36,834 |
| Raw materials purchased | 22,422 |
| Direct wages—allocated to WIP | 18,370 |
| Cost of goods sold | 42,000 |
| Raw materials—issued to production | 17,000 |
| Raw materials—credited by suppliers | 1,000 |
| Inventory audit—raw material losses | 1,300 |
| WIP rejected (with no scrap value) | 1,800 |
| Customer's returns (at cost) of finished goods | 3,000 |

Prepare all the Ledger Accounts in Cost Ledger.

*(C.A. Inter Nov. 1998)*

*Solution*

**Dr. Raw Materials Control Account Cr.**

| *Particulars* | *Amount Rs* | *Particulars* | *Amount Rs* |
|---|---|---|---|
| To Balance b/d | 48,836 | By WIP control A/c | 17,000 |
| To Nominal Leger Control A/c | 22,422 | By Nominal Ledger Control A/c | 1,000 |
| | | By Nominal Ledger Control A/c | 1,300 |
| | | By Balance c/d | 51,958 |
| | 71,258 | | 71,258 |

**Dr. Work-in-progress Control Account Cr.**

| *Particulars* | *Amount Rs* | *Particulars* | *Amount Rs* |
|---|---|---|---|
| To Balance b/d | 14,745 | By Finished Stock Control A/c | 36,834 |
| To Nominal Ledger Control A/c | 11,786 | By Nominal Ledger Control A/c | 1,800 |
| To Raw Material Control A/c | 17,000 | By Balance c/d | 23,267 |
| To Nominal Ledger Control A/c | 18,370 | | |
| | 61,901 | | 61,901 |

**Dr. Finished Stock Control Account Cr.**

| *Particulars* | *Amount Rs* | *Particulars* | *Amount Rs* |
|---|---|---|---|
| To Balance b/d | 21,980 | By Nominal Ledger Control A/c | 42,000 |
| To WIP Control A/c | 36,834 | By Balance c d | 19,814 |
| To Nominal Ledger Control A/c | 3,000 | | |
| | 61,814 | | 61,814 |

**Dr.** **Nominal Ledger Control Account** **Cr.**

| *Particulars* | *Amount Rs* | *Particulars* | *Amount Rs* |
|---|---|---|---|
| To Raw Material Control A/c | 1,000 | By Balance b/d | 85,561 |
| To Raw Material Control A/c | 1,300 | By Raw Material Control A/c | 22,422 |
| To Finished Stock Control A/c | 42,000 | By WIP Control A/c | 11,786 |
| To WIP Control A/c | 1,800 | By WIP Control A/c | 18,370 |
| To Balance c/d | 95,039 | By Finished Stock Control A/c | 3,000 |
| | 1,41,139 | | 1,41,139 |

### *Example 12.9*

A company operates on historic job cost accounting system, which is not integrated with the financial accounts. At the beginning of a month, the operating balances in cost ledger were:

| *Particulars* | | | *Rs (in lakhs)* |
|---|---|---|---|
| Stores Ledger Control Account | | | 80 |
| Work-in-progress Control Account | | | 20 |
| Finished Goods Control Account | | | 430 |
| Building Construction Account | | | 10 |
| Cost Ledger Control Account | | | 540 |
| During the month, the following transactions took place: | | | |
| Materials | — | Purchased | 40 |
| | | Issued to production | 50 |
| | | Issued to general maintenance | 6 |
| | | Issued to building construction | 4 |
| Wages | — | Gross wages paid | 150 |
| | | Indirect wages | 40 |
| | | For building construction | 10 |
| Work Overheads | — | Actual amount incurred (excluding items shown above) | 160 |
| | | Absorbed in building construction | 20 |
| | | Under absorbed | 8 |
| Royalty paid | | | 5 |
| Selling Distribution and Administration Overheads | | | 25 |
| Sales | | | 450 |

At the end of the month, the stock of raw material and work-in-progress was Rs 55 lakhs and Rs 25 lakhs respectively. The loss arising in the raw material account is treated as factory overheads. The building under construction was completed during the month. Company's gross profit margin is 20% on sales.

Prepare the relevant control accounts to record the above transactions in the cost ledger of the company. *(C.A. Inter May 1996)*

*Solution*

**Cost Ledger Control Account** (Rs in Lakhs)

| *Particulars* | *Rs* | *Particulars* | *Rs* |
|---|---|---|---|
| To Costing P & L A/c | 450 | By Balance b/d | 540 |
| To Building Construction A/c | 44 | By Stores Ledger Control A/c | 40 |
| To Balance c/d | 483 | By Wages Control A/c | 150 |

| | | | |
|---|---|---|---|
| | | By Works Overhead Control A/c | 160 |
| | | By Royalty A/c | 5 |
| | | By Selling, Distribution and Administration Overheads A/c | 25 |
| | | By Costing Profit & Loss A/c | 57 |
| | 977 | | 977 |

**Stores Ledger Control Account**

| *Particulars* | *Rs* | *Particulars* | *Rs* |
|---|---|---|---|
| To Balance b/d | 80 | By WIP Control A/c | 50 |
| To Cost Ledger Control A/c | 40 | By Works Overhead Control A/c | 6 |
| | | By Building Const. A/c | 4 |
| | | By Works Overhead Control A/c (Loss) | 5 |
| | | By Balance C/d | 55 |
| | 120 | | 120 |

**Work-in-progress Control Account**

| *Particulars* | *Rs* | *Particulars* | *Rs* |
|---|---|---|---|
| To Balance b/d | 20 | By Finished Goods Control A/c | 333 |
| To Stores Ledger Control A/c | 50 | By Balance c/d | 25 |
| To Wages Control A/c | 100 | | |
| To Works Overhead Control A/c | 183 | | |
| To Royalty A/c | 5 | | |
| | 358 | | 358 |

**Finished Goods Control Account**

| *Particulars* | *Rs* | *Particulars* | *Rs* |
|---|---|---|---|
| To Balance b/d | 430 | By Cost of Goods sold A/c (*See Working Note*) | 360 |
| To WIP Control A/c | 333 | By Balance c/d | 403 |
| | 763 | | 763 |

**Cost of Sales Account**

| *Particulars* | *Rs* | *Particulars* | *Rs* |
|---|---|---|---|
| To Cost of Goods Sold A/c | 360 | By Costing P/L A/c | 385 |
| To Selling, Distribution and Administration Overheads A/c | 25 | | |
| | 385 | | 385 |

**Costing P & L Account**

| *Particulars* | *Rs* | *Particulars* | *Rs* |
|---|---|---|---|
| To Cost of Sales A/c | 385 | By Cost Ledger Control A/c | 450 |
| To Works Overhead Control A/c | 8 | | |
| To Cost Ledger Control A/c (Profit) | 57 | | |
| | 450 | | 450 |

**Building Construction Account**

| *Particulars* | *Rs* | *Particulars* | *Rs* |
|---|---|---|---|
| To Balance b/d | 10 | By Cost Ledger Control A/c | 44 |
| To Stores Ledger Control A/c | 4 | | |
| To Wages Control A/c | 10 | | |
| To Works Overhead Control A/c | 20 | | |
| | 44 | | 44 |

**Works Overhead Control Account**

| *Particulars* | *Rs* | *Particulars* | *Rs* |
|---|---|---|---|
| To Stores Ledger Control A/c | 6 | By Building Construction A/c | 20 |
| To Wages Control A/c | 40 | By WIP Control A/c | 183 |
| To Cost Ledger Control A/c | 160 | By Costing P and L A/c | 8 |
| To Stores Ledger Control A/c (Loss) | 5 | | |
| | 211 | | 211 |

**Wages Control Account**

| *Particulars* | *Rs* | *Particulars* | *Rs* |
|---|---|---|---|
| To Cost Ledger Control A/c | 150 | By Works Overhead Control A/c | 40 |
| | | By Building Const. A/c | 10 |
| | | By WIP Control A/c | 100 |
| | 150 | | 150 |

**Royalty Account**

| *Particulars* | *Rs* | *Particulars* | *Rs* |
|---|---|---|---|
| To Cost Ledger Control A/c | 5 | By WIP Control A/c | 5 |
| | 5 | | 5 |

**Cost of Goods Sold Account**

| *Paricular*s | *Rs* | *Particulars* | *Rs* |
|---|---|---|---|
| To Finished Goods Control A/c | 360 | By Cost of Sales A/c | 360 |
| | 360 | | 360 |

**Selling, Distribution and Administration Overheads Account**

| *Particulars* | *Rs* | *Particulars* | *Rs* |
|---|---|---|---|
| To Cost Ledger Control A/c | 25 | By Cost of Sales A/c | 25 |
| | 25 | - | 25 |

*(Rs in lakhs)*

**Trial Balance**

| *Particulars* | *Dr.* | *Cr.* |
|---|---|---|
| Stores Ledger Control Account | 55 | |
| WIP Control Account | 25 | |
| Finished Goods Control Account | 403 | |
| Cost Ledger Control Account | | 483 |
| | 483 | 483 |

**Working Note:**

If Selling Price is Rs 100, Cost price is = Rs 80

If Selling Price is Rs 450, cost price will be = Rs $\frac{80}{100}$ × Rs 450 = Rs 360 lakhs

***Example 12.10***

A fire destroyed some accounting records of a company. You have been able to collect the following from the spoilt papers/records and as a result of consultation with accounting staff in respect of January, 1997;

(i) *Incomplete Ledger Entries:*

**Raw-Materials Account**

| | Rs | | Rs |
|---|---|---|---|
| Beginning Inventory | 32,000 | | |

**Work-in-progress Account**

| | Rs | | Rs |
|---|---|---|---|
| Beginning Inventroy | 9,200 | Finished Stock | 1,51,000 |

**Creditors Account**

| | Rs | Opening Balance | Rs |
|---|---|---|---|
| Closing Balance | 19,200 | | 16,400 |

**Manufacturing Overheads Account**

| | Rs | | Rs |
|---|---|---|---|
| Amount Spent | 29,600 | | |

**Finished Goods Account**

| | Rs | | Rs |
|---|---|---|---|
| Opening Inventory | 24,000 | Closing Inventory | 30,000 |

(ii) *Additional Information:*

(1) The Cash-book showed that Rs 89,200 have been paid to creditors for raw-material.

(2) Ending inventory of work-in-progress included material Rs 5,000 on which 300 direct labour hours have been booked against wages and overheads.

(3) The job card showed that workers have worked for 7,000 hours. The wage rate is Rs 10 per labour hour.

(4) Overhead recovery rate was Rs 4 per direct labour hour.

You are required to complete the above accounts in the cost ledger of the company.

*(C.A. Inter May 1997)*

*Solution*

**Dr. Creditors Account Cr.**

| *Particulars* | *Rs* | *Particulars* | *Rs* |
|---|---|---|---|
| To Cash and Bank (1) | 89,200 | By Balance b/d | 16,400 |
| To Balacne c/d | 19,200 | By Purchases (Balancing figure) | 92,000 |
| | 1,08,400 | | 1,08,400 |

**Dr. Work-in-progress Account Cr.**

| *Particulars* | *Rs* | *Particulars* | | *Rs* |
|---|---|---|---|---|
| To Balance b/d | 9,200 | By Finished stock | | 1,51,000 |
| To Raw-materials (Balancing figure) | 53,000 | By Balance c/d: Material (2): | Rs 5,000 | |
| To Wages (3) (7,000 hrs. × Rs 10) | 70,000 | Labour (2): (300 hrs. × 10 hrs) | Rs 3,000 | |
| To Overheads (4) (7,000 hrs. × Rs 4) | 28,000 | Overheads (2): (300 hrs. × 4 hrs.) | Rs 1,200 | 9,200 |
| | 1,60,200 | | | 1,60,200 |

**Dr. Raw-materials Account Cr.**

| *Particulars* | *Rs* | *Particulars* | *Rs* |
|---|---|---|---|
| To Balance b/d | 32,000 | By Work-in-progress (As above) | 53,000 |
| To Purchases (as above) | 92,000 | By Balance c/d | 71,000 |
| | 1,24,000 | | 1,24,000 |

**Dr.** **Finished Goods Account** **Cr.**

| *Particulars* | *Rs* | *Particulars* | *Rs* |
|---|---|---|---|
| To Balance b/d | 24,000 | By Cost of Sales | 1,45,000 |
| To *WIP* (as above) | 1,51,000 | (Balancing figure) | |
| | | By Balance c/d | 30,000 |
| | 1,75,000 | | 1,75,000 |

**Dr.** **Manufacturing Overheads A/c** **Cr.**

| *Particulars* | *Rs* | *Particulars* | *Rs* |
|---|---|---|---|
| To Sundries | 29,600 | By WIP (7,000 × Rs 4) | 28,000 |
| | | By Under-absorbed Overheads A/c | 1,600 |
| | 29,600 | | 29,600 |

## THEORY QUESTIONS

1. What is non-integral accounting system?
2. What are cost control accounts? Describe their advantages?
3. Mention the principal ledgers maintained in financial accounts and cost accounts.

## PROBLEMS

1. The balance on Ist December, 2001 in a company's job ledger control account was Rs 8,76,230. During the following month transactions took place as follows:

| | Rs |
|---|---|
| Direct wages incurred | 30,960 |
| Direct materials issued | 1,21,140 |
| Completed work invoiced (cost) | 5,28,680 |
| Factory overhead incurred | 58,630 |
| Materials price rebates (on jobs) | 1,210 |
| Special purchases (for jobs) | 7,640 |
| Sub-contractor's charges | 8,230 |
| Direct expenses incurred | 11,370 |
| Materials returned to store | 4,060 |
| Suppliers, credit notes (special purchases) | 2,390 |
| Contractors' credits | 4,870 |

You are required to:
(i) Write up and bring down the balance on the cost account.
(ii) State what the balance represents. *(ICWA Inter)*

*Ans:* Balance Rs 5,72,990

2. Jounalise the following transactions in the cost journal of a company:

| | *Rs* |
|---|---|
| Stores purchased | 45,620 |
| Manufacturing wages | 25,440 |
| Sales | 66,870 |

| | |
|---|---|
| Wages for plant repairs | 470 |
| Stores issued for plant repairs | 250 |
| Stores issued for production | 36,630 |
| Wages for stores department | 690 |
| Selling expenses | 2,560 |
| Stores returned to suppliers | 620 |
| Indirect wages | 2,950 |
| Normal waste of stores | 290 |
| Wages for repairs to building | 290 |
| Normal idle time | 560 |
| Stores issued for repairs to building | 85 |
| Work on cost | 4,750 |
| General on cost | 1,350 |
| Balance at end work-in-progress | 6,500 |
| Completed stock | 2,875 |
| Stores balance on hand | 8,900 |

3. Pass the journal entries for the following transactions in a double entry cost accounting system.

| | | |
|---|---|---|
| (a) Issue of materials: | Direct | Rs 5,50,000 |
| | Indirect | 1,50,000 |
| (b) Allocation of wages and salaries: | Direct | 2,00,000 |
| | Indirect | 40,000 |
| (c) Overheads absorbed in jobs: | Factory | 1,50,000 |
| | Administration | 50,000 |
| | Selling | 30,000 |
| (d) Under/over absorbed overheads: | Factory (over) | 20,000 |
| | Administration (under) | 10,000 |

*(ICWA Inter)*

4. Pass suitable journal entries for the following transactions both in cost and financial books:

| | Rs |
|---|---|
| (i) Materials purchases: | |
| (a) Credit purchases | 10,000 |
| (b) Credit purchases for job X | 400 |
| (c) Cash purchases | 5,000 |
| (ii) Return to suppliers | 1,000 |
| (iii) Direct materials issued to production | 8,000 |
| (iv) Indirect materials issued: | |
| (a) Factory | 1,000 |
| (b) Office | 500 |
| (c) Selling and distribution | 500 |
| (v) Materials returned from production to stores | 1,000 |
| (vi) Wages paid: | |

| | | | |
|---|---|---|---|
| Gross wages | | Rs 10,000 | |
| *Less:* Deduction: | | | |
| Employee's state insurance | 500 | | |
| Employee's provident fund | 500 | | |
| Income tax | 200 | 1,200 | 8,800 |

Provide Employer's contribution to ESI Rs 500 and P.F. 500.

| | | | |
|---|---|---|---|
| (vii) | The wages analysis book gives the following details: | | |
| | Wages paid to direct labour | 8,000 | |
| | Salaries paid to administration staff | 1,000 | |
| | Salaries paid to production staff | 1,000 | |
| | Salaries paid to selling and distribution staff | 1,000 | 11,000 |
| (viii) | Services provided by creditors | | 5,000 |
| (ix) | Petty expenses incurred | | 500 |
| (x) | Analysis of petty expenses: | | |
| | Production overhead | | 200 |
| | Administration overhead | | 200 |
| | Selling and distribution overhead | | 100 |
| (xi) | Analysis of services reveals the following position: | | |
| | Production overhead | | 2,000 |
| | Administration overhead | | 2,000 |
| | Selling and distribution overhead | | 1,000 |
| (xii) | Overheads are absorbed as under: | | |
| | Production overhead | | 2,500 |
| | Administration overhead | | 2,000 |
| | Selling and distribution overhead | | 3,000 |

5. The following is the general ledger control account in the ledger:

| | | | | | |
|---|---|---|---|---|---|
| Sales | | Rs 60,000 | Opening Stock: | Rs | Rs |
| Closing stock: | Rs | | Materials | 7,000 | |
| Material | 7,300 | | Work-in-progress | 4,000 | |
| Work-in-progress | 5,000 | | Finished goods | 2,000 | 13,000 |
| Finished goods | 2,500 | 14,800 | | | |
| | | | Purchases of materials | | 10,000 |
| | | | Production overhead | | 11,000 |
| | | | Administration overhead | | 2,000 |
| | | | Selling and distribution overhead | | 4,000 |
| | | | Wages and salaries, etc : | | |
| | | | Direct | Rs 12,000 | |
| | | | Indirect | 5,900 | |
| | | | Idle time | 300 | |
| | | | Administration | 2,900 | |
| | | | Selling salaries and commission | 5,250 | 26,350 |
| | | | Net profit per financial accounts | | Rs 8,450 |
| | | 74,800 | | | 74,800 |
| | | Stores: | Direct materials | Rs 8,500 | |
| | | | Consumable stores | Rs 1,000 | |
| | | Overheads recovered: | Production | 150% of direct wages | |
| | | | Administration | Rs 5,000 | |
| | | | Selling and distribution | Rs 9,000 | |

From the above information, prepare control accounts for materials finished stock, work-in-progress and overheads, and the profit and loss account, as they would appear in the cost ledger.

*Ans:* Net profit Rs 8,450

6. The cost ledger of a company shows the following balances as on January 1, 2001

| | Dr. | Cr. |
|---|---|---|
| Work-in-progress control A/c | Rs 7,840 | |
| Finished stock ledger control A/c | 5,860 | |
| Works overhead suspense A/c | 400 | |
| Office and administration overhead suspense A/c | 200 | |
| Stores ledger control A/c | 10,500 | |
| General adjustment A/c | | 24,800 |

Transactions for the year 2001 were:

| | |
|---|---|
| Wages (direct labour) | 61,200 |
| Wages (indirect labour) | 2,800 |
| Works overhead allocated to production | 18,700 |
| Office and administration overhead allocated | 6,200 |
| Stores issued to production | 39,300 |
| Goods finished during the year | 1,20,000 |
| Finished goods sold (no stock were left at the year end) | 1,32,000 |
| Stores purchased | 36,000 |
| Stores issued to factory repair orders | 1,500 |
| Carriage inwards on stores issued for production | 600 |
| Works expenses | 14,000 |
| Office and administration expenses | 6,000 |

You are required to:

(a) Write up the cost ledger accounts recording the above transactions and make necessary transfers to control accounts.

(b) Prepare the Trial Balance as on 31st December, 2001.

7. The following balances appeared in the books of M/s M.K. Co. Ltd. on 1st January 2001:

| | Rs | Rs |
|---|---|---|
| General ledger adjustment account | | 15,200 |
| Stores ledger control account | 8,750 | |
| Work-in-progress ledger contingency account | 4,280 | |
| Finished goods ledger contingency account | 2,170 | |
| | 15,200 | 15,200 |

On 31st December, 2001 the following information was supplied:

| | Rs | Rs |
|---|---|---|
| Purchase of stores | | 60,640 |
| Purchase for special job | | 1,950 |
| Direct wages | 38,627 | |
| Indirect factory wages | 9,543 | |
| Administrative salaries | 6,731 | |
| Selling and distribution salaries | 4,252 | 59,153 |
| Production expenses | | 10,432 |

| | |
|---|---|
| Administrative expenses | 9,546 |
| Selling and distribution expenses | 6,430 |
| Stores issued to production | 56,501 |
| Stores issued to maintenance account | 2,586 |
| Returns to suppliers | 312 |
| Production overhead absorbed by production | 23,410 |
| Administrative overhead absorbed by finished goods | 15,150 |
| Selling overheads recovered on sales | 9,515 |
| Products finished during the year | 1,18,517 |
| Finished goods sold at cost | 1,33,382 |
| Sales | 1,55,000 |

You are required to record the entries in the cost ledger for the year 2001 and prepare a trial balance.

*Ans:* Cost ledger general ledger adjustment A/c balance Rs 18,697.
Stores ledger control A/c balance Rs 9,991.
Work-in-progress A/c balance Rs 6,251.
Finished goods ledger A/c balance Rs 2,455.
Trial balance total Rs 18,697.



# Integrated Accounting System

## Meaning and Features

In integrated accounting system, the concept of a separate profit and loss account for financial and costing purposes is discarded in favour of a unified account which will serve both financial and costing purposes. Such a system of accounting is referred to as the "integrated" or "integral" cost accounting system. A single book-keeping system which contains both financial and cost accounts is known as an integral accounting system. An integrated accounting system has the following advantages:

1. There is no problem of reconciliation as there will only be one profit amount.
2. This system is economical and easy to understand. Duplication of work and labour are avoided.
3. Cost data can be presented promptly and regularly.
4. All cost data and accounts are automatically checked and thus cost figures are accurate.

The following factors should be considered before establishing an integrated cost accounting system:

1. *Degree of integration* The degree of integration should be determined. Some business firms may integrate up to the stage of prime cost or factory cost. On the other hand, many undertakings integrate the whole of the records.
2. *Control accounts* In place of classifying expenditure according to it nature, control accounts may be prepared for each of the elements of cost, such as:
   Material Control Account
   Direct Labour Control Account
   Factory Overhead Control Account
   Administrative Overhead Control Account
   Selling and Distribution Overhead Control Account.

Some of the above control accounts could be separated into fixed and variable depending on the circumstances.

3. *Cost accumulation purposes* Full details about the cost data are provided to the cost accounting department so as to achieve the following objectives:
   (a) To provide the necessary costing data.
   (b) To form the basis of journal entries so that the control accounts can be cleared to suitable revenue accounts resulting into a cost of sales account.

4. Provisions for accured expenses, prepayments and stocks should be dealt with by transfers to suitable suspense accounts, so that the balance remaining in each control account represent the charges for the period.

## PRINCIPAL ACCOUNTS

Under integrated accounting the following accounts are mainly kept;

### Stock Control Account

This account is prepared for each of the following cost items:

(i) *Raw material* This account has opening stock and purchases on the debit side and material issues on credit side.

(ii) *Work-in-progress* This account is debited with opening stock and factory overhead and credited with cost of goods finished. The closing stock, if any, will be carried forward to the next year.

(iii) *Finished stock* This account is known as the finished goods account also. It is debited with goods finished and credited with the cost of sales.

The above stock accounts are usually used in place of the stock and purchase account which is maintained in the financial books.

### Cost of Sales Account

The cost of goods sold is debited to this account and the finished goods account is credited.

### Assets Account

Separate accounts are kept for different assets possessed by the firm, such as plant, furniture, building, etc.These individual assest accounts are prepared in the usual way. Any capital expenditure incurred is debited.

### Debtors and Creditors Control Account

The creditors account mentions the transactions and their amounts with creditors and suppliers. The balance in creditors account should tally with the balance in the purchase ledger. Similarly, the debtors control account should tally with the sales ledger.

### Prepayments Account and Outstanding Account

An expense account will show the prepaid amount made, if any. The prepaid amount is debited to the prepaid account and credited to overhead control accounts. Thus, the expense which is related to the period is charged to the work-in-progress account. In case of an expense due but not paid, the expense due account is credited and the overhead control account is debited. When the amount is actually paid, the expense due account is debited and cash account is credited or it can be adjusted through the overhead control account.

### Direct Wages and Overhead Costs Control Account

When these costs are incurred, the appropriate control account is debited and the cash account credited. For example, the total direct wages paid will be debited to the direct labour control account. At the end of a period, they are transferred to work-in-progress accounts by crediting the appropriate control accounts and debiting the work-in-progress account. It is possible that actual payments for a period may not tally with the expenditure to be charged for the period and, therefore, adjustments should be made.

### Departmental or Cost Centre Account

Under integrated account, an account is kept for each department or cost centre. This helps in knowing the cost of a department and controlling costs associated with different departments.

### Cash Account

In this account all cash receipts are debited and cash disbursements are credited.

## JOURNAL ENTRIES

Journal entries which are recorded in integral and non-integral accounting systems are given on the following pages.

### Distinction between 'Interlocking' and 'Integration' of Cost and Financial Accounts

When independent sets of books are maintained for cost and financial accounts, they are 'interlocked' by control accounts maintained in the two sets of books. Cost Ledger Control Account is maintained in the financial books and a General Ledger Adjustment Account in the costing books. Thus, a link is established between the two sets of books. In costing books, all entries pertaining to fixed assets, cash, or outsiders are posted in General Ledger Adjustment Account. In case it is desired to integrate the two trial balances into one, the Cost Ledger Control Account and General Ledger Adjustment Account can be omitted because they are 'contra' accounts.

Integration requires the maintenance of only one set of books in which all transactions are recorded. By eliminating cost ledger, all the control accounts are maintained in general ledger.

Integration is preferable to interlocking from the point of view of economy but sometimes due to practical difficulties, the maintenance of 'interlocking' system is essential. Although integration (maintaining one set of accounts) offers better scope for economy and efficiency in accounting, sometimes it is desirable to have separate sets of accounts because of organisational problems involved in the maintenance of one set of books. Cost Accounting has assumed considerable significance in the planning and control of business operations and hence the need for a separate costing department is felt by the management. Therefore, generally, 'integral' system can be employed, with advantages, only in small units.

**Journal Entries to be Recorded under Non-integral and Integral System**

| *Items* | *Non-integral System* | | *Integral System* |
|---|---|---|---|
| | *Financial books* | *Cost books* | |
| 1. Purchase of materials | Purchases A/c Dr.<br>To Bought Ledger<br>To Bought Ledger Control<br>Control (or creditors) A/c | Stores Ledger Control A/c Dr.<br>To General Ledger Adjustment A/c | Stores Ledger Control A/c Dr.<br><br>(or creditors) A/c |
| 2. Issue of materials for production | No entry | Work-in-progress Ledger Control A/c Dr.<br>To Stores Ledger Control A/c | Work-in-progress A/c Dr.<br>To Stores Ledger Control A/c |
| 3. Payment of wages | Wages A/c Dr.<br>To Cash<br>To Insurance<br>To Tax | Wages A/c (or Wages Control A/c) Dr.<br>To General Ledger Adjustment A/c | Wages A/c (wages control A/c) Dr.<br>To Cash A/c |
| 4. Analysis and distribution of wages | No entry | Work-in-progress A/c Dr.<br>(for direct labour)<br>Factory Ov. Control A/c Dr.<br>(for factory indirect labour)<br>Adm. Overhead Control A/c Dr.<br>(for office indirect labour)<br>S & D Overhead Control A/c Dr.<br>(for selling and distribution indirect labour)<br>To Wages Control A/c | Work-in-Progress Control A/c Dr.<br>Factory Overhead A/c Dr.<br>Administration Overhead A/c Dr.<br>S & D Overhead A/c Dr.<br>To Wages Control A/c |
| 5. Payment for indirect expenses, e.g. power, repairs, etc. | Expenses A/c Dr.<br>To Cash<br>To Creditors | Factory/Adm./Selling & Dis. Overhead A/c Dr.<br>To General Ledger adj. A/c | Factory/Office/Selling & Distribution Overhead A/c Dr.<br>To Cash<br>To Creditors |
| 6. Recording of factory overheads at predetermined rates | No entry | Work-in-progress Control A/c Dr.<br>To Factory Overheads Control A/c | Work-in-progress Control A/c Dr.<br>To Factory Overhead Control A/c |
| 7. Factory overheads over-absorbed | No entry | Factory Overhead Control A/c Dr.<br>To Costing P&L A/c | Factory Overhead A/c Dr. |

*(Contd.)*

| *Items* | *Non-integral System* | | *Integral System* |
|---|---|---|---|
| | *Financial books* | *Cost books* | |
| | | (or alternatively the balance may be carried forward) | To P&L A/c |
| 8. Jobs completed | No entry | Stock Ledger Control A/c Dr.<br>To Work-in-progress Ledger Control A/c | Stock Ledger Control A/c Dr.<br>To Work-in-progress Ledger Control A/c |
| 9. Interest paid | Interest A/c Dr.<br>To Cash | No entry | Interest A/c Dr.<br>To Cash |
| 10. Rent of own premises | No entry | Works Overhead A/c Dr.<br>To General Ledger Adjustment A/c | Works Overheads A/c Dr.<br>To Rent (notional) A/c |
| 11. Abnormal idle time | No entry | Costing P&L A/c Dr.<br>To Wages A/c<br>(or alternatively the balance may be carried forward) | Profit & Loss A/c Dr.<br>To Wages A/c |
| 12. Sales (credit) | Sales Ledger Control (or Debtors) A/c Dr.<br>To Sales A/c | General Ledger Adjustment A/c Dr.<br>To Cost of Sales A/c | Sales Ledger Control (Debtors) A/c To Sales A/c |

### *Example 13.1*

Journalise the following transactions in the integrated books of accounts:

| | |
|---|---|
| (a) Credit purchase | Rs 12,00,000 |
| (b) Production wages paid | 7,00,000 |
| (c) Stocks issued to production orders | 8,00,000 |
| (d) Work expenses charged to production | 4,50,000 |
| (e) Finished goods transferred from production orders | 18,00,000 |
| (f) Administration expenses charged to production | 1,50,000 |
| (g) Work expenses outstanding | 1,20,000 |
| (h) Work expenses paid | 4,60,000 |

*(ICWA Inter Dec. 1996)*

*Solution*

**Journal Entries Under Integral System of Accounting**

| *Particulars* | | *Dr. (Rs)* | *Cr. (Rs)* |
|---|---|---|---|
| (a) Stores Ledger Control Account | Dr. | 12,00,000 | |
| To Sundry Creditors Account | | | 12,00,000 |
| (Being purchases of goods on credit) | | | |
| (b) Wages Control Account | Dr. | 7,00,000 | |
| To Cash/Bank Account | | | 7,00,000 |
| (Being wages paid in cash/cheque) | | | |
| (c) Work-in-progress Control Account | Dr. | 8,00,000 | |
| To Stores Ledger Control Account | | | 8,00,000 |
| (Being stores issued against production order) | | | |
| (d) Work-in-progress Control Account | Dr. | 4,50,000 | |
| To Production Overhead Control A/c | | | 4,50,000 |
| (Being the Work Expenses allocated to Production/Jobs) | | | |
| (e) Finished Goods Ledger Control A/c | Dr. | 1,80,000 | |
| To Work-in-progress Ledger Control A/c | | | 1,80,000 |
| (Being goods finished during the year transferred) | | | |
| (f) Work-in-progress Control Account | Dr. | 1,50,000 | |
| To Administration Overhead Control A/c | | | 1,50,000 |
| (Being administration expenses charged to production) | | | |
| (g) Production Overhead Control A/c | Dr. | 1,20,000 | |
| To Outstanding Works Overhead Account | | | 1,20,000 |
| (Being works expenses incurred during the period but still unpaid) | | | |
| (h) Overhead Control Account | Dr. | 4,60,000 | |
| To Cash/Bank Account | | | 4,60,000 |
| (Being works expenses paid in Cash/Bank during the period) | | | |

### *Example 13.2*

Journalise the following transactions assuming cost and financial accounts are integrated:

| | (Rs) |
|---|---|
| Raw materials purchases | 40,000 |
| Direct materials issued to production | 30,000 |
| Wages paid (30% indirect) | 24,000 |
| Direct wages charged to production | 16,800 |
| Manufacturing expenses incurred | 19,000 |
| Manufacturing overhead charged to production | 18,400 |
| Selling and distribution costs | 4,000 |
| Finished products (at cost) | 40,000 |
| Sales | 58,000 |
| Closing stock | NIL |
| Receipt from debtors | 13,800 |
| Payment to creditors | 22,000 |

*(C.A. Inter)*

*Solutions*

**Journal Entries**

| | | *Dr.* | *Cr.* |
|---|---|---|---|
| | | *Rs* | *Rs* |
| Stores ledger control A/c | Dr. | 40,000 | |
| To Bought ledger control A/c | | | 40,000 |
| (Materials purchased) | | | |
| Work-in-progress ledger control A/c | Dr. | 30,000 | |
| To Stores ledger control A/c | | | 30,000 |
| (Materials issued to jobs) | | | |
| Wages control A/c | Dr. | 24,000 | |
| To Bank A/c | | | 24,000 |
| (Wages accrued and paid—30% being indirect) | | | |
| Factory overhead A/c | Dr. | 7,200 | |
| To Wages control A/c | | | 7,200 |
| (Indirect wages allocated) | | | |
| Work-in-progress ledger control A/c | Dr. | 16,800 | |
| To Wages control A/c | | | 16,800 |
| (Allocation of direct wages to production) | | | |
| Factory overhead A/c | Dr. | 19,000 | |
| To Bank A/c | | | 19,000 |
| (Manufacturing expenses incurred) | | | |
| Work-in-progress ledger control A/c | Dr. | 18,400 | |
| To Factory overhead A/c | | | 18,400 |
| (Overhead charged to production) | | | |
| Selling & distribution overheads A/c | Dr. | 4,000 | |

| | | | |
|---|---|---|---|
| To Bank A/c | | | 4,000 |
| (Selling and distribution costs incurred) | | | |
| Finished stock ledger control A/c | Dr. | 40,000 | |
| To Work-in-progress ledger control A/c | | | 40,000 |
| (Cost of production of completed units) | | | |
| Cost of sales A/c | Dr. | 44,000 | |
| To Finished stock ledger control A/c* | | | 40,000 |
| To Selling and distribution overhead A/c* | | | 4,000 |
| (Cost of products sold) | | | |
| Sales ledger control A/c | Dr. | 58,000 | |
| To Cost of sales A/c | | | 58000 |
| (Billed amount of sales) | | | |
| Bank A/c | Dr. | 13,800 | |
| To sales ledger control A/c | | | 13,800 |
| (Amount received from debtors) | | | |
| Bought ledger control A/c | Dr. | 2,200 | |
| To Bank | | | 2,200 |
| (Amount paid to creditors) | | | |

* It has been assumed that all manufactured units have been sold and selling and distribution overhead have been charged to cost of sales.

### *Example 13.3*

From the following particulars pass the journal entries in an integral accounting system:

(a) Issued materials Rs 3,00,000/- of which Rs 2,80,000 (standard Rs 2,40,000) is direct material.
(b) Net wages paid Rs 70,000/-, Deductions being Rs 12,000/- (standard Rs 75,000/-)
(c) Gross salaries payable for the period is Rs 26,000/- (standard Rs 25,000/-), Deductions Rs 2,000/-
(d) Sales (Credit) Rs 8,00,000/-
(e) Discount allowed Rs 5,000/-
(f) Salaries and wages allocation: Rs 60,000/- direct (standard Rs 62,000/-) and out of the balance, 50% production, 30% admn. and 20% selling and distribution overheads.

*(ICWA Inter)*

*Solution*

| | | | |
|---|---|---|---|
| (a) WIP Control A/c Dr. | | 2,40,000 | |
| Material Price Variance A/c Dr. | | 40,000 | |
| Production Overhead Control A/c | | 20,000 | |
| To Stores Ledger Control A/c | | | 3,00,000 |
| (Being the Issue of Materials and debit to WIP A/c at standard material cost of Rs 240,000) | | | |
| (b) Wages Control A/c | Dr. | 75,000 | |
| Wages Variance A/c | Dr. | 7,000 | |
| To Deductions A/c | | | 12,000 |
| To Cash A/c | | | 70,000 |

(Being the Net Wages paid Rs 70,000/- and Gross Wages Rs 82,000/- out of which debit to wages control A/c at standard wages of Rs 75,000/-)

| | | | | |
|---|---|---|---|---|
| (c) | Salaries control A/c | Dr. | 25,000 | |
| | Salaries variance A/c | Dr. | 1,000 | |
| | To Deductions A/c | | | 2,000 |
| | To Cash | | | 24,000 |
| | (Being the accounting of Gross Salaries of Rs 26,000/- standard Rs 25,000/-) | | | |
| (d) | Debtors control A/c | Dr. | 8,00,000 | |
| | To Sales A/c | | | 8,00,000 |
| | (Being the accounting of Credit Sales) | | | |
| (e) | Selling overheads A/c | Dr. | 5,000 | |
| | To Debtors A/c | | | 5,000 |
| | (Being the discount allowed to debtors) | | | |
| (f) | WIP Control A/c | Dr. | 62,000 | |
| | Production Overhead A/c (50% of 40,000 balance) | Dr. | 20,000 | |
| | Admn. Overhead A/c (30% of 40,000) | Dr. | 12,000 | |
| | S&D Overheads A/c (20% of 40,000/-) | Dr. | 8,000 | |
| | To Wages control A/c | | | 75,000 |
| | To Salaries control A/c | | | 25,000 |
| | To Wages variance A/c | | | 2,000 |

***Example 13.4***

In the absence of the Chief Accountant, you have been asked to prepare a month's cost accounts for a company which operate a batch costing system fully integrated with the financial accounts. The following relevant information is provided to you:

| | | Rs |
|---|---|---|
| Balances at the beginning of the month: | | |
| Stores Ledger Control Account | | 25,000 |
| Work-in-progress Control Account | | 20,000 |
| Finished Goods Control Account | | 35,000 |
| Prepaid production Overheads brought forward from previous month | | 3,000 |
| Transactions during the month: | | |
| Materials purchased | | 75,000 |
| Materials issued: | | |
| To production | 30,000 | |
| To Factory maintenance | 4,000 | 34,000 |
| Materials transferred between batches | | 5,000 |
| Total wages paid: | | |
| To Direct workers | 25,000 | |
| To Indirect workers | 5,000 | 30,000 |
| Direct wages charged to batches | | 20,000 |

| | |
|---|---|
| Recorded non-productive time of direct worker | 5,000 |
| Selling and distribution overheads incurred | 6,000 |
| Other production overheads incurred | 12,000 |
| Sales | 1,00,000 |
| Cost of finished goods sold | 80,000 |
| Cost of goods completed and transferred into Finished goods during the month | 65,000 |
| Physical value of work-in-progress at the end of the month | 40,000 |

The production overhead absorption rate is 150% of direct wages charged to work-in-progress.

*Required:*

Prepare the following accounts for the month:

(a) Stores Ledger Control Account
(b) Work-in-progress Control Account
(c) Finished Goods Control Account
(d) Production Overhead Control Account
(e) Profit and Loss Account

*(CA Inter)*

*Solution*

**(a) Stores Ledger Control Account***

| | | | |
|---|---|---|---|
| To Balance b/d | 25,000 | By Work-in-progress control A/c | 30,000 |
| To Creditors/Bank | 75,000 | By Production overhead control A/c | 4,000 |
| | | By Balance c/d | 66,000 |
| | 1,00,000 | | 1,00,000 |

**(b) Work-in-progress Control Account**

| | Rs | | Rs |
|---|---|---|---|
| To Balance b/d | 20,000 | By Finished goods control A/c | 65,000 |
| To Stores ledger control A/c | 30,000 | By Balance c/d | 40,000 |
| To Wages control A/c | 20,000 | (Physical value) | |
| To Production overhead control A/c (15% of direct wages) | 30,000 | | |
| To Profit & loss A/c (Gain on stock) | 5,000 | | |
| | 1,05,000 | | 1,05,000 |

**(c) Finished Goods Control Account**

| | | | |
|---|---|---|---|
| To Balance b/d | 35,000 | By Cost of sales A/c | 80,000 |
| To Work-in-progress control A/c | 65,000 | By Balance c/d | 20,000 |
| | 1,00,000 | | 1,00,000 |

**(d) Production Overhead Control Account**

| | | | | |
|---|---|---|---|---|
| To Balance b/d | | 3,000 | By Work-in-progress control A/c | 30,000 |
| To Stores ledger control A/c | | 4,000 | (150% of direct wages) | |
| To Wages control A/c: | | | | |
| Direct workers | 5,000 | | | |
| Indirect workers | 5,000 | 10,000 | | |
| To Bank | | 12,000 | | |
| To Profit & Loss A/c* | | 1,000 | | |
| (Over absorption-balancing figure) | | | | |
| | | 30,000 | | 30,000 |

*Alternatively the over absorbed overhead may be carried forward.

**(e) Profit & Loss Account**

| | Rs | | Rs |
|---|---|---|---|
| To Balance c/d | 20,000 | By Cost of sales A/c (profit) | 14,000 |
| | | By Production overhead control A/c | 1,000 |
| | | By Work-in-progress control A/c | 5,000 |
| | | Gain on stock | 5,000 |
| | 20,000 | | 20,000 |

**(f) Cost of Sales Account**

| | | | |
|---|---|---|---|
| To Finished goods control A/c | 80,000 | By Sundry Debtors/Bank A/c (sales) | 1,00,000 |
| To Selling & Distribution overhead control A/c | 6,000 | | |
| To Profit & loss A/c | 14,000 | | |
| | 1,00,000 | | 1,00,000 |

**Notes:**

(i) Materials transferred between batches will not affect the Control accounts.
(ii) Non-production time of direct workers is a production overhead and hence transferred to production overhead control account.
(iii) Production overheads charged to Work-in-progress Control A/c is Rs 30,000 (150% of Rs 20,000).
(iv) In the Work-in-progress Control A/c the excess of physical value of stock over book value has been taken as gain on stock and transferred to Profit and Loss Account.

***Example 13.5***

Record the following transactions in the ledger under the integral system and prepare the trial balance. Trial balance at the beginning of the period is as follows:

| | *Dr.* | *Cr.* |
|---|---|---|
| Bank Balance | Rs 1,500 | |
| Stock: | | |
| Finished goods | 2,000 | |
| Work-in-progress | 3,250 | |
| Raw materials | 3,000 | |
| Creditors | | 1,000 |
| Debtors | 500 | |
| Fixed assets | 51,000 | |
| Depreciation provision | | 1,250 |
| Capital account | | 55,000 |
| Profit and loss account | | 4,000 |
| | 61,250 | 61,250 |
| Transactions during the year were: | | |
| | Rs | Rs |
| Materials purchased on credit | | 5,000 |
| Materials issued to production: | | |
| Direct | 3,500 | |
| Indirect | 500 | 4,000 |
| Payment to creditors | | 3,000 |
| Wages paid: | | |
| Direct | 5,000 | |
| Indirect | 1,000 | 6,000 |
| Finished goods produced | | 15,000 |
| Cost of finished goods sold | | 16,000 |
| Sales value | | 20,000 |
| Receipt from debtors | | 17,500 |
| Overhead incurred: | | |
| Factory | 3,000 | |
| Office | 500 | |
| Selling and distribution | 500 | 4,000 |
| Depreciation (in addition to overheads) | | 250 |

*Solution*

**Bank Account**

| | Rs | | Rs |
|---|---|---|---|
| To Balance b/d | 1,500 | By Purchases ledger control A/c | 3,000 |
| To Sales ledger control A/c | 17,500 | By Wages control A/c | 6,000 |
| | | By Factory overheads | 3,000 |
| | | By Office overheads | 500 |
| | | By Selling and distribution overheads | 500 |
| | | By Balance c/d | 6,000 |
| | 19,000 | | 19,000 |

**Finished Goods Ledger Control Account**

| | Rs | | Rs |
|---|---|---|---|
| To Balance b/d | 2,000 | By Cost of sales A/c | 16,000 |
| To Work-in-progress A/c | 15,000 | By Balance | 1,500 |
| To Office overheads A/c | 500 | | |
| | 17,500 | | 17,500 |

**Work-in-progress Ledger Control Account**

| | Rs | | Rs |
|---|---|---|---|
| To Balance b/d | 3,250 | By Finished goods ledger control A/c | 15,000 |
| To Stores ledger A/c | 3,500 | By Balance c/d | 1,500 |
| To Wages control A/c | 5,000 | | |
| To Factory overheads A/c | 4,750 | | |
| | 16,500 | | 16,500 |

**Stores Ledger Control Account**

| | Rs | | Rs |
|---|---|---|---|
| To Balance b/d | 3,000 | By W.I.P. Ledger control A/c | 3,500 |
| | | By Factory overheads A/c | 500 |
| To Purchases ledger Control A/c | 5,000 | By Balance c/d | 4,000 |
| | 8,000 | | 8,000 |

**Purchases Ledger Control Account (Creditors account)**

| | Rs | | Rs |
|---|---|---|---|
| To Bank | 3,000 | By Balance b/d | 1,000 |
| To Balance b/d | 3,000 | By Stores ledger control A/c | 5,000 |
| | 6,000 | | 6,000 |

**Sales Ledger Control Account (Debtors A/c)**

| | Rs | | Rs |
|---|---|---|---|
| To Balance b/d | 500 | By Bank | 17,500 |
| To Cost of sales A/c | 20,000 | By Balance c/d | 3,000 |
| | 20,500 | | 20,500 |

**Factory Overheads Account**

| | Rs | | Rs |
|---|---|---|---|
| To Stores ledger control A/c | 500 | By W.I.P. Ledger A/c | 4,750 |
| To Wages control A/c | 1,000 | | |
| To Bank | 3,000 | | |
| To Depreciation provision | 250 | | |
| | 4,750 | | 4,750 |

**Wages Control Account**

| | Rs | | Rs |
|---|---|---|---|
| To Bank | 6,000 | By Work-in-progress A/c | 5,000 |
| | | By Factory overheads | 1,000 |
| | 6,000 | | 6,000 |

**Cost of Sales Account**

| | Rs | | Rs. |
|---|---|---|---|
| To Finished goods ledger control A/c | 16,000 | By Sales ledger control A/c | 20,000 |
| To Profit and Loss A/c | 4,000 | | |
| | 20,000 | | 20,000 |

**Office Overheads Account**

| | | | |
|---|---|---|---|
| To Bank | Rs 500 | By Finished goods ledger control A/c | Rs 500 |

**Selling and Distribution Overhead Account**

| | | | |
|---|---|---|---|
| To Bank | Rs 500 | By Profit and loss A/c | Rs 500 |

**Provision for Depreciation Account**

| | | | |
|---|---|---|---|
| To Balance c/d | Rs 1,500 | By Balance b/d | Rs 1,250 |
| | | By Factory overheads | 250 |
| | 1,500 | | 1,500 |

**Profit and Loss Account**

| | | | |
|---|---|---|---|
| | | By Cost of sales A/c | 4,000 |
| To Selling and distribution overhead A/c | Rs 500 | | |
| To Net profit | 3,500 | | |
| | 4,000 | | 4,000 |

**Profit and Loss Appropriation Account**

| | | | |
|---|---|---|---|
| To Balance c/d | Rs 7,500 | By Balance b/d | Rs 4,000 |
| | | By Profit and Loss A/c (profit for the year) | 3,500 |
| | 7,500 | | 7,500 |

**Share Capital Account**

| | | | |
|---|---|---|---|
| To Balance c/d | Rs 55,000 | By Balance b/d | Rs 55,000 |

**Fixed Assets Account**

| | | | |
|---|---|---|---|
| To Balance b/d | Rs 51,000 | By Balance c/d | Rs 51,000 |

**Trial Balance**

| | Dr. | Cr. |
|---|---|---|
| Purchase ledger control A/c | | 3,000 |
| Sales ledger control A/c | 3,000 | |
| Provision for depreciation | | 1,500 |
| Bank | 6,000 | |
| Finished goods ledger control A/c | 1,500 | |
| Work-in-progress ledger control A/c | 1,500 | |
| Stores ledger control A/c | 4,000 | |
| Profit and loss A/c | | 7,500 |
| Share capital | | 55,000 |
| Fixed assets | 51,000 | |
| | 67,000 | 67,000 |

## THEORY QUESTIONS

1. What do you understand by "integrated accounts", and what are the principles involved? State the advantages of "Integrated accounts."

*(B. Com. (Hons), Delhi)*

2. What is an integrated accounting? State its advantages.

*(ICWA Inter)*

3. What do you understand by the integrated accounting system? State its advantages and prerequisites.

*(CA Inter)*

4. Distinguish between Interlocking and Integration System of cost and financial accounts?
5. Explain the accounts kept in Integrated Accounting System.
6. State the advantages of 'integrated accounts'.

*(B. Com. (Hons), Delhi)*

7. Explain the basic requirements of an Integrated System of Accounting.

*(B. Com. (Hons), Delhi)*

8. What is integrated accounting? Briefly describe the merits of integration.

*(B. Com. (Hons), Delhi)*

## PROBLEMS

1. Dutta Enterprises operates an integral system of accounting. You are required to pass the Journal Entries for the following transactions that took place for the year ended 30.6.2001
(Narrations are not required)

| | *Rs* |
|---|---|
| Raw materials purchased (50% on Credit) | 6,00,000 |
| Materials issued to production | 4,00,000 |
| Wages paid (50% direct) | 2,00,000 |
| Wages charged to production | 1,00,000 |
| Factory overheads incurred | 80,000 |
| Factory overheads charged to production | 1,00,000 |
| Selling and distribution overheads incurred | 40,000 |
| Finished goods at cost | 50,00,000 |

| | |
|---|---|
| Sales (50% Credit) | 7,50,000 |
| Closing stock | Nil |
| Receipts from debtors | 2,00,000 |
| Payments to creditors | 2,00,000 |

*(B. Com. (Hons), Delhi 1998)*

2. From the following information write up the control accounts in the general ledger of a factory where cost and financial accounts are integrated and prepare a trial balance as on 31st March, 2001.

| | Rs |
|---|---|
| Ledger balance as on April 1, 2000 | |
| Shares capital | 1,50,000 |
| Reserves | 37,500 |
| Sundry debtors | 30,000 |
| Plant and machinery | 1,87,500 |
| Sundry creditors | 45,000 |
| Bank (overdraft) | 60,000 |
| Raw materials | 75,000 |
| Transactions during the years: | |
| Raw material purchases | 1,20,000 |
| Raw material issued to production deptts. | 1,50,000 |
| Raw materials on hand 31.3.2001 | 39,000 |
| Direct wages (incurred) | 1,42,500 |
| Charged to production | 1,39,500 |
| Production overhead incurred | 1,31,250 |
| Production overhead charged to production | 1,39,500 |
| Selling and distribution overhead | 15,000 |
| Finished stock (production) (at cost) | 2,86,500 |
| (sales) (at selling price) | 4,29,000 |
| Payments to creditors | 1,27,500 |
| Receipts from debtors | 4,50,000 |

*(CA Inter)*

3. The following balance have been extracted from the books of M/s Bharat Forging Ltd. as on 1.1.2001.

| | *Rs* | *Rs* |
|---|---|---|
| General ledger adjustment A/c | | 81,228 |
| Stores ledger control A/c | 40,852 | |
| Work-in-progress ledger control A/c | | 9,690 |
| Finished goods ledger control A/c | 30,686 | |
| | 81,228 | 81,228 |

The summary of transactions during the year 2001 is as under:

| | |
|---|---|
| Stores purchased for stock | 2,51,846 |
| Purchases against specific jobs | 28,402 |
| Stores issued (direct materials) | 1,80,642 |
| Stores issued (indirect material) | 65,813 |
| Stores issued returned to suppliers | 22,187 |
| Wages to (direct workers) | 1,42,682 |
| Wages to (indirect workers) | 41,841 |
| Salaries to sales office staff | 31,832 |

| | |
|---|---|
| Warehouse salaries | 26,419 |
| Head office salaries | 8,100 |
| Work overhead expenses | 1,28,832 |
| Sales office and showroom expenses | 61,432 |
| Warehouse and delivery expenses | 48,919 |
| Head office expenses | 28,602 |
| Overhead absorbed in costs (works) | 2,22,690 |
| Overhead absorbed in costs (selling) | 90,742 |
| Overhead absorbed in costs (distribution) | 79,108 |
| Overhead absorbed in costs (office) | 35,819 |
| Cost of goods produced during the year | 5,78,412 |
| Value of finished goods sold (at cost) | 6,13,826 |
| Value of finished goods sold (at sales price) | 8,45,400 |

Prepare the necessary account in the company's books.

14

# Reconciliation of Cost and Financial Accounts

## NEED FOR RECONCILIATION

When a manufacturing firm uses an integrated accounting system, i.e., no separate cost and financial accounts, the question of reconciliation does not arise. But in many manufacturing concerns, cost and financial accounts are maintained separately and independently of each other. In such a case, profit disclosed by one accounting system tends to differ from that of the other accounting system. This creates problems and the need arises of reconciling the two accounting systems to arrive at one profit figure.

## REASONS FOR DIFFERENCES IN PROFIT

Differences in the profits presented in cost and financial books may be due to the following reasons:

### Items Appropriated or Charged to Profit but Not Found in Cost Accounts

1. Company tax.
2. Transfer to general reserve or any other fund to accumulated profits, e.g., dividend equalisation reserve.
3. Dividend paid on the share capital.
4. Additional provisions for depreciation on plant, etc. and for bad debts.
5. Amounts written off as goodwill, preliminary expenses, underwriting commissions, debenture discount, capital issue expenses.
6. Appropriation for the purpose of repayment of loans or debentures.

### Purely Financial Matters Not Found in Cost Accounts

1. Interest received on bank deposits.
2. Interest, dividends, etc. received on investments.
3. Rents received.
4. Losses on the sale of investments, machinery, buildings, etc.

5. Profits on the sale of fixed assets.
6. Transfer fees received.
7. Interest on bank loans, mortgages, debentures and other borrowed money.
8. Interest on proprietor's capital.
9. Damages payable.
10. Penalties payable.

### Treatment of Items in Cost Books and Financial Books

In cost accounts overheads are recovered on the basis of a predetermined rate. In this way recovered overhead may not agree with the actual overhead incurred. Profit in cost books may be comparatively (as to financial books) higher or lower depending on the under-absorption or over-absorption of overhead. Reconciliation is necessary to eliminate differences in profits. If the amount of over- or under-absorption is transferred to the costing and profit and loss accounts, then financial profit will tally with the costing profit.

### Differences in the Valuation of Stock and Work-in-progress

In financial books, stock is valued at cost or market price whichever is lower. In cost accounting different methods of valuation of stock are in practice such as FIFO, LIFO, Average Costing, Weighted Average Costing, etc. Besides work-in-progress in cost accounts is often valued on a prime cost basis and sometimes variable manufacturing overhead is included therein. In financial accounting, work-in-progress may be valued after taking into account administrative expenses also. Similarly, finished goods in financial accounting is valued at cost or market price whichever is lower. On the contrary, in cost accounting, finished stock is generally valued at total cost of production. Since the value of stocks (raw material, work-in-progress, finished goods) in the financial accounts and cost accounts differs, the profits also differ from financial to cost accounting.

### Depreciation

In financial accounts, depreciation may be calculated on straight line method or diminishing balance method. But, in cost accounting, depreciation can be calculated in terms of machine hour or any other base.

### Abnormal Losses and Gains

Abnormal losses and gains (discussed earlier) may be transferred to costing profit and loss account or alternatively may not be considered and excluded totally from cost accounts. In the first situation (transfer to costing and profit and loss account) there will be no difference between financial profit and costing profit. But in the second situation (exclusion from cost accounts) financial profit (losses) will differ from costing profit (loss) and adjustments will be required.

## RECONCILIATION PROCEDURE

Reconciliation of cost and financial accounts is done on the principle of bank reconciliation statement. One may begin with profit as per the financial books or cost books and thereafter items causing differ-

ences in profit may be added or deducted depending on the circumstances. After all such items have been considered, profit as per other books may be arrived at. This reconciliation may be achieved through a mere statement (Reconciliation Statement) or preparing a Memorandum Reconciliation Account. Both these approaches are discussed below:

**1. Reconciliation Statement** The following steps are required to be completed to prepare a Reconciliation Statement.

(i) Profit as per any set of books (cost or financial) may be taken as a starting point. This profit plus making all suitable adjustments (in terms of causes of difference in profit) will finally result into profit figure as per the other set of books.

(ii) The effect of a particular cause of difference should be determined on the profits shown by the other set of books.

(iii) In case, the cause (causing the difference in profit) has given as increase in profit shown by the other set of books, the amount of such increase should be added to the profit as per the former set of books which has been taken as a starting point.

(iv) In case, the cause has decreased the profit shown by other set of books, the amount of such decrease should be deducted from the profit as per the former set of books which has been taken as the starting point.

Completion of the above steps will give the profit as per the other set of books.

**2. Memorandum Reconciliation Account** This reconciliation procedure is in the form of an account. The debit side (Dr.) of the Memorandum Reconciliation Account shows items to be deducted from the profit as per any set of books taken as a starting point. The credit side of this account shows profit figure accepted as a starting point as well as items to be added to this profit figure. The difference between the credit side and debit side will give profit as per the other set of books. A proforma of Memorandum Reconciliation Account is shown in Fig. 14.1.

**Memorandum Reconciliation Account**

| Dr. | | | Cr. |
|---|---|---|---|
| Particulars | Amt (Rs) | Particulars | Amt (Rs) |
| To _____ | — | By profits as per cost Accounts | — |
| To _____ | — | By _____ | — |
| To _____ | — | By _____ | — |
| To _____ | — | By _____ | — |
| To profit as per financial accounts | — | | |
| Total | — | Total | — |

Fig. 14.1

***Example 14.1***

In a factory, works overheads are absorbed at 60% of Labour cost and Office overheads are 20% of Works Cost. Prepare (i) Cost Sheet, (ii) Trading and Profit and Loss Account and (iii) Reconciliation Statement if Total Expenditure consists of Material Rs 2,00,000; Wages Rs 1,50,000; Factory Expenses Rs 1,00,000 and Office Expenses Rs 85,000.

10% of the Output is Stock at the end and Sales are Rs 5,20,000.

*(B. Com. (Hons), Delhi, 2000)*

*Solution*

**Cost Sheet**

| *Particulars* | *Amount Rs* |
|---|---|
| Material | 2,00,000 |
| Wages | 1,50,000 |
| Prime Cost | 3,50,000 |
| Factory Overhead (60% of Rs 1,50,000) | 90,000 |
| Works cost | 4,40,000 |
| Office Overheads (20% of works cost) | 88,000 |
| Cost of Production | 5,28,000 |

| | Rs |
|---|---|
| Cost of goods sold: | |
| $\frac{5,28,000 \times 90}{100}$ | 4,75,200 |
| Profit | 44,800 |
| Sales | 5,20,000 |

Profit as per Cost Accounts = Rs 44,800

**Trading and Profit and Loss Account**

**Dr.** **Cr.**

| *Particulars* | *Amt.* | *Particulars* | *Amt.* |
|---|---|---|---|
| | Rs | | Rs |
| To Material | 2,00,000 | By Sales | 5,20,000 |
| To Wages | 1,50,000 | By Closing stock | |
| | | $\frac{5,28,000 \times 10}{100}$ | 52,800 |
| To Gross profit c/d | 2,22,800 | | |
| | 5,72,800 | | 5,72,800 |
| To Factory Expenses | 1,00,000 | By Gross Profit b/d | 2,22,800 |
| To Office Expenses | 85,000 | | |
| To Net Profit c/d | 37,800 | | |
| | 2,22,800 | | 2,22,800 |

*Reconciliation Statement*

| | Rs |
|---|---|
| Profit as per cost accounts | 44,800 |
| *Add:* Overcharged in Cost accounts : Office Overhead | 3,000 |
| | 47,800 |
| *Less:* Undercharged in Cost accounts : Factory Overhead | 10,000 |
| Profit as per financial records | 37,800 |

### *Example 14.2*

From the following data prepare a Reconciliation Statement:

| | Rs |
|---|---|
| Profit as per cost accounts | 1,45,500 |
| Works overheads under-recovered | 9,500 |
| Administrative overheads under-recovered | 22,750 |
| Selling overheads over-recovered | 19,500 |
| Overvaluation of opening stock in cost accounts | 15,000 |
| Overvaluation of closing stock in cost accounts | 7,500 |
| Interest earned during the year | 3,750 |
| Rent received during the year | 27,000 |
| Bad debts written off during the year | 9,000 |
| Preliminary expenses written off during the year | 18,000 |

*(I.C.W.A. Inter June 1998)*

*Solution*

**Reconciliation Statement**

| | | Rs (+) | Rs (–) |
|---|---|---|---|
| Profit as per Cost Accounts | | 1,45,500 | |
| *Add:* | Over-recovery of Selling Overheads in Cost Account | 19,500 | |
| | Over-valuation of Opening Stock in Cost A/cs | 15,000 | |
| | Income excluded from Cost Accounts: | | |
| | Interest earned | 3,750 | |
| | Rent received | 27,000 | |
| *Less:* | Under-recovery of Works Overhead in Cost A/cs | | 9,500 |
| | Under-recovery of Administration Overhead in Cost A/cs | | 22,750 |
| | Over-valuation of Closing Stock in Cost A/cs | | 7,500 |
| | Expenses excluded from Cost Accounts: | | |
| | Bad Debts | | 9,000 |
| | Preliminary Expenses | | 18,000 |
| | | 2,10,750 | 66,750 |
| | Profit as per Financial Accounts | 1,44,000 | |

### *Example 14.3*

The following information is available from the financial books of a company having a normal production capacity of 60,000 units for the year ended 31st March, 1995:

(i) Sales Rs 10,00,000 (50,000 units).
(ii) There was no opening and closing stock of finished units.
(iii) Direct material and direct wages cost were Rs 5,00,000 and Rs 2,50,000 respectively.
(iv) Actual factory expenses were Rs 1,50,000 of which 60% are fixed.

(v) Actual administrative expenses were Rs 45,000 which are completely fixed.
(vi) Actual selling and distribution expenses were Rs 30,000 of which 40% are fixed.
(vii) Interest and dividends received Rs 15,000.

*You are required to:*

(a) Find out profit as per financial books for the year ended 31st March, 1995;
(b) Prepare the cost sheet and ascertain the profit as per cost accounts for the year ended 31st March, 1995 assuming that the indirect expenses are absorbed on the basis of normal production capacity; and
(c) Prepare a statement reconciling profits shown by financial and cost books.

*(C.A. Inter May 1995).*

*Solution*

**(a) Computation of Profit as per Financial Books**
**Profit and Loss Account**
**(for the year ended 31st March, 1995)**

| *Particulars* | *Rs* | *Particulars* | *Rs* |
|---|---|---|---|
| To Direct Material | 5,00,000 | By Sales (50,000 units) | 10,00,000 |
| To Direct Wages | 2,50,000 | By Interest and Dividends | 15,000 |
| To Factory Expenses | 1,50,000 | | |
| To Administrative Expenses | 45,000 | | |
| To Selling and Distribution Expenses | 30,000 | | |
| To Profit | 40,000 | | |
| | 10,15,000 | | 10,15,000 |

**(b) Cost Sheet**
**(for the year ended 31st March, 1995)**

| | Rs | Rs |
|---|---|---|
| Direct Material | | 5,00,000 |
| Direct Wages | | 2,50,000 |
| *Prime Cost* | | 7,50,000 |
| Factory Overheads: | | |
| Variable | 60,000 | |
| Fixed Rs 90,000 × 5/6 | 75,000 | 1,35,000 |
| | | 8,85,000 |
| *Works Cost* | | |
| Administrative Expenses Rs 45,000 × 5/6 | | 37,500 |
| | | 9,22,500 |
| *Cost of Production* | | |
| Selling and Distribution Overheads: | | |
| Variable | 18,000 | |
| Fixed Rs 12,000 × 5/6 | 10,000 | 28,000 |
| | | 9,50,500 |
| *Cost of Sales* | | 49,500 |
| *Profit* | | 10,00,000 |
| *Sales* | | |

**(c) Statement of Reconciliation**
**(Reconciling Profit shown by Financial and Cost Accounts)**

| | | Rs (+) | Rs (–) |
|---|---|---|---|
| Profit as per cost Accounts | | 49,500 | |
| *Add:* | Income from Interest and Dividends excluded in Cost Accounts | 15,000 | |
| *Less:* | Factory overheads undercharged in Cost Accounts | | 15,000 |
| | Administrative Overheads undercharged in Cost Accounts | | 7,500 |
| | Selling and Distribution Overheads undercharged in Cost Accounts (Rs 30,000 – Rs 28,000) | | 2,000 |
| | Profit as per Financial Accounts | | 40,000 |
| | | 64,500 | 64,500 |

***Example 14.4***

A Company's trading, and profit and loss account was as follows:

| Dr. | | | Cr. Rs |
|---|---|---|---|
| To Purchase | 25,210 | By Sales: 50,000 units | |
| *Less:* Closing stock | 4,080 | @ Rs 1.50 each | 75,000 |
| | 21,130 | By Discount received | 260 |
| To Direct wages | 10,500 | By profit on sale of land | 2,340 |
| To Work expenses | 12,130 | | |
| To Selling expenses | 7,100 | | |
| To Administration expenses | 5,340 | | |
| To Depreciation | 1,100 | | |
| To Net profit | 20,300 | | |
| | 77,600 | | 77,600 |

The profit as per cost accounts was only Rs 19,770. Reconcile the financial and cost profits using the following information:

(a) Cost accounts valued closing stock at Rs 4,280.
(b) The work expenses in the cost accounts were taken at 100% of direct wages.
(c) Selling and administration expenses were charged in the cost accounts at 10% of sales and Rs 0.10 per unit respectively.
(d) Depreciation in the cost accounts was Rs 800.

*(CA Inter)*

*Solution*

**Reconciliation Statement**

| | | Rs | Rs |
|---|---|---|---|
| | Profit as per cost accounts | | 19,770 |
| *Add:* | Over-absorption of selling expenses | 400 | |
| | Discount received | 260 | |
| | Profit on sale of land | 2,340 | 3,000 |

*(Contd.)*

| | | | |
|---|---|---|---|
| *Less:* | Difference in the valuation of closing stock | 200 | 22,770 |
| | Under-absorption of administration expenses | 340 | |
| | Under-absorption of work expenses | 1,630 | |
| | Depreciation undercharged | 300 | 2,470 |
| | Profit as per financial accounts | | 20,300 |

### *Example 14.5*

The following is the trading, and profit and loss account of M/s Time and Tide Limited for the year ending 31st December, 2001.

| | Rs | | | Rs |
|---|---|---|---|---|
| To Materials consumed | 7,08,000 | By Sales 30,000 units | | 15,00,000 |
| To Direct wages | 3,71,000 | By Finished stock | | |
| To Works overheads | 2,13,000 | 1000 units | | 40,000 |
| To Administration overheads | 95,500 | By Work-in-progress: | | |
| To Selling and distribution | | Material | 17,000 | |
| overheads | 1,13,500 | Wages | 8,000 | |
| To Net profit for the year | 69,000 | Works overhead | 5,000 | 30,000 |
| | 15,70,000 | | | 15,70,000 |

In manufacturing a standard unit, the company's cost records show that:

(i) Work overhead have been charged to work-in-progress at 20% on prime cost.
(ii) Administration overheads have been recovered as Rs 3 per finished unit.
(iii) Selling and distribution overheads have been recovered as Rs 4 per unit sold.
(iv) The under-absorbed or over-absorbed overheads have not been adjusted into the costing P & L A/c.

*Prepare:*

(i) A costing profit and loss account indicating net profit.
(ii) A statement reconciling the profit as disclosed by the cost accounts and that shown in the financial accounts.

*(B. Com. Delhi)*

*Solution*

**Costing Profit and Loss Account**
**for the Year Ending 31st December, 2001**

| | Rs | | Rs |
|---|---|---|---|
| To Materials consumed | 7,08,000 | By Cost of production c/d | 13,57,800 |
| To Direct wages | 3,71,000 | | |
| Prime Cost | 10,79,000 | | |
| To Work overheads @ 20% on prime cost | 2,15,800 | | |
| Gross Works cost | 12,94,800 | | |

*(Contd.)*

| | | | |
|---|---|---|---|
| *Less:* Closing stock of work-in-progress | 30,000 | | |
| Works Cost | 12,64,800 | | |
| To Administration overheads @ Rs 3 per unit | 93,000 | | |
| | 13,57,800 | | 13,57,800 |
| To Cost of production b/d | 13,57,800 | By Finished stock @ Rs 43.80 per unit | 43,800 |
| | | By Cost of goods sold c/d | 13,14,000 |
| | 13,57,800 | | 13,57,800 |
| To Cost of goods sold b/d | 13,14,000 | By Sales | 15,00,000 |
| To Selling and distribution overheads @ Rs 4 per unit | 1,20,000 | | |
| To Profit | 66,000 | | |
| | 15,00,000 | | 15,00,000 |

**Reconciliation Statement**

| | | (+) Rs | (–) Rs |
|---|---|---|---|
| | Profit as per cost accounts | 66,000 | |
| *Add:* | Over-absorption of works overheads in cost accounts | 2,800 | |
| | Over-absorption of selling and distribution overheads | 6,500 | |
| *Less:* | Under-absorption of administration overheads | | 2,500 |
| *Less:* | Over-valuation of closing stock in costing books | | 3,800 |
| | | 75,300 | 6,300 |
| | Profit as per financial accounts | 69,000 | |

### *Example 14.6*

M/s Modern Company Limited furnished the summary of the trading, and profit and loss account for the year ending 31st December, 2001.

| | Rs | | | Rs |
|---|---|---|---|---|
| To Raw materials | 1,39,600 | By Sales (12,000 units) | | 4,80,000 |
| To Direct wages | 76,200 | By Finished stock (200 units) | | 8,000 |
| To Production overheads | 42,600 | | | |
| To Selling and distribution overheads | 42,700 | By Work-in-progress: Materials | 28,200 | |
| To Administration overheads | 39,100 | Wages | 11,796 | |
| To Preliminary expenses-written off | 2,200 | Production overhead | 7,999 | 47,995 |
| To Goodwill-written off | 2,501 | By Interest on securities (gross) | | 6,000 |
| To Dividend (net) | 3,000 | | | |
| To Income tax | 4,100 | | | |
| To Net profit | 1,89,994 | | | |
| | 5,41,995 | | | 5,41,995 |

The company manufactures a standard unit. Scrutiny of cost records for the same period shows that:

(i) Factory overheads have been allocated to the production at 20% on prime cost.
(ii) Administration overheads have been charged at Rs 3 per unit on units produced.
(iii) Selling and distribution expenses have been charged at Rs 4 per unit on units sold.

You are required to prepare a statement of cost and work out profit as per cost accounts and to reconcile the same with that shown in the financial accounts.

*(CA Inter)*

*Solution*

**M/s Modern Company Limited**
**Statement of Cost and Profit**
**(for the year ending Dec. 31st, 2001)**

| | | | *(Production: 12,000 units)* |
|---|---|---|---|
| | | | Rs |
| Materials consumed | | | 1,39,600 |
| Direct wages | | | 76,200 |
| | | Prime cost | 2,15,800 |
| Factory overheads @ 20% of prime cost | | | 43,160 |
| | | | 2,58,960 |
| *Less:* | Closing work-in-progress: | | |
| | Materials | Rs 28,200 | |
| | Wages | 11,796 | |
| | Production overheads | 7,999 | |
| | | | 47,995 |
| | | Works cost | 2,10,965 |
| | Administration overheads @ Rs 3 per unit on 12,200 units | | 36,600 |
| | Total cost of production | | 2,47,565 |
| *Less:* | Cost of finished goods stock (see Working Note 1) | | 4,058 |
| | Production cost of goods sold | | 2,43,507 |
| | Selling and distribution overheads @ Rs 4 on 12,000 units | | 48,000 |
| | Cost of sales | | 2,91,507 |
| | Profit as per cost accounts | | 1,88,493 |
| | Sales (12,000) units @ Rs 40 per unit | | 4,80,000 |

**Working Notes:**

1. The total cost of production is Rs 2,47,565. Of 12,200 units, 200 units are in stock. Hence the stock of finished goods has to be valued at $\frac{\text{Rs } 247565 \times 200 \text{ units}}{12200 \text{ units}} = \text{Rs } 4{,}058$
2. Administrative overheads are absorbed on the basis of units produced, hence they have been considered a part of the production cost.

**Statement reconciling Profit as per Cost Accounts and Profit as per Financial Account**

| | | (+) Rs | (–) Rs |
|---|---|---|---|
| | Profit as per cost accounts | 1,88,493 | |
| *Less:* | Admn. overheads under-absorbed | | 2,500 |
| | Preliminary expenses | | 2,200 |
| | Goodwill written off | | 2,501 |
| | Dividend | | 3,000 |
| | Tax | | 4,100 |
| *Add:* | Production overheads over-absorbed | 560 | |
| | Selling overheads over-absorbed | 5,300 | |
| | Interest on securities | 6,000 | |
| | Closing stock over-valued in Financial accounts (at selling price instead of cost) | 3,942 | |
| | | 2,04,295 | 14,301 |
| | Profit as per financial accounts | 1,89,994 | |

***Example 14.7***

From the accounts of M/s Shankar & Co. Ltd. the manufacturing trading, and profit and loss accounts are reproduced below:

| | Rs | | Rs |
|---|---|---|---|
| To Raw materials: | | By Work-in-progress: | |
| Opening stock | 29,500 | Materials | 4,000 |
| Purchase | 1,86,500 | Wages | 5,500 |
| To Wages | 2,98,000 | Work expenses | 3,300 |
| To Work expenses | 1,90,750 | By Cost of goods manufactured | 6,59,950 |
| | | By Closing stock of raw materials | 32,000 |
| | 7,04,750 | | 7,04,750 |
| To Cost of goods sold | 6,59,950 | By Sales (7,600 units) | 9,12,000 |
| To Administrative expenses | 1,22,500 | By Finished stock (1,400 units) | 1,17,600 |
| | | By Interest on investment | 6,800 |
| To Selling and distribution expenses | 1,64,000 | | |
| To Bad debts written off | 17,500 | | |
| To Net profit transferred to appropriation A/c | 72,450 | | |
| | 10,36,400 | | 10,36,400 |

The following information is also available:

1. Accrued wages of Rs 17,000 included in wages.
2. Works expenses are allocated to production at 60 per unit of direct labour cost.
3. Administrative expenses are allocated at Rs 12 per unit of production.

4. Selling and distribution expenses are allocated so as to work out 20% of selling price. Prepare the costing profit and loss account and statement of reconciliation between the two accounts (cost and financial).

*Solution*

**M/s Shankar & Co. Ltd.**
**Costing Profit and Loss Account**

| | Rs | Rs | | Rs |
|---|---|---|---|---|
| To Raw materials: | | | By Sales | 9,12,000 |
| Opening stock | 29,500 | | | |
| + Purchase | 86,500 | | | |
| | 2,16,000 | | | |
| – Closing stock | 32,000 | 1,84,000 | | |
| To Wages | | 2,98,000 | | |
| Prime cost | | 4,82,000 | | |
| To Work overheads | | 1,78,800 | | |
| | | 6,60,800 | | |
| –Closing stock of W.I.P. | | 12,800 | | |
| Works cost | | 6,48,000 | | |
| To Administration overheads | | 1,08,000 | | |
| Cost of production of 9,000 units | | 7,56,000 | | |
| *Less:* Closing stock of finished goods (1,400 units) | | 1,17,600 | | |
| Cost of production of goods sold | | 6,38,400 | | |
| To Selling overheads (20% of total sales) | | 1,82,400 | | |
| To Cost of sales | | 8,20,800 | | |
| To Profit | | 91,200 | | |
| | | 9,12,000 | | 9,12,000 |

**Reconciliation Statement**

| | (+) Rs | (–) Rs |
|---|---|---|
| Profit as per financial accounts | 72,450 | |
| *Add:* Bad debts not written off in cost accounts | 17,500 | |
| Under-recovery of works overheads | 11,950 | |
| Under-recovery of administration overheads | 14,500 | |
| *Less:* Interests on investment excluded in cost accounts | | 6,800 |
| Over-recovery of selling and distribution overheads | | 18,400 |
| | 1,16,400 | 25,200 |
| Profit as per cost accounts | 91,200 | |

### *Example 14.8*

The Profit and Loss Account of Oil India (Pvt.) Ltd. for the year ended 31st March, 2001 is as follows:

| | *Rs* | | | *Rs* |
|---|---|---|---|---|
| To Materials | 4,80,000 | By Sales | | 9,60,000 |
| To Wages | 3,60,000 | By Work-in-progress: | | |
| To Direct Exp. | 2,40,000 | | | |
| To Gross Profit | 1,20,000 | Materials | 30,000 | |
| | | Wages | 18,000 | |
| | | Direct Exp. | 12,000 | 60,000 |
| | | By Closing Stock | | 1,80,000 |
| | 12,00,000 | | | 12,00,000 |
| | | By Gross Profit | | 1,20,000 |
| To Administration Exp. | 60,000 | By Dividends Received | | 6,000 |
| Net Profit | 66,000 | | | |
| | 1,26,000 | | | 1,26,000 |

As per the cost records, the direct expenses have been estimated at a cost of Rs 30 per kg and administration expenses at Rs 15 per kg: During the year production was 6,000 kg and sales were 4,800 kg.

Prepare a statement of costing profit and loss account and reconcile the costing profit with financial profit.

*(B. Com. Hons, Delhi, 2001)*

*Solution*

**Statement Showing Profit as Per Cost Accounts**

| | *Rs* | *Rs* |
|---|---|---|
| Material (Purchase) | 4,80,000 | |
| *Less:* Works in progress of material | (–) 30,000 | 4,50,000 |
| | 3,60,000 | |
| Wages | | |
| *Less:* Work in progress of wages | (–) 18,000 | 3,42,000 |
| Direct Expenses 6000 kg × Rs 30 = | | 1,80,000 |
| Administrative Expenses 6,000 kg × 15 | | 90,000 |
| Cost of production of 6000 units | | 10,62,000 |
| *Less:* Closing Stock-1200 units | | |
| $\left(\frac{10,62,000}{6,000} \times 1,200\right)$ | | 2,12,400 |
| Cost of goods sold (4,800 units) | | 8,49,600 |
| Sales | | 9,60,000 |
| Profit as per Cost Records | | 1,10,400 |

*(Contd.)*

**Reconciliation Statement**

| | | | |
|---|---|---|---|
| | Profit as per Cost Account | | 1,10,400 |
| *Add:* | Admn. Expenses overcharged in Cost A/c. (Rs 90,000 – Rs 60,000) | | 30,000 |
| *Add:* | Dividend received shown in Financial A/c | | 6,000 |
| | | | 1,46,400 |
| *Less:* | Over-valuation of Closing Stock (Rs 2,12,400 – Rs 1,80,000) = | Rs 32,400 | |
| *Less:* | Direct expenses under-recovered in Cost A/c (Rs 2,28,000 – Rs 1,80,000) | 48,000 | 80,400 |
| | Profit as per P and L A/c | | 66,000 |

*Note:* In financial accounts, direct expenses debited is Rs 2,40,000 – Rs 12000 WIP = Rs 2,28,000.

### *Example 14.9*

From the information given below, prepare (i) a statement showing costing profit and loss and (ii) another statement reconciling the costing profits with those shown by financial accounts:

**Profit and Loss A/c for the Year Ending 31st March 2000**

| | Rs | | Rs |
|---|---|---|---|
| To Materials consumed | 1,05,000 | By Sales (1,50,000 units) | 2,00,000 |
| To Direct wages | 45,000 | | |
| To Indirect factory expenses | 30,000 | | |
| To Office expenses | 9,000 | | |
| To Selling and distribution expenses | 6,000 | | |
| To Net profit | 5,000 | | |
| | 2,00,000 | | 2,00,000 |

The normal output of the factory is 1,00,000 units. Factory expenses of a fixed nature are Rs 18,000. Office expenses are for all practical purposes constant. Selling and distribution expenses are constant to the extent of Rs 3,000 and the balance varies with sales.

*(B. Com. (Hons), Delhi)*

*Solution*

**Statement Showing Costing Profit or Loss (as per Cost A/cs)**

| | | Rs |
|---|---|---|
| Materials consumed | | 1,05,000 |
| Direct wages | | 45,000 |
| Prime Cost | | 1,50,000 |
| Factory overheads : Fixed $\left(\frac{150000}{100000} \times 18000\right)$ | 27,000 | |
| Variable | 12,000 | 39,000 |
| Works Cost | | 1,89,000 |
| Office overheads : Fixed $\left(\frac{150000}{100000} \times 9000\right)$ | | 13,500 |
| Cost of production | | 2,02,500 |

| | | | |
|---|---|---|---|
| Selling & distribution overheads : | | | |
| Fixed $\left(\frac{150000}{100000} \times 3000\right)$ | | 4,500 | |
| Variable | | 3,000 | 7,500 |
| | Cost of Sales | | 2,10,000 |
| Sales | | | 2,00,000 |
| Loss | | | 10,000 |

**Reconciliation Statement**

| | (–) Rs | (+) Rs |
|---|---|---|
| Loss as per cost accounts | 10,000 | |
| Over-recovery of factory overheads | | 9,000 |
| Over-recovery of office expenses | | 4,500 |
| Over-recovery of selling & distribution expenses | | 1,500 |
| Profit as per financial accounts | 5,000 | |
| | 15,000 | 15,000 |

***Example 14.10***

The profit as per cost accounts is Rs 1,65,300. The following details are ascertained on comparison of the Cost and Financial Accounts.

| | *Cost accounts* Rs | *Financial accounts* Rs |
|---|---|---|
| (a) Opening Stocks: | | |
| Materials | 32,600 | 33,000 |
| Work-in-progress | 20,000 | 21,000 |
| (b) Closing Stocks: | | |
| Materials | 36,000 | 34,400 |
| Work-in-progress | 16,000 | 15,200 |
| Finished Goods | 8,000 | 9,000 |

(c) Directors' fees paid Rs 1,000, interest paid Rs 800; reserve for bad debts Rs 500, transfer fees collected Rs 300, and dividends received Rs 200 are exclusively taken in Financial Accounts, but ignored in Cost Accounts.

(d) Rent charged in costing but not in Financial Accounts Rs 6,000.

(e) Preliminary expenses written off Rs 13,000, but not charged in costing.

(f) Overheads charged in Financial Books Rs 1,21,200, but recovered in costing Rs 1,26,200.

Find out profit as per Financial Accounts and draw up a Reconciliation Statement.

*Solution*

**Reconciliation Statement**

| | Rs | Rs |
|---|---|---|
| Profit as per Cost Accounts | | 1,65,300 |
| *Add:* Closing stock of finished goods undervalued in cost accounts | 1,000 | |
| *Add:* Dividends received taken in financial accounts but ignored in Cost accounts | 200 | |
| *Add:* Transfer fees ignored in cost accounts | 300 | |
| *Add:* Rent charged in cost accounts but not in financial accounts | 6,000 | |
| *Add:* Overheads over-recovered in cost accounts | 5,000 | 12,500 |
| | | 1,77,800 |
| *Less:* Opening stock of materials undervalued in cost accounts | 400 | |
| *Less:* Opening stock of work-in-progress undervalued in cost accounts | 1,000 | |
| *Less:* Closing stock of material over-valued in cost accounts | 1,600 | |
| *Less:* Closing stock of work-in-progress over-valued in cost accounts | 800 | |
| *Less:* Directors fees Rs 1,000, interest paid Rs 800, and reserve for bad debts Rs 500 taken in financial accounts, but not in cost accounts | 2,300 | |
| *Less:* Preliminary expenses written off in financial accounts | 13,000 | 19,100 |
| Profit as per Financial Accounts | | 1,58,700 |

### *Example 14.11*

From the following Profit and Loss Account, draw up a Memorandum Reconciliation Account, showing the Profit as per cost accounts:

**Profit & Loss Account (as at 31.12.2001)**

| | Rs | | Rs |
|---|---|---|---|
| To Office salaries | 11,282 | By Gross profits | 54,648 |
| To Office expenses | 6,514 | By Dividend received | 400 |
| To Salesmen's salaries | 4,922 | By Interest on bank deposits | 150 |
| To Sales expenses | 9,304 | | |
| To Distribution expenses | 2,990 | | |
| To Loss on sale of machinery | 1,950 | | |
| To Fines | 200 | | |
| To Discount on debentures | 100 | | |
| To Net Profit | 17,936 | | |
| | 55,198 | | 55,198 |
| To Income Tax | 8,000 | Net Profit | 17,936 |
| To Reserve | 1,000 | | |
| To Dividend | 4,000 | | |
| To Balance c/d | 4,936 | | |
| | 17,936 | | 17,936 |

The cost accountant of the company has ascertained a profit of Rs 19,936 as per his books.
*(ICWA Inter)*

*Solution*

**Memorandum Reconciliation Account**

| | Rs | | Rs |
|---|---|---|---|
| To Expenses not debited to Cost accounts: | | By Profit as per cost accounts | 19,636 |
| Fines | 200 | By Income not credited to cost A/cs: | |
| Discount on debentures | 100 | Dividend received | 400 |
| Loss on sale of machinery | 1,950 | Interest on Bank Deposit | 150 |
| Income Tax | 8,000 | | |
| Reserve | 1,000 | | |
| Dividend | 4,000 | | |
| Net profit as per financial A/c | 4,936 | | |
| | 20,186 | | 20,186 |

### *Example 14.12*

In reconciliation between Cost and Financial Accounts, one of the areas of differences is for different methods of stock valuation. State, with reasons, in each of the following circumstances whether Costing Profit will be higher or lower than the Financial Profit.

| *Items of stock* | *Cost Valuation* | *Financial valuation* |
|---|---|---|
| Raw material (Opening) | 50,000 | 60,000 |
| Work-in-progress (Closing) | 60,000 | 50,000 |
| Finished stock (Closing) | 50,000 | 60,000 |
| Finished stock (Opening) | 60,000 | 50,000 |

*(B. Com. (Hons), Delhi 1998)*

*Solution*

In the reconciliation it does not matter in which form the stock is kept, i.e., raw material, work-in-progress or finished stocks. The basic principle is that if the opening stock is larger, Profit is lower, whereas if the closing stock is larger, profit is higher and vice-versa. On the basis of this principle, the following conclusions on the four propositions can be drawn:

1. Raw Material (Opening) is lower in Cost Accounts, the Costing Profit will be higher by Rs 10,000.
2. Work-in-progress (Closing) is higher in Cost Accounts, Costing Profit will be higher by Rs 10,000.
3. Finished Stock (Closing) is lower in Cost Accounts, Costing Profit will be lower by Rs 10,000.
4. Finished Stock (Opening) is higher by Rs 10,000 in Cost Accounts, Costing Profit will, therefore, be lower by Rs 10,000.

### *Example 14.13*

The following figures have been taken from the financial accounts of a manufacturing firm for the year of its operation:

| | Rs |
|---|---|
| Direct material consumption | 50,00,000 |
| Direct wages | 30,00,000 |
| Factory overheads | 16,00,000 |
| Administrative overheads | 7,00,000 |
| Selling and distribution overheads | 9,60,000 |
| Bad debts | 80,000 |
| Preliminary expenses written off | 40,000 |
| Legal charges | 10,000 |
| Dividends received | 1,00,000 |
| Interest on deposit received | 20,000 |
| Sales—1,20,000 units | 1,20,00,000 |
| Closing Stock: | |
| Finished stock—4,000 units | 3,20,000 |
| Work-in-progress | 2,40,000 |

The Cost Accounts for the same period reveal that the Direct Material consumption was Rs 56,00,000; Factory Overhead is recovered at 20% on Prime Cost; Administration Overhead is recovered @ Rs 6 per unit of production; and Selling and Distribution Overheads are recovered at Rs 8 per unit sold.

You are required to prepare, Costing and Financial Profit & Loss Accounts and reconcile the difference in the profit as arrived at in the two sets of accounts by preparing a Reconciliation Statement.

*(B. Com. (Hons) Delhi, CA Inter)*

*Solution*

**Costing Profit & Loss Account**

| | Rs | | Rs |
|---|---|---|---|
| To Direct material consumed | 56,00,000 | By Sales | 1,20,00,000 |
| To Direct wages | 30,00,000 | | |
| Prime Cost | 86,00,000 | | |
| To Factory overheads (20% on prime cost) | 17,20,000 | | |
| | 1,03,20,000 | | |
| *Less:* Work-in-Progress | 2,40,000 | | |
| Works cost | 1,00,80,000 | | |
| To Administrative overheads (Rs 6 per unit produced) | 7,44,000 | | |
| Cost of production (1,24,000 units) | 1,08,24,000 | | |
| *Less:* Closing stock (4,000 units) | 3,49,161 | | |

| | | | |
|---|---|---|---|
| Cost of production of goods sold | 1,04,74,839 | | |
| To Selling & distribution overheads (8 × 1,20,000) | 9,60,000 | | |
| To Net Profit | 5,65,161 | | |
| | 1,20,00,000 | | 1,20,00,000 |

**Financial Profit & Loss Account**

| | Rs | | Rs |
|---|---|---|---|
| To Direct materials consumed | 50,00,000 | By Sales | 1,20,00,000 |
| | | By Dividends | 1,00,000 |
| To Direct wages | 30,00,000 | By Interest on deposits | 20,000 |
| To Factory overheads | 16,00,000 | By Closing Stock: | |
| To Admn. overheads | 7,00,000 | Finished stock | 3,20,000 |
| To Selling & distribution | 9,60,000 | Work-in-progress | 2,40,000 |
| To Bad debts | 80,000 | | |
| To Pre. expenses | 40,000 | | |
| To Legal charges | 10,000 | | |
| To Net profit | 12,90,000 | | |
| | 1,26,80,000 | | 1,26,80,000 |

**Reconciliation Statement**

| | | (+) Rs | (–) Rs |
|---|---|---|---|
| | Profit as shown by financial books | 12,90,000 | |
| *Less:* | Direct Materials overcharged in costs | | 6,00,000 |
| | Factory overheads over-absorbed in costs | | 1,20,000 |
| | Administrative overheads undercharged in cost | | 44,000 |
| *Add:* | Closing stock of finished goods overvalued in costs | 29,161 | |
| | Bad debts not recovered in costs | 80,000 | |
| | Preliminary expenses not charged in costs | 40,000 | |
| | Legal charges not charged in cost | 10,000 | |
| *Less:* | Dividends not included in costs | | 1,00,000 |
| | Interest on deposits not included in costs | | 20,000 |
| | | 14,49,161 | 8,84,000 |
| | Profit as per Cost Accounts | | 5,65,161 |
| | | 14,49,161 | 14,49,161 |

### *Example 14.14*

A firm of Sports equipments commenced business on 1.4.93 for manufacturing 2 varieties of bat, 'Senior' and 'Sub-Junior'. The following information has been extracted from the account records for the half-year period ended 30.9.1993.

| | | Rs |
|---|---|---|
| (i) | Average material cost per piece of 'Senior' bat | 80 |
| (ii) | Average material cost per piece of 'Sub-Junior' bat | 60 |
| (iii) | Average cost of labour per piece of 'Senior' bat | 140 |
| (iv) | Average cost of labour per piece of 'Sub-Junior' bat | 110 |
| (v) | Finished goods sold: | |
| | Senior 300 pieces | |
| | Sub-Junior 700 pieces | |
| (vi) | Sale price: | |
| | – per piece of 'Senior' bat | 500 |
| | – per piece of 'Sub-Junior' bat | 390 |
| (vii) | Work expenses incurred during the period | 1,20,000 |
| (viii) | Office expenses | 68,000 |

You are required to prepare a statement showing

(1) The profit per each brand-piece of bat; charge labour and material at actual average cost, works on-cost at 100% on labour cost and office cost at 25% of works cost.
(2) Financial Profit for the half-year ending 30.9.1993.
(3) Reconciliation between profit as shown by cost accounts and financial accounts.

*(C.A. Inter June 1995)*

*Solution*

**Statement of Cost and Profit (As per Cost Books)**
**(For the Half-Year ending 30th Sept., 1993)**

| *Particulars* | *Senior bat 300 units* | | *Sub-Junior Bat 700 units* | | *Total for 1,000 units* |
|---|---|---|---|---|---|
| | *Per unit* | *Total Rs* | *Per unit* | *Total Rs* | *Rs* |
| Material | 80 | 24,000 | 60 | 42,000 | 66,000 |
| Labour | 140 | 42,000 | 110 | 77,000 | 1,19,000 |
| Prime Cost | 220 | 66,000 | 170 | 1,19,000 | 1,85,000 |
| *Add:* Works Oncost (100% of Labour) | 140 | 42,000 | 110 | 77,000 | 1,19,000 |
| Work Cost | 360 | 1,08,000 | 280 | 1,96,000 | 3,04,000 |
| *Add:* Office Oncost (25% of Works Cost) | 90 | 27,000 | 70 | 49,000 | 76,000 |
| Total Cost | 450 | 1,35,000 | 350 | 2,45,000 | 3,80,000 |
| Profit | 50 | 5,000 | 40 | 28,000 | 43,000 |
| Sales | 500 | 1,50,000 | 390 | 2,73,000 | 4,23,000 |

**Profit and Loss Account (as per Financial Books)**
**(For the Half Year Ending 30th Sept., 1993)**

| | | Rs | | | Rs |
|---|---|---|---|---|---|
| To Materials | | | By Sales | | |
| Senior Bat | 24,000 | | Senior Bat | 1,50,000 | |
| Sub-Junior Bat | 42,000 | 66,000 | Sub-Junior Bat | 2,73,000 | 4,23,000 |
| To Labour | | | | | |
| Senior Bat | 42,000 | | | | |
| Sub-Junior Bat | 77,000 | 1,19,000 | | | |
| To Works Expenses | | 1,20,000 | | | |
| To Office Expenses | | 68,000 | | | |
| To Net Profit | | 50,000 | | | |
| | | 4,23,000 | | | 4,23,000 |

**Reconciliation Statement**

| Particulars | Rs (+) | Rs (–) |
|---|---|---|
| Profit as per Cost Books | 43,000 | |
| Office Overheads overcharged in Cost Books (76,000 – 68,000) | 8,000 | |
| Works Overheads undercharged in Cost Books (1,19,000 – 1,20,000) | | 1,000 |
| | 51,000 | 1,000 |
| Profit as per Financial Books | 50,000 | |

## THEORY QUESTIONS

1. Explain the need for reconciliation of cost and financial accounts. *(ICWA)*
2. It has been stated that the results worked out from the costing records and those worked out from the financial accounts may not necessarily agree. Why? *(B. Com. Delhi)*
3. Give reasons as to why it is necessary to reconcile cost accounts and financial accounts. What is the accounting procedure to be adopted for their reconciliation? *(CA Inter)*
4. Indicate the reasons why it is necessary for the cost and financial accounts of an organisation to be reconciled and explain the main sources of difference which would enter into such a reconciliation.
5. Discuss the main sources of difference between profit shown by financial accounts and profit shown by cost accounts. *(B. Com. (Hons), Delhi)*
6. Describe in brief the conditions which necessitate reconciliation of financial and cost records. *(B. Com. (Hons), Delhi)*

## PROBLEMS

1. From the following figures prepare a Reconciliation Statement:

| | Rs |
|---|---|
| Net profit as per financial records | 1,28,755 |
| Net profit as per costing records | 1,72,400 |
| Works overhead under-recovered in costing | 3,120 |
| Administrative overhead recovered in excess | 1,700 |
| Depreciation charged in financial records | 11,200 |
| Depreciation recovered in costing | 12,500 |
| Interest received but not included in costing | 8,000 |
| Obsolescence loss charged in Financial records | 5,700 |
| Income tax provided in financial books | 40,300 |
| Bank interest credited in financial books | 750 |
| Stores adjustments (credit in financial books) | 475 |
| Depreciation of stock charged in financial books | 6,750 |

2. The following transactions have been extracted from the financial books of a company:

| | | *Rs* | *Units* |
|---|---|---|---|
| Sales | | 2,50,000 | 20,000 |
| Materials | | 1,00,000 | |
| Wages | | 50,000 | |
| Factory overheads | | 45,000 | |
| Office and administration overheads | | 26,000 | |
| Selling and distribution overheads | | 18,000 | |
| Closing stock; | | | |
| Finished goods | | 15,000 | 1,230 |
| Work-in-progress: | | | |
| Materials | 3,000 | | |
| Wages | 2,000 | | |
| Factory overheads | 2,000 | 7,000 | |
| Goodwill written off | | 20,000 | |
| Interest on capital | | 2,000 | |

In costing books factory overhead is charged at 100% on wages, administration overhead at 10% of factory cost and selling and distribution at the rate of Re 1 per unit sold. Prepare a statement reconciling the profit as per cost and financial accounts.

*(B. Com. (Hons). Delhi,)*

*Ans:* Profit as per cost accounts Rs 30,000
Profit as per financial accounts Rs 11,000.

3. The following figure are available from financial accounts for the year ending 31st March, 2002:

| | Rs |
|---|---|
| Direct material consumption | 2,50,000 |
| Direct wages | 1,00,000 |
| Factory overheads | 3,80,000 |
| Administration overheads | 2,50,000 |
| Selling and distribution overheads | 4,80,000 |
| Bad debts | 20,000 |
| Preliminary expenses (written off) | 10,000 |

| | |
|---|---|
| Legal charges | 5,000 |
| Dividend received | 50,000 |
| Interest on deposit received | 10,000 |
| Sales 1,20,000 units | 7,00,000 |
| Closing stock: | |
| Finished stock = 40,000 units | 1,20,000 |
| Work-in-progress | 80,000 |

The cost accounts reveal:
Direct material consumption—Rs 2,80,000
Factory overhead recovered at 20% on prime cost.
Administration overhead at Rs 3 per unit of production.
Selling and distribution overhead at Rs 4 per unit sold.
*Prepare:*

1. Costing profit and loss account.
2. Financial profit and loss account.
3. Statement reconciling the profits disclosed by the costing profit and loss account and financial profit and loss account.

*(CA Inter)*

*Ans:* Loss as per cost A/c Rs 4,22,000
Loss as per financial books Rs 5,35,000.

4. During a particular year, the auditors certified the financial accounts showing a profit of Rs 1,68,000, whereas the same as per costing books was coming out to be Rs 2,40,000. Given the following information, you are required to prepare a reconciliation statement showing clearly the reasons for the gap:

**Trading and Profit and Loss Account**

| | Rs | | Rs |
|---|---|---|---|
| To Opening stock | 8,20,000 | By Sales | 34,65,000 |
| Purchases | 24,72,000 | By Closing stock | 7,50,000 |
| Direct wages | 2,30,000 | | |
| Factory overheads | 2,10,000 | | |
| Gross profit c/d | 4,83,000 | | |
| | 42,15,000 | | 42,15,000 |
| | | By Gross profit b/d | 4,83,000 |
| To Administrative expenses | 95,000 | By Sundry income | 5,000 |
| Selling expenses | 2,25,000 | | |
| Net profit | 1,68,000 | | |
| | 4,88,000 | | 4,88,000 |

The costing records show:
(a) Book value of closing stock Rs 7,80,000.
(b) Factory overheads have been absorbed to the extent of Rs 1,89,800.
(c) Sundry income is not considered.
(d) Administrative expenses are recovered at 3% of selling price.
(e) Total absorption of direct wages Rs 2,46,000.
(f) Selling prices include 5% for selling expenses.

5. The financial profit and loss account of a manufacturing company for the year ending 31st March, 2001 given below:

| | Rs | | Rs |
|---|---|---|---|
| To Opening Stock: | | By Sales | 4,60,000 |
| Raw materials | 25,000 | By Closing Stock: | |
| Finished stock | 40,000 | Raw materials | 30,000 |
| Work-in-progress | 12,500 | | |
| | 77,500 | Finished stock | 15,000 |
| | | Work-in-progress | 20,700 |
| To Purchases | 1,20,000 | | |
| To Wages (factory) | 30,000 | | |
| To Electric power (factory) | 65,000 | | |
| To Factory overheads | 45,000 | | |
| To Gross Profit c/d | 1,88,200 | | |
| | 5,25,700 | | 5,25,700 |
| To Administration expenses | 20,500 | By Gross profit b/d | 1,88,200 |
| | | By Miscellaneous revenue | 26,800 |
| To Selling and distribution expenses | 46,500 | | |
| To Bad debts | 15,600 | | |
| To Net profit | 1,32,400 | | |
| | 2,15,000 | | 2,15,000 |

The cost accounts of the concern showed a net profit of Rs 1,32,200.
It is seen that the costing profit and loss account is arrived at on the basis of figures furnished below:

| | Rs |
|---|---|
| Opening stock of raw materials, finished stock and work-in-progress | 90,000 |
| Closing stock of raw materials, finished stock and work-in-progress | 69,500 |

You are required to prepare a memorandum reconciliation account and reconcile the difference in the profit and loss account.

6. The trading and profit and loss account of M/s XY (P) Ltd. for the year ending 31st December, 2000 (as prepared by the head office oaccounts department) is summarised as follows:

| | Rs | | Rs |
|---|---|---|---|
| To Stock on 1st January 1972 | 60,000 | By Sales | 1,30,000 |
| To Purchases | 82,000 | By Stock on 31st Dec. 2000 | 80,000 |
| To Wages | 40,000 | | |
| To Works expenses | 1,800 | | |
| To Gross profit c/d | 26,200 | | |
| | 2,10,000 | | 2,10,000 |
| To Salaries | 8,000 | By Gross profit b/d | 26,200 |
| To Rent and rates | 4,000 | By Rent received | 6,000 |
| To Selling expenses | 5,600 | By Dividend (gross) | 20,000 |
| To Administration expenditure | 4,200 | | |
| To Profit | 30,400 | | |
| | 52,200 | | 52,200 |

The following information was also supplied:

| | *On 1st January 2000* Rs | *On 31st December 2000* Rs |
|---|---|---|
| 1. Stock: | | |
| Manufactured units | 24,000 | 20,000 |
| Purchased units | 14,000 | 44,000 |
| Raw materials | 22,000 | 16,000 |
| | 60,000 | 80,000 |
| 2. Purchases: | | |
| Purchased units | 54,000 | |
| Raw Materials | 28,000 | |
| | 82,000 | |
| 3. Wages: | | |
| Direct wages | 30,000 | |
| Indirect wages | 8,000 | |
| Clerical wages (sales) | 2,000 | |
| | 40,000 | |
| 4. Salaries: | | |
| Works supervision | 2,200 | |
| Sales department | 4,000 | |
| Administration | 1,800 | |
| | 8,000 | |
| 5. Rent and rates: | | |
| Works | 2,000 | |
| Sales office | 400 | |
| Let property | 1,600 | |
| | 4,000 | |

*Other particulars:*

1. Purchased units 3,000 and manufactured units 10,000 were sold at the rate of Rs 10 each.
2. Units purchased at Rs 8 each. Units produced by the company were valued at Rs 8 each.
3. Administrative expenditure – 2/3rd to be charged to works supervision and 1/3rd to sales supervision.
4. Dividend was on trade investments.

You are required to prepare a costing profit and loss acount for the year ending 31st December, 2000 for submission to the higher management.

*Ans:* Profit as per cost book Rs 6,000

**7.** S.V. Ltd. has furnished you with the following information from the financial books for the year ending 30th June 2002.

**Profit and Loss Account for the Year Ending 30th June, 2002**

| | Rs | | Rs |
|---|---|---|---|
| Opening stock: | | Sales: | |
| 500 units at Rs 35 each | 17,500 | 10,250 units | 7,17,500 |
| Materials consumed | 2,60,000 | Closing stock: | |
| Wages | 1,50,000 | 250 units at Rs 50 each | 12,500 |
| Gross profit | 3,02,500 | | |
| | 7,30,000 | | 7,30,000 |
| Factory overheads | 94,750 | Gross profit | 3,02,500 |
| Administration overheads | 1,06,000 | Interest | 250 |
| Selling expenses | 55,000 | Rent Received | 10,000 |
| Bad debts | 4,000 | | |
| Preliminary expenses | 5,000 | | |
| Net Profit | 48,000 | | |
| | 3,12,750 | | 3,12,750 |

The cost sheet shows the cost of materials as Rs 26 per unit and the labour cost as Rs 15 per unit. The factory overheads are absorbed at 60% of labour cost and administration overheads at 20% of factory cost. Selling expenses are charged at Rs 6 per unit. The opening stock of finished goods is valued at Rs 45 per unit. You are required to prepare:

(i) A statement showing profit as per cost accounts for the year ending 30th June, 2002.
(ii) A statement showing the reconciliation of profit disclosed in the cost accounts with the profits shown in the financial accounts.

*(CA Inter)*

*Ans:* Profit as per cost books Rs 48,500.

15

# Uniform Costing and Inter-firm Comparison

## UNIFORM COSTING

Uniform costing is defined as the use by several undertakings of the same costing principles and/or practices. Uniform or identical methods may be applied by various members of a group of similar companies under common control. Sometimes trade and business associations bring uniformity in costing principles and practices among all industries. Uniform costing in not a separate method of cost accounting like process or job costing, standard costing or marginal costing. It only points to a situation where a number of business firms are applying similar costing principles and practices.

### Advantages

The advantages of uniform costing may be listed as follows:

1. Small business firms are not able to maintain a full costing system as it is costly and complicated. If the business associations and federations develop some costing principles for the benefit of all business concerns, much cost likely to be incurred on designing and establishing a costing system is likely to be saved.
2. It is always possible for management to be able to compare the cost of its own business with the average costs in the industry. Comparison helps to minimise areas of inefficiencies and weaknesses.
3. Some business associations use the costs provided by the members to prepare a standard price list, the existence of which tends to reduce destructive competition and help all members to obtain at least a fair price for their goods or services.
4. The applications of uniform costing in an industry provide the means whereby relevant information can be obtained to help in negotiations with goverment departments, trade unions, etc.
5. When customers find that quotations are based on sound costing principles they accept them more readily, and the relationship of business enterprises with their customers is thus improved.

6. Uniform cost accounting facilitates the work of wage boards set up to fix minimum wages and fair wages for industry.
7. The benefits of research and development carried out by big firms may be made available to smaller firms also through uniform costing.
8. Uniform costing makes available cost data which are vital to goverment and regulatory authorities. In many areas, such as price control, protection or subsidy to industry, import licenses, quota for scarce materials, uniform costing provides suitable and important statistics.
9. Uniform costing is helpful in comparing the production efficiency of two units at the time of an amalgamation and merger.

### Disadvantages

1. Business firms differ in nature of work, conditions and organisational characteristics. It becomes difficult to suggest a uniform costing for all business firms which widely differ from each other.
2. Uniform costing requires utmost cooperation, openness and confidence among members of the business and industry groups.
3. Uniform costing tends to suggest a single price within the industry which may create monopolistic tendencies.

## ESTABLISHING A UNIFORM COSTING SYSTEM

Uniform costing may be useful to those business firms which are in the same industry, within a single management and also to industries of a similar nature, big or small. The success of uniform costing depends on the following factors:

1. Free exchange of ideas, information practices and techniques
2. Mutual trust, cooperation, confidence and a desire to share with each other.
3. Bigger enterprises should lend more cooperation and help to smaller enterprises.
4. No concealment of any information.
5. Absence of competition and hatred among participating members.

In uniform costing the purpose is to establish uniformity in cost accounting principles and practices and, therefore, an attempt should be made to locate differences and remove the causes creating such differences. The differences in cost accounting practices of different firms may be due to the following reasons:

(i) *Difference in nature, size and organisation set-up of business enterprises* Managing personnel, division of labour, division of work, number and size of department, services provided, smaller firms, larger firms, salary and wage structure.

(ii) *Methods of production* Use of plant and equipment, degree of mechanisation, manufacturing process or operation, sequence in processing.

(iii) *Use of cost accounting principles and procedures* Different methods of pricing materials issues, methods of wage payment, classifications, apportionment and absorption of overheads, methods of depreciation, treatment of administrative and selling and distribution overheads.

## AREAS OF UNIFORMITY

Uniform costing requires uniformity in cost accounting principles and procedures especially in the following areas:

1. *General classifications of accounts* Uniformity in classification and codification of accounts should be maintained.
2. *Method of overhead allotment* The basis on which the various overheads should be allotted to producing and servicing departments should be followed by all members of the industry groups using uniform costing.
3. *Method of overhead absorption* Uniformity in the method of overhead absorption is most important.
4. *Scrap and losses* The general method of treatment to be accorded to scrap and losses should be specified. The method of dealing with income from tlhe sale of waste products should also be specified.
5. *Joint costs* The treatment of joint costs is also very important and a uniform method should be followed. It should also be decided as to which costs should or should not be included in cost.

## UNIFORM COST MANUAL

The designing and applications of uniform costing require that a uniform cost manual containing instructions, clarifications, rules and guidelines about cost determination, cost analysis and cost control, should be developed and circulated among the business enterprises that have decided to use uniform costing. A uniform cost manual usually contains the following materials:

1. *Introduction* The introduction of the manual describes the statement of objectives of the system, scope of the system, advantages to be achieved and its basic features.
2. *Accounting organisation* It contains a scheme of organisation for designing and operating the cost accounting system.
3. *Accounting system* It contains general principles of accounting, a coding system, terminology, classification and description of accounts.
4. *Cost accunting system* It describes methods of costing (job, process, standard costing, etc.), system of integration in accounts, relation between cost and financial accounts, items to be included or excluded in stocks, classification of departments into producing and servicing, treatment of materials cost and materials losses, pricing of materials issues, classification of materials into direct and indirect, classifictation of labour cost and treatment of labour related costs such as idle time, overtime, hoildays and shift allowances, etc. classification, collection, apportionment and absorption of overhead, calculation of depreciation, treatment of under- and over-absorption.
5. *Presentation of information* This section clearly describes how the cost information should be presented. It contains forms and contents of statements to be prepared, forms of reports to management, forms of report to shareholders, detailed operation and production costs, cost ratios, financial ratios and other supplementary information.

## INTER-FIRM COMPARISON

Inter-firm comparison is the technique of evaluating the performance efficiencies, costs and profits of firms in an industry. Inter-firm comparison is greatly facilitated if uniform costing has been used. Inter-firm comparison requires exchanges of information relating to costs, profits, prices, efficiency on a voluntary basis among participating firms. Trade and commerce associations usually employ accountants to collect cost information about business firms and make inter-firm comparisons.

## ESSENTIALS OF INTER-FIRM COMPARISON

Inter-firm comparison can succeed when uniform costing principles and procedures have been used among member business firms. The following are the important requirements of inter-firm comparison:

1. *Nature and extent of information to be accumulated* Inter-firm comparison requires that all relvent and detailed cost information should be collected regarding business firms. No definite list of information can be suggested for collection. However, the following are the usual information which are applicable to all industries and therefore can be collected for inter-firm comparison:
   (i) Information regarding cost and cost structure.
   (ii) Labour efficiency and labour utilisation.
   (iii) Machine efficiency and machine utilisation.
   (iv) Raw materials comsumed, wastage and stores-keeping.
   (v) Return on capital employed.
   (vi) Liquidity and liquid resources.
   (vii) Reserve and appropriation of profits.
   (viii) Debtors and creditors.
   (ix) Methods of production and technical aspects.
   (x) Inventory and inventory systems.
2. *Responsibility for collection, coordination and presentation of information* In some countries separate organisations have been established for collecting and presenting information. In India inter-firm comparison information is collected by various trade associations, chambers of commerce, the National Productivity Council, research and statistics divisions of several commerce and trade journals and periodicals and newspapers.
3. *Method of collection and presentation of information* Information for the purpose of inter-firm comparison is usually supplied by business enterprises to organisation(s) regularly. Information can be collected by field workers also. After the information is collected, it is properly compiled and arranged and finally a consolidated report is prepared for the benefit of business firms. For the information to be purposeful, it is essential that participating firms should agree about the meaning of various terms used in ratios and accounting information.

## BENEFITS OF INTER-FIRM COMPARISON

Inter-firm comparison has the following advantages:

1. It makes a business firm aware of its limitations as compared to other in the industry.

2. It eliminates confusion and uncerainty and encourages business firms to take some positive steps to improve performance and increase efficiency.
3. Information about the industry and business is available which is useful to present and prospective business enterpreneurs.
4. Reporting of data on business firms is generally treated free from bias.
5. Useful data about business enterprises becomes available to government for formulating economic, commercial and other policies for the well-being of the nation.

## LIMITATIONS OF INTER-FIRM COMPARISON

1. Business firms may be afraid that disclosure of information may help competitors, and may thus be reluctant to part with facts which are detrimental to their interests.
2. Some managements are not convinced about the utility of inter-firm comparison.
3. If business firms have not established suitable cost accounting systems, the information supplied by them may not be usable for inter-firm comparsion.
4. Business firms usually do not agree about a common suitable basis for comparison.

Howerver, the above limitations are basically due to differences in the nature of participating business firms and use of accounting methods. Therefore, a uniform cost accounting system should be established in every participating firm and business firms should be educated about the advantages and uses of inter-firm comparison.

## THEORY QUESTIONS

1. Explain the concept of "uniform costing". What is a uniform costing manual?
2. What principle factors should be considered in introducing a system of uniform costing in an industry? *(ICWA)*
3. What is a uniform cost accounting system? What are the items on which you would seek uniformity so far as overheads are concerned in a uniform cost accounting system? *(CA)*
4. "A scheme of inter-firm comparison combines the advantages of a uniform costing system and the benefits arising out of the use of ratios." Discuss. *(ICWA)*
5. Discuss the scope and applications of uniform costing methods and their usefulness especially in the context of the economy of our country. Assume that you are advising a trade association in this regard in the interest of its member firms and outline your views and suggestions. *(ICWA)*
6. Why is inter-firm comparison desirable? What are the essential points that should be considered in inter-firm comparison? What are its advantages.
7. What are the purpose of uniform costing when it is introduced in an industry under a federation? What are the basic requirements of uniform costing? *(ICWA Inter Dec.)*

Part 4

# Cost Analysis for Planning, Control and Decision Making

- Marginal (Variable) Costing
- Alternative Choices Decisions
- Standard Costing
- Budgeting
- Pricing Decisions
- Responsibility Accounting and Divisional Performance Measurement
- Activity—Based Costing



# Marginal (Variable) Costing

## CONCEPT OF MARGINAL COST, MARGINAL COSTING

Marginal cost, in cost accounting, means variable production costs, i.e. the costs which tend to vary in direct proportion to the changes in the production level. If an extra unit of output is produced, the costs which could be incurred for producing this extra unit, will only be marginal (variable) costs since fixed costs remain constant.

Marginal costing is a costing techinque in which only variable manufacturing costs are considered and used while valuing inventories and determining cost of goods sold. That is, only variable manufacturing costs are considered product costs and are allocated to products manufactured. These costs include direct materials, direct labour and variable factory overhead. Fixed factory (manufacturing) overheads are not considered product costs and are not used to value inventories and determine the cost of goods sold and are excluded from the cost of product. Fixed manufacturing costs are treated as period costs in marginal costing, i.e. costs which are a function of a time rather than of production. In marginal costing, fixed manufacturing overheads are written off to the profit and loss account in the period in which are incurred.

## ABSORPTION COSTING

Absorption costing, also known as full costing, is a costing technique in which all manufacturing costs, variable and fixed, are considered as costs of production and are used in determining the cost of goods manufactured and inventories. All manufacturing costs are fully absorbed into finished goods.

## DIFFERENCE BETWEEN MARGINAL COSTING AND ABSORPTION COSTING

Marginal costing and absorption costing differ from each other in the following respects:

1. *Cost element in product cost* Marginal costing and absorption costing differ only in the treatment of fixed factory (manufacturing) overheads in the accounting records and financial statement. In both the costing techniques it is agreed that selling and administrative expenses.

whether variable or fixed, are period costs and these costs are not treated as product costs with the result that selling and administrative expenses are not included in the costs of inventories, and costs of goods sold. Similarly, it is also agreed that variable manufacturing costs are products costs, i.e., costs to be charged to the product.The disagreement between the two, is only in regard to the treatment of fixed manufacturing costs.

2. *Inventory values* Marginal costing and absorption costing do influence inventory values differently. The value of inventories under marginal costing is relatively at a lower figure as inventories are determined in terms of only variable production costs. In absorption costing, the value of inventories is comparatively at a higher figure because it considers fixed factory overhead also besides the variable production costs.
3. *Difference in net income* The treatment of fixed factory overhead brings differences in the net income figures in the two costing techniques. The magnitude of any difference in net income is a function of fixed manufacturing costs per unit and the change in inventory levels.

The question of difference in net income has been further explained in the following pages while discussing income statement under absorption costing and marginal costing.

## INCOME STATEMENTS UNDER ABSORPTION COSTING AND MARGINAL COSTING

### Income Statement under Absorption Costing

Under absorption costing all costs are divided into three categories: manufacturing, selling, and administrative costs. In the income statement, all manufacturing costs (variable and fixed) are subtracted from the sales revenue to get a gross margin/gross profit on sales: and selling and administrative expenses (fixed and variable) are deducted from gross margin to arrive at the net income.

It should be clearly understood that fixed manufacturing overhead are charged to units produced on the basis of per unit fixed manufacturing overhead rate obtained by dividing the standard fixed manufacturing overhead by normal output level as follows:

$$\frac{\text{Standard fixed manufacturing overhead}}{\text{Normal output (Capacity)}}$$

If production is above or below the normal or standard output, adjustments are made for volume (capacity) variances. If the volume (capacity) variance is favourable, i.e., over-absorption (actual production being higher than normal capacity production), the amount of over-absorption is deducted from the total cost of goods manufactured and sold. If the volume (capacity) variance is unfavourable, i.e., under-absorption (actual production being lesser than normal capacity production), the amount of under-absorption is added to the cost of goods manufactured and sold. A proforma of income statement prepared under absorption costing is given in Fig. 16.1.

### Income Statement under Marginal Costing

Under marginal costing, only variable costs of production (direct material, direct labour and variable manufacturing) are subtracted from sales revenue to determine a balance which is known by different names, such as marginal contribution, marginal income (profit), marginal revenue, marginal balance, profit pick-up, etc. All fixed costs, and variable selling, distribution and administrative costs are deducted from this balance to arrive at the net income. Since fixed manufacturing costs are not charged to

**Income Statement (Absorption Costing)**

| | | *Amount Rs* |
|---|---|---|
| | Sales | |
| *Less:* | Manufacturing costs: | |
| | (1) Variable production costs: | |
| | Direct material cost | |
| | Direct labour cost | |
| | Variable manufacturing overhead | |
| | (2) Fixed factory (manufacturing) overhead | |
| | Cost of goods manufactured | |
| *Add:* | Beginning inventory | |
| | Cost of goods available for sale | |
| *Less:* | Closing inventory | |
| | Cost of goods sold | |
| | Over- or under-applied factory (manufacturing) overhead (Over-absorption to be deducted and under-absorption to be added) | |
| | Cost of goods sold at actual | |
| | Gross profit on sales | |
| *Less:* | Fixed selling and administrative expenses | |
| | Variable selling and administrative expenses | |
| | Net Income | |

**Fig. 16.1** Income Statement Proforma (Absorption Costing)

products under marginal costing, there can be no volume (capacity) variance. Marginal contribution/ marginal income under marginal costing is greater than the gross profit/gross margin under absorption costing. Figure 16.2 depicts a proforma of income statement prepared under marginal costing.

Under marginal costing, fixed manufacturing overhead are excluded and therefore inventory values are lower than inventory value computed under absorption costing. Income may be higher or lower depending upon whether inventories are built up or liquidated. That is, the income statement under absorption costing may reflect higher profit if the production is more than the normal capacity production and also lower sales has been made. This happens because above normal capacity production has over-absorbed its actual fixed manufacturing overhead.

Absorption/full costing and marginal costing influence differently gross profit, net profit, and inventory values of different month/periods. The following data and income statement prepared under both costing techniques explain this situation.

*Data:*

Normal capacity 20,000 units per month
Variable costs (direct materials, direct labour, variable factory overhead) per unit Rs 6.
Fixed factory overhead Rs 25,000 per month or Rs 1.25 per unit at normal capacity.
Fixed selling and administrative expenses are Rs 5,000 p.m.
Variable selling and administrative expenses are Re 1.00 per unit sold.
Sales prices per unit is Rs 10.
Actual production, sales and inventories in units are:

**Income Statement (Marginal Costing)**

| | | Amount (Rs) |
|---|---|---|
| | Sales | |
| Less: | Variable production costs: | |
| | Direct material costs | |
| | Direct labour cost | |
| | Variable manufacturing (factory) overhead | |
| | Cost of goods manufactured | |
| *Add:* | Beginning inventory | |
| | Cost of goods available for sale | |
| *Less:* | Closing inventory | |
| | Cost of goods sold | |
| | Marginal contribution | |
| *Less:* | Fixed manufacturing overhead | |
| | Variable selling and administrative expenses | |
| | Fixed selling and administrative expenses | |
| | Net Income | |

**Fig. 16.2** Income Statement Proforma (Marginal Costing)

| | *First month* | *Second month* | *Third month* | *Fourth month* |
|---|---|---|---|---|
| Unit in beginning inventory | — | — | 3,000 | 1,000 |
| Units produced | 17,500 | 21,000 | 19,000 | 20,000 |
| Units sold | 17,500 | 18,000 | 21,000 | 16,500 |
| Units in closing inventory | — | 3,000 | 1,000 | 4,500 |

*Solution*

**Income Statement (Absorption Costing)**

| | *First month* | *Second month* | *Third month* | *Fourth month* |
|---|---|---|---|---|
| Sales | Rs 1,75,000 | 1,80,000 | 2,10,000 | 1,65,000 |
| Variable cost per unit Rs 6 | 1,05,000 | 1,26,000 | 1,14,000 | 1,20,000 |
| Fixed factory overhead @ Rs 1.25 | 21,875 | 26,250 | 23,750 | 25,000 |
| Cost of goods manufactured | 1,26,875 | 1,52,250 | 1,37,750 | 1,45,000 |
| *Add:* Beginning inventory | — | — | 21,750 | 7,250 |
| Cost of goods available for sales | 1,26,875 | 1,52,520 | 1,59,500 | 1,52,250 |
| *Less:* Ending inventory | — | 21,750 | 7,250 | 32,625 |
| Cost of goods sold | 1,26,875 | 1,30,500 | 1,52,250 | 1,19,625 |
| Over- or under-applied | | | | |

(*Contd.*)

| | *First month* | *Second month* | *Third month* | *Fourth month* |
|---|---|---|---|---|
| factory overhead | 3,125 | (1,250) | 1,250 | — |
| Cost of goods sold at actual | 1,30,000 | 1,29,250 | 1,53,500 | 1,19,625 |
| Gross profit on sales | 45,000 | 50,750 | 56,500 | 45,375 |
| Selling and administrative expenses (fixed and variable) | 22,500 | 23,000 | 26,000 | 21,500 |
| Net income for the month | 22,500 | 27,750 | 30,500 | 23,875 |

*Note:* In absorption costing income statement, fixed factory expenses are included in the unit cost and also in the inventory values.

(i) Ending inventory: Second month $\frac{3,000}{21,000} \times 1,52,250 = \text{Rs } 21,750$

Third month $\frac{1,000}{22,000} \times 1,50,500 = \text{Rs } 7,250$

Fourth month $\frac{4,500}{21,000} \times 1,52,250 = \text{Rs } 32,625$

(ii) In first month, Rs 3,125 is under-absorbed factory overhead due to production less than normal capacity and should be added to the cost of goods sold.

(iii) In the second month, Rs 1,250 is over-absorbed due to higher production and has, therefore been subtracted.

(iv) In the third month, Rs 1,250 is under-absorbed and has been added back to cost of goods sold.

(v) In the fourth month, production is at normal capacity and there is no under- or over-absorption.

**Income Statement (Marginal Costing)**

| | *First month* | *Second month* | *Third month* | *Fourth month* |
|---|---|---|---|---|
| Sales (Rs) | 1,75,000 | 1,80,000 | 2,10,000 | 1,65,000 |
| Variable production cost: | | | | |
| Variable manufacturing costs Rs 6 per unit | 1,05,000 | 1,26,000 | 1,14,000 | 1,20,000 |
| Cost of goods manufactured | 1,05,000 | 1,26,000 | 1,14,000 | 1,20,000 |
| *Add:* Beginning inventory | — | — | 18,000 | 6,000 |
| Cost of goods available for sale | 1,05,000 | 1,26,000 | 1,32,000 | 1,26,000 |
| *Less:* Closing inventory | — | 18,000 | 6,000 | 27,000 |
| Cost of goods sold | 1,05,000 | 1,08,000 | 1,26,000 | 99,000 |
| Contribution | 70,000 | 72,000 | 84,000 | 66,000 |

*(Contd.)*

| | *First month* | *Second month* | *Third month* | *Fourth month* |
|---|---|---|---|---|
| *Less:* Fixed factory overhead | 25,000 | 25,000 | 25,000 | 25,000 |
| Fixed selling and administrative expenses | 5,000 | 5,000 | 5,000 | 5,000 |
| Variable selling and administrative expenses | 17,500 | 18,000 | 21,000 | 16,500 |
| Total fixed costs and non-manufacturing variable costs | 47,500 | 48,000 | 51,000 | 46,500 |
| Net income for the month | 22,500 | 24,000 | 33,000 | 19,500 |

*Note:* Under marginal costing, fixed factory (manufacturing) overhead costs are not included in the product unit costs and costs of inventories.

(i) Valuation of closing inventory

| | | | |
|---|---|---|---|
| Second month | = 3,000 × Rs 6 | = Rs | 18,000 |
| Third month | = 1,000 × Rs 6 | = Rs | 6,000 |
| Fourth month | = 4,500 × Rs 6 | = Rs | 27,000 |

(ii) The question of under- or over-absorption of factory overhead does not arise under marginal costing.

A comparison of the income statements leads to the following conclusions:

1. Under variable costing, the closing inventory is costed at a smaller figure because only variable costs are charged to the product.
2. Both costing methods report the same amount of profit in periods in which production and sales are equal and there is no inventory change (first month). This is because the amount of fixed factory overhead costs charged to the period was the same in each case. Under marginal costing Rs 25,000 was deducted from sales as period costs. Under absorption costing Rs 25,000 was charged to the sales in two parts; (a) Rs 21,875 as part of the cost of sales (17,500 units × Rs 1.25); and (b) Rs 3,125 as unfavourable volume (capacity) variance.
3. When inventory of manufactured goods fluctuates from period to period, net income will differ somewhat under the two methods because absorption costing requires that part of the period costs be included in inventory, whereas marginal costing excludes period costs. Therefore:
   (i) When production exceeds sales (the inventory is increased), the net income reported under absorption costing is higher than reported under variable costing. This follows because under absorption costing, a portion of the fixed costs budgeted for the period is shifted to the following period in the closing inventories whereas under marginal costing the total fixed costs are charged against income. This is clear from comparing the net income of the second and fourth month.
   (ii) When sale exceeds production (the inventories are decreased), marginal costing shows a higher profit because only current period costs are being charged aganist current revenues, whereas under absorption costing the period costs previously included in inventory are now being charged against current revenues. This situation is illustrated by the income of the third month.

4. Under marginal costing profits always move in the same direction as sales volume. They cannot, of course, increase of decrease in direct proportion because unit fixed costs do not remain constant. Profit reported under absorption costing behave irregularly and sometimes in the opposite direction from sales. For example, sales of the fourth month is higher than the net income for the first month.
5. The above income statements are prepared on the assumption that selling prices remained constant and that there were no changes in either the manufacturing costs or the selling and administrative expenses. Further, it has been assumed that overheads costs are absorbed at predetermined rates based on normal capacity.
6. The aggregate net income (of different months or periods taken together) will be the same under both costing methods provided production and sales, in total, are equal. In the above example, total production are 77,500 units and total sales are 73,000 units. Since production and sales are unequal, the combined net income is not the same.

## Reconciliation of Net Income

The differences in the net income between absorption costing and marginal costing are due to: (i) amount of fixed factory overhead charged to inventory, (ii) Over or under-absorbed fixed factory overhead having been deferred in absorption costing. The entire difference in net income can be explained by the amount of fixed factory overhead that is included in the beginning and closing inventories.

**Reconciliation of Differences between Absorption and Marginal Costing Income**

| | *Second month (Rs)* | *Third month (Rs)* | *Fourth month (Rs)* |
|---|---|---|---|
| Marginal costing income | 24,000 | 33,000 | 19,500 |
| Absorption costing income | 27,750 | 30,500 | 23,875 |
| Difference to be explained | (3,750) | 2,500 | (4,375) |
| 1. Differences in the value of opening and closing inventories: | | | |
| (a) Second month: | | | |
| Opening zero | 0 | — | — |
| Closing 18,000–21,750 | (3,750) | | |
| (b) Third month: | | | |
| Opening 18,000–21,750 | — | 3,750 | |
| Closing 6,000 –7,250 | — | (1,250) | — |
| (c) Fourth month: | | | |
| Opening 6,000–7,250 | — | — | (1,250) |
| Closing 27,000–32,625 | — | — | (5,625) |
| | (3,750) | 2,500 | (4,375) |

## Inventory Values

Differences between the net incomes reported under absorption costing and marginal costing are also reflected in inventory values. As stated earlier, inventories under absorption costing absorb a part of the fixed manufacturing costs of a period, whereas inventories under marginal costing include only the variable manufacturing costs. Closing inventories calculated from the data given above would be as follows:

| Closing Inventories | | | | |
|---|---|---|---|---|
| | *First month* | *Second month* | *Third month* | *Fourth month* |
| Absorption costing @ Rs 7.25 per unit | — | 21,750 | 7,250 | 32,625 |
| Margin costing @ Rs 6.00 per unit | — | 18,000 | 6,000 | 27,000 |

The following summarises the differences between marginal costing and absorption costing with regard to effect on net income:

1. If production = sales; absorption profit = marginal costing profit.
2. If production > sales; absorption profit > marginal costing profit.
3. If production < sales; absorption profit < marginal costing profit.
4. If production fluctuates and sales are constant; absorption profit fluctuates and marginal costing profit is constant.
5. If production is constant and sales fluctuates; both profits vary in the direction of sales.

## APPLICATIONS (ADVANTAGES) OF MARGINAL COSTING

The marginal costing has great potentialities for management in different managerial tasks and decision-making processes. Marginal costing is particularly useful to management in (i) profit planning, (ii) product pricing decisions, (iii) cost control, (iv) managerial decision-making, and (v) the impact of fixed costs.

### Profit Planning

Profit planning, generally known as budget or plan of operations, may be defined as the planning of future operations to attain a defined profit goal. Under marginal costing, the cost data needed for profit planning and decision-making are readily available from the accounting records and statements. It facilitates the analysis of cost-volume-profit relationships by separating fixed and variable costs on the income statement. Marginal costing helps management in planning and evaluating the profit resulting from a change in volume, in the sales-mix, in make or buy situations, in the selection of the most profitable products, customers, territories, and other segments of the entire business.

### Product Pricing Decisions

Marginal costing provides more useful information to management for pricing than absorption costing. Marginal costing serves as the basis of product pricing in many cases. Under marginal costing, management has the data to determine when it is advisable to accept orders if other than normal conditions exist. In some cases, a sales order can be accepted even if it contributes partly to fixed costs. However, the full cost and not only the variable cost should be the basis of product pricing in the long-run. The full cost is the cost which includes variable manufacturing cost and fixed manufacturing cost incurred in the production process.

### Cost Control

Marginal costing provides continuing opportunities to review period costs in relation to the level of sales and net income. Separation of variable and period costs supports the use of standards, budgets, and responsibility reporting to aid management in controlling costs. Marginal costing helps in preparing reports for all departments or responsibility centres based on standard costs, flexible budgets, and a division of all costs into their fixed and variable components. All managers can examine and interpret their reports with respect to the cost variances originating in their respective areas of responsibility. Reports prepared on the marginal costing basis and accompanied by additional information become valuable planning and control tools.

### Impact of Fixed Costs

Marginal costing evaluates the impact of fixed costs on profits because the total amount of fixed costs for the period appears in the income statement. It is argued that managerial decisions can be easily made if fixed expenses are separated and are not mixed in controlling operating costs.

### Managerial Decision Making

The identification and classification of costs as either fixed or variable provide a framework for the accumulation and analysis of costs. This also provides a basis for the study of contemplated changes in production levels or proposed actions concerning new markets, plant expansion or contraction, or special promotional activities. The marginal income figure is useful figure to management because it can be readily projected to measure increments in net income which accompany increments in sales.

## LIMITATIONS OF MARGINAL COSTING

The limitations of marginal costing are listed below:

1. The marginal costing method requires that all costs should be divided into fixed and variable components. It cannot be true under all circumstances. Examples of factors that might affect this assumption include quantity discounts on materials, and labour efficiency variances.
2. Complete product cost does not depend only on variable costs. Fixed costs should be considered in determining the product cost and for long-range pricing and other long-run policy decisions.
3. Income figure obtained under marginal costing have to be used carefully if management decides to expand business or drop a product line. Management has to consider other factors also before deciding to drop a product line such as customer goodwill.

## COST BEHAVIOUR

Cost behaviour can be defined as the manner in which costs changes due to changes in volume or activity. In relation to cost behaviour analysis, fixed and variable cost classifications are basically found. A proper analysis of cost behaviour patterns is the basis of all profit planning and cost control. The separation of costs into fixed, variable and semi-variable is necessary in order to determine, analyse, control, measure or evaluate the following:

1. Departmental expenses allowed at various levels of production.
2. Operating efficiency of a department.

3. Use of variable costing method.
4. Utilisation of facilities.
5. Break-even point.
6. Relative profitability of territories, departments and customers.
7. Company profit position.
8. Cost-profit-volume analysis.
9. Marginal or differential cost for various decision making purposes.
10. Effect of proposed capital expenditures.
11. Effect of alternative courses of action.

## METHODS OF DETERMINING COST BEHAVIOUR

Several methods are used for segregating semi-variable costs into fixed and variable. There are four major techniques that are found in practice and they may be listed as follows:

1. Higher and low points method
2. Scattergraph method
3. Least squares regression method
4. Accounting or analytical approach.

### High and Low Points Method

This approach considers the difference in total cost between two different volumes, and divides the incremental cost by the volume. As the words 'high' and 'low' imply, the two levels of volume chosen are the highest and the lowest for the period under review. The result of this division is the estimated variable cost per unit. Then, the average activity level is computed together with the average cost for the periods in the data base. The fixed cost is estimated by taking the total average cost and subtracting the variable cost for the average activity level. The variable cost is computed by multiplying the average activity level by the variable cost per unit as determined above.

As a simple illustration, assume that a company incurred the following costs in two periods (high and low) in which 5,000 units and 10,000 units were produced:

| | *Cost incurred* | |
|---|---|---|
| | 5,000 units | 10,000 units |
| Insurance on factory building | Rs 30,000 | 30,000 |
| Indirect material | 45,000 | 70,000 |

Since insurance remained constant at the two volumes, there is no variable component. Indirect materials contain both a fixed and variable components.

Separation is made as follows:

| | |
|---|---|
| Variable components: | |
| Indirect material cost of 10,000 units | Rs 70000 |
| Indirect material cost of 5,000 units | Rs 45000 |
| Cost of production of additional 5,000 units | Rs 25000 |
| Variable cost per unit Rs 25000 ÷ 5,000 units | Rs 5 |

| | | | |
|---|---|---|---|
| Fixed components: | 5,000 | units | 10,000 units |
| Total indirect material cost | Rs 45000 | | Rs 70000 |
| Variable components @ Rs 5 per unit | 25000 | | 50000 |
| Fixed costs for period | Rs 20000 | | Rs 20000 |

## Scattergraph Method

In this method, various costs are plotted on a vertical line, the $y$-axis, and measurement figures (activity levels such as direct labour hours, units of output, percentage of capacity or direct labour cost) are plotted along a horizontal line, the $x$-axis. A stright line is fitted to this scatter of points by visual approximation. The slope of the line is used to estimate the variable costs and the intercept of the line with the vertical axis is considered as the estimated fixed cost.

## Least Squares Regression Method

The method of least squares uses the equation for a straight line:

$Y = a + bx$, with $a$ as the fixed element, and $b$ the degree of variability. For many accounting applications, regression provides an accurate estimate of fixed and variable costs.

## Accounting or Analytical Approach

This approach to cost behaviour analysis is a close scrutiny of the chart of accounts and a classification of costs into their fixed and variable components according to their basic characteristics determined by the accountant using good judgement, knowledge, and experience. This approach is simple and inexpensive but in its simplicity lies its inherent weakness. The results obtained are not accurate and may happen to be mere guesses.

### *Example 16.1*

The following are the maintenance costs incurred in a machine shop for six months with corresponding machine hours:

| *Month* | *Machine hours* | *Maintenance costs* |
|---|---|---|
| January | 2,000 | 30000 |
| February | 2,200 | 32000 |
| March | 1,700 | 27000 |
| April | 2,400 | 34000 |
| May | 1,800 | 28000 |
| June | 1,900 | 29000 |
| Total: | 12,000 | 1,80,000 |

Analyse the Maintenance Cost which is semi-variable into fixed and variable element.

*Solution*

Computation of Variable Cost and Fixed Cost has been done according to Range Method.

| | *Machine hours* | *Maintenance costs* |
|---|---|---|
| Highest point, April | 2,400 | 34,000 |
| Lowest point, March | 1,700 | 17,000 |
| | 700 | 7000 |

$$\text{Variable cost per machine hour} = \frac{\text{Change in maintenance costs}}{\text{Change in hours}}$$

$$= 7000/700 = \text{Rs } 10$$

Total variable cost for 2,400 machine hours will be 2,400 × Rs 10 = Rs 24,000
Hence, fixed cost is (Rs 34,000 – Rs 24,000) = Rs 10,000

**Analysis of Maintenance Cost into Fixed and Variable Element**

| | *Machine hours* | *Maintenance cost (Rs)* | *Fixed cost (Rs)* | *Variable cost (Rs)* |
|---|---|---|---|---|
| January | 2,000 | 30000 | 10000 | 20000 |
| February | 2,200 | 32000 | 10000 | 22000 |
| March | 1,700 | 27000 | 10000 | 17000 |
| April | 2,400 | 34000 | 10000 | 24000 |
| May | 1,800 | 28000 | 10000 | 18000 |
| June | 1,900 | 29000 | 10000 | 19000 |

## COST-VOLUME PROFIT (CVP) ANALYSIS

Profits of business firms are the result of many factors such as: (i) selling prices, (ii) volume of sales (iii) unit variable costs (iv) total fixed costs, (v) combinations in which the various product lines are sold, etc. To do an affective job in planning, management must have analyses which allow reasonably correct predictions of how profits will be affected by a change in any one of these factors. A cost volume profit (CVP) analysis is useful to management in knowing how profit is influenced by sales volume, sales price, variable expenses and fixed expenses.

Broadly, CVP analysis uses the techniques of (i) Break-even analysis and (ii) Profit-volume (P/V) analysis.

### Break-even Analysis

A break-even analysis indicates at what level cost and revenue are in equilibrium. It is a simple and easily understandable method of presenting to management the effect of changes in volume on profits. Detailed analysis of break-even data will reveal to management the effect of alternative decisions which reduce or increase costs and which increase sales volume and income. It is a device which portrays the effects of any type of future planning by evaluating alternative courses of action.

#### *Break-even Point*

The break-even point can be defined as the point or sales level at which profit are zero and there is no loss. That is, break-even point is that point at which total costs are equal to total sales revenue. At the break-even point profit being zero, contribution (sales-variable cost) is equal to the fixed cost. If the

actual volume of sales is higher than the break-even volume, there will be a profit. Beyond the break-even point, all the marginal contribution represents income.

Assume that a company manufactures and sells a single product as follows:

Selling price per unit = Rs 20
Variable cost per unit = Rs 10
Total fixed cost = Rs 1,00,000

The break-even sales to cover fixed costs will be 10,000 units,

Selling price per unit = Rs 20
Variable cost per unit = Rs 10
Contribution = Rs 10

$$\text{Break-even volume} = \frac{\text{Rs 1,00,000 fixed cost}}{\text{Rs 10 contribution margin}}$$

= 10,000 units.

If the company can sell more than 10,000 units, it will earn profits because fixed costs remain constant. If less than 10,000 units are sold, a loss will be incurred. The profits will be equal to the number of units sold in excess of 10000 units multiplied by the unit contribution margin. For example, if 25000 units are sold the company will be operating at 15,000 units above its break-even point and will earn a profit of Rs 1,50,000 (15,000 units × Rs 10 contribution margin).

### *Break-even Formula*

The break-even point can be obtained directly by a mathematical formula. The basic formula to find out the break-even point is:

$$\text{Break-even sales (units)} = \frac{\text{Fixed cost}}{\text{Contribution margin per unit}}$$

$$\text{Break-even sales (volume)} = \frac{\text{Fixed cost}}{\text{C/S ratio (also known as P/V ratio *)}}$$

$$\text{Break-even sales volume} = \frac{\text{Total fixed expenses}}{1 - \text{Total variable expenses / Total sales volume}}$$

$$\text{Cash break-even point (units)} = \frac{\text{Cash fixed cost}}{\text{Cash contribution per unit}}$$

* C/S ratio is popularly known as P/V ratio because after fixed costs are fully recovered, i.e. after break-even point all contributions (sales-variable costs) become profit. However, before break-even point all contributions will not become profit since fixed costs are yet to be recovered.

### *Break-even Chart*

Total revenues and total costs at different sales volume can be estimated and plotted on a break-even chart. This chart is constructed as follows:

1. A horizontal base line, the $x$-axis, is drawn and spaced into equal distances representing either plant capacity, sales volume or number of units.

2. A vertical line, the *y*-axis is drawn on the left side of the chart and also spaced into equal parts. This line indicates sales revenue and also costs.
3. A line parallel to the horizontal line (*x*-axis) is drawn for fixed costs.
4. A total cost line is drawn starting at the *y*-axis fixed cost point and moving to the right. This total cost line represents the total of all items of cost, fixed and variable.
5. The sales line is drawn starting at the zero point on the vertical axis and ending at the top on the right side.
6. The total cost line intersects the sales line at a point which is known as the break-even point.
7. The area to the left of the break-even point between the total cost line and the sales line is the loss area; the profit area lies to the right of the break-even point above the total cost line.

The data from the previous example are presented on the break-even chart (see Fig. 16.3).

From Fig. 16.3 it can be observed that the break-even point occurs when sales are 10,000 units at Rs 2,00,000.

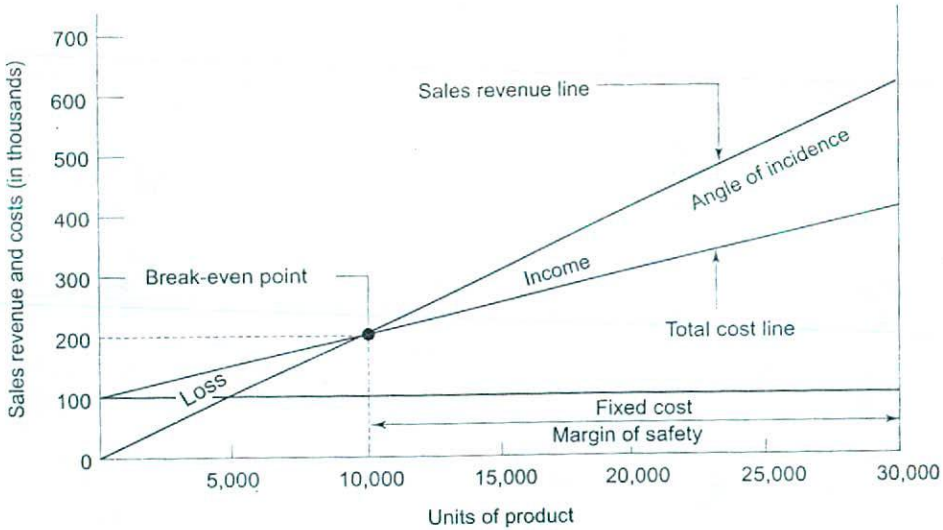



**Fig. 16.3** Break-even Chart

## Cash Break-Even Point

If a firm has a minimum of available cash or the opportunity cost of holding excess cash is high, management may want to know the volume of sales that will cover all cash expenses, during a period. This is known as the cash break-even point.

Not all fixed operating costs involve cash payments. For example, depreciation expense is a non-cash charge. To find the cash break even point, the non-cash charges must be subtracted from total fixed operating costs. Therefore, the cash break-even point is lower than the usual break-even point. The formula is:

$$\text{BEP} = \frac{\text{FC} - \text{d}}{\text{P} - \text{V}}$$

where P = selling price per unit
V = unit variable cost
FC = Fixed operating costs
d = depreciation expenses

Thus, cash break even point indicates break even sales to cover only the fixed costs involving cash payments and to break even.

This is illustrated below:

Let Sales 20,000 units at Rs 10 per unit
Variable costs, Rs 4 per unit
Fixed cost Rs 5000 including depreciation, Rs 10,000
Preference divided to be paid Rs 20,000
Taxed to be paid Rs 25,000
Assume that there are no lags in payment.

Break-even point (in units) will be 6667 units as displayed in Figure 16.4 below.

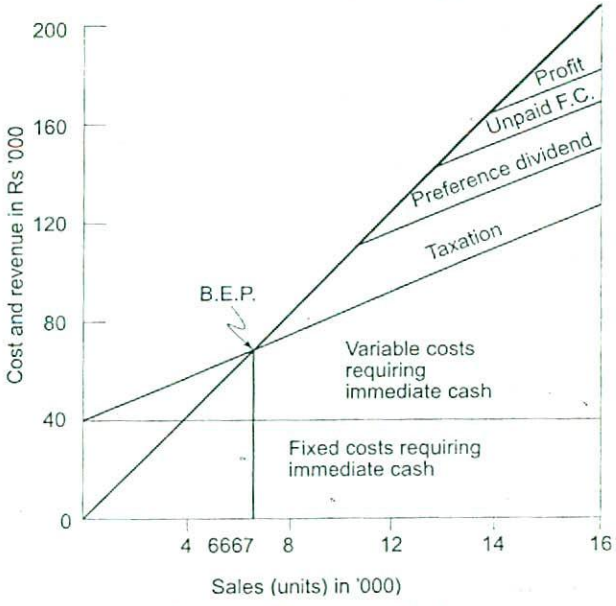



**Fig 16.4** Break-even Chart

### *Margin of Safety*

This is the difference between sales and the break-even point. If the distance is relatively short, it indicates that a small drop in production or sales will reduce profits considerably. If the distance is long, it means that the business can still make profits even after a serious drop in production. It is important that there should be a reasonable margin of safety, otherwise a reduced level of production may prove dangerous. The margin of safety can be found by using the following formula:

$$\text{Margin of safety} = \text{Profit} \div \text{P/V ratio}$$

or $$\text{Margin of safety} = \frac{\text{Profit} \times \text{Sales}}{\text{Sales} - \text{Variable cost}}.$$

### *Angle of Incidence*

This is the angle at which the sales line cuts the total cost line. Management's aim will be to have as large an angle of incidence as possible because a large angle of incidence shows a high rate of profit. A narrow angle would show that even fixed overheads are absorbed and profit accrues at a relatively low rate of return, indicating that variable costs form a large part of cost of sales.

### *Sales Formula*

Often, it is necessary to know what level of sales is required to achieve a desired level of profit. The desired sales can be expressed in various ways:

$$\text{Sales} = \text{Fixed cost} + \text{Variable cost} + \text{Profit}$$

or

$$\text{Sales} = (\text{Profit} + \text{Fixed cost})/\text{P/V ratio}$$

### *Basic Assumptions in Break-even Analysis*

Break-even analysis is based on several assumptions, listed as follows:

1. Selling prices and pricing policy will remain constant at all sales levels. If this is not ture, sales revenue cannot be plotted as a straight line.
2. All costs and expenses can be separated into fixed and variable components.
3. The total of the fixed costs is constant at all sales levels; the unit variable costs remain the same. If this is not true, straight lines cannot be drawn.
4. Production and sales quantities are equal.
5. Managerial policies, technological methods, and efficiency of men and machines will not change and cost control will neither be strengthened nor weakened.
6. Volume is assumed to be the only important factor affecting cost behaviour. Other influencing factors such as unit prices, sales-mix, labour strikes, and production methodology remain constant.
7. In case of multiple products being manufactured by the enterprise, the sales-mix should remain unchanged. That is, the calculation of the break-even point in the case of multiple products predetermines the number of units to be sold in respect of each product. This multiproduct sales-mix should remain unchanged.

## Profit/Volume (P/V) Analysis

A P/V graph is sometimes used in place of or along with a break-even chart. Profits and losses are given on a vertical scale; and units of products, sales revenue or percentage of activity are given on a horizontal line. The horizontal line is drawn on the graph to separate profits from losses. The profits and losses at various sales levels are plotted and connected by the profit line. The break-even point is measured at the point where the profit line intersects the horizontal line. The P/V graph may be preferred to the break-even chart because profit and losses at any point can be read directly from the vertical scale; but the P/V graph does not clearly show how costs vary with activity.

Data used earlier to prepare the break-even chart are also used in preparing the P/V graph (see Fig. 16.5).

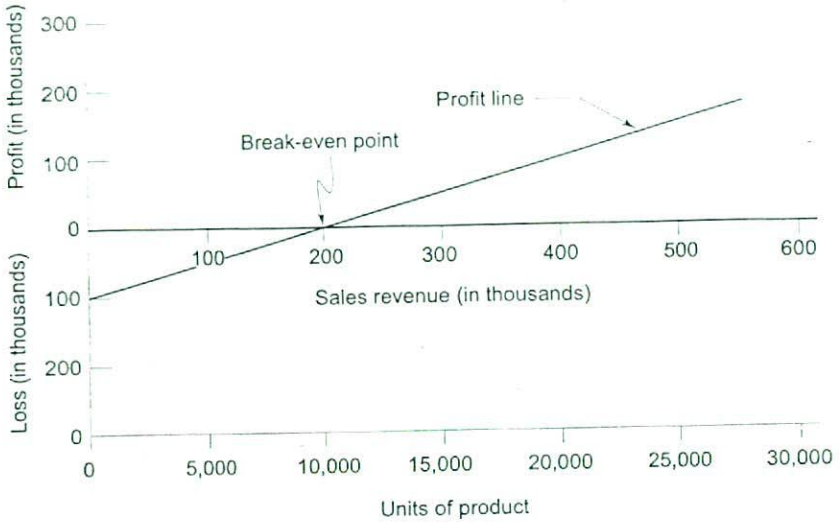



**Fig. 16.5** Profit Volume (P/V) Graph

### *Role of CVP Analysis*

A cost-volume profit analysis can be used to measure the effect of factor changes and management decision alternatives on profits. These factors include possible changes in selling prices, changes in variable or fixed cost, expansion or contraction of sales volume, or other changes in operating methods or policies. Cost-volume profit analysis is also useful for problems of product pricing, sales-mix, adding or deleting product lines, and accepting special orders.

### *Changes in Selling Prices*

The CVP graph is frequently used to illustrate the potential profit effects of contemplated price changes. Effects on the profit pattern are as follows:

1. *Increase in selling price* If the selling price is increased, it increases the P/V ratio, and the rate of fixed costs recovery is increased. The break-even point (break-even volume) declines, profit beyond the break-even point increases, losses below the break-even point decreases.
2. *Decrease in selling price* If the selling price decreases, it decreases the P/V ratio and the rate of fixed cost recovery declines. The break-even point increases.

Assume, for example, that a company produces a product with a selling price of Rs 10 per unit and a variable cost of Rs 4 per unit. Fixed costs are Rs 36,000 per year. The effect of a 20% increase and 20% decrease in the present selling price is given below:

| | *Selling price* | | |
|---|---|---|---|
| | *Present* | *20% Increase* | *20% Decrease* |
| Selling price per unit | Rs 10.00 | Rs 12.00 | Rs 8.00 |
| Variable cost per unit | 4.00 | 4.00 | 4.00 |
| Marginal contribution per unit | 6.00 | 8.00 | 4.00 |

| | | | |
|---|---|---|---|
| P/V ratio | 60% | $66\frac{2}{3}\%$ | 50% |
| Fixed costs | 36,000 | 36,000 | 36,000 |
| Break-even point in units | 6,000 | 4,500 | 9,000 |
| In volume | 60,000 | 54,000 | 72,000 |
| Changes in break-even point | – | – | – |
| In units | 0% | – 25% | + 50% |
| In sales volume | 0% | – 10% | + 20% |

### Changes in Variable Costs

The CVP graph is used to evaluate the impact of increases and decreases in variable costs per unit.

1. *Increase in variable costs* An increase in variable costs has the same effect as a decrease in the selling price. It decreases the P/V ratio and the rate of fixed cost recovery is slower. The break-even point moves to higher level; profits after the break even point decreases; losses before the break even point increases.
2. *Decrease in variable costs* A decrease in variable costs has the same effect as an increase in the selling price. A higher P/V ratio is achieved and the rate of fixed costs recovery is increased. The break-even point declines, profits beyond the break-even point are higher; losses before the break-even point are lower.

To illustrate the effect of change in variable costs, assume a company is selling a product for Rs 40 a unit and has a variable cost of Rs 20 per unit. Fixed costs total Rs 48,000 per year. The effects of a 20% increase and a 20% decrease in variable cost are given in the following table:

| | *Present variable cost (Rs)* | *20% Increase (Rs)* | *20% Decrease (Rs)* |
|---|---|---|---|
| Unit selling price | 40.00 | 40.00 | 40.00 |
| Variable cost per unit | 20.00 | 24.00 | 16.00 |
| Marginal contribution | 20 | 16.00 | 24.00 |
| P/V ratio | 50% | 40% | 60% |
| Fixed costs | 48,000 | 48,000 | 48,000 |
| Break-even point: | | | |
| Sales volume | 96,000 | 1,20,000 | 80,000 |
| Units | 2,400 | 3,000 | 2,000 |

### Changes in Fixed Cost

Increases and decreases in the fixed cost do not have any impact on the P/V ratio but they change the break-even point. With the same P/V ratio, the rate of the fixed costs recovery remains the same.

1. *Increase in fixed costs* If fixed costs are increased, the break-even point (break-even-volume) is higher. Profits above the break-even point are lower by the amount of the increase in fixed costs; below the break-even point losses increase by the amount of increase.
2. *Decrease in fixed costs* If fixed costs are decreased, it lowers the break-even point. The profits are greater by the amount of the decrease, and losses are smaller by the amount of the decrease in fixed costs.

Assume that a company has a P/V ratio of 40% and present fixed costs of Rs 50,000. The effects of change in the fixed costs by Rs 10,000 are as follows:

| | *Present fixed cost* | *Increase by* Rs 10,000 | *Decrease by* Rs 10,000 |
|---|---|---|---|
| Fixed costs | Rs 50,000 | Rs 60,000 | Rs 40,000 |
| P/V ratio | 40% | 40% | 40% |
| Break-even point | 1,25,000 | 1,50,000 | 1,00,000 |
| Decrease | 0 | +25,000 | – 25,000 |

From the above example, it is clear that the P/V ratio is the same in each situation and break-even point can be determined by dividing the amount of the change by the P/V ratio:

$$\frac{\text{Change in fixed costs}}{\text{P/V ratio}}$$

$$= \frac{\text{Rs } 10{,}000}{40\ \%} = \text{Rs } 25{,}000$$

### *Desired or Target Profit*

Sometimes, management faces two decisions: (i) to increase sales volume through reduction in selling prices, and (ii) to increase selling prices in case the P/V ratio is low, with the expectation that a higher profit will be earned. These decisions should be taken carefully after studying the profit pattern and other factors, otherwise the results can be harmful particularly for those companies whose P/V ratios are already low. Also, if reduction in selling prices does not increase the sales volume, the price reduction will result only in lower profits.

The increase in sales volume required to overcome the effect of a price reduction is relatively greater when the rate of the contribution margin per unit is relatively greater as compared to when the rate of the contribution margin per unit is relatively low. If a product makes only a small contribution, then a reduction in selling price makes it all the more difficult to recover the fixed costs and to earn profits.

Similarly, a business firm may think of increasing the selling price if the P/V ratio is low. However, increase in selling price may reduce the sales volume.

### *Multi-product Situations*

When there are multiple products with different contribution margins, the mix of the product has a direct effect on the fixed costs recovery and total profits of the firm. Different products have different P/V ratios because of different selling prices and variable costs. The total profits depend to some extent upon the proportions in which the products are sold.

For example, assume that a company with fixed costs of Rs 25,000 per year manufactures two products A and B with P/V ratios as follows:

| | *Product A* | *Product B* |
|---|---|---|
| Unit selling price | Rs 10 | Rs 20 |
| Variable costs | 4 | 16 |
| Marginal contribution | 6 | 4 |
| P/V ratio | 60% | 20% |

With comparatively low variable costs, product A has a relatively high P/V ratio; each unit of product A sold contributes Rs 6 to fixed costs recovery and profit. Product B, with comparatively high variable costs, has a low P/V ratio; each unit sold contributes only Rs 4 to fixed costs recovery and profit. Other things being equal, the sale of product A is more profitable than that of product B, despite the fact that the selling price of product B is twice that of product A. It is correct to say that profits will decline as the sales mix shifts from product A to product B. This also implies, however, that new analyses of profit volume relationship must be made as the product-mix changes.

## LIMITATIONS OF CVP ANALYSIS

CVP analysis is a useful planning and control device, usually in the form of a chart, showing how revenue, costs, and profit fluctuate with volume. The CPV technique is useful to management in areas of budgeting, cost control and decision making. In spite of CVP being a useful technique, it suffers from some limitations. Firstly, because of the many assumptions, CVP is only an approximation at best. If prices, unit costs, sales-mix, operating efficiency, or other relevant factors change, then the overall CVP analysis and relationships also must be modified. Because of these assumptions, cost data are of limited significance.

In a multi-product situation, different products typically yield different contribution margins and are produced in various volumes with differing costs. As a result neither the revenue curve nor the cost curve is necessarily straight and the break-even point is difficult to find.

Therefore, while preparing or interpreting cost-volume profit analysis, all assumptions and limitations should be carefully considered. A series of CVP analysis based on different sets of assumptions and circumstances may be prepared to reflect situations prevailing in different business enterprises. When circumstances change, CVP analysis should also be revised to reflect the changing situations. It is also necessary to have up-to-date analysis so that it can act as a useful device in profit forecast, budgeting, cost control and managerial decision-making.

### *Example 16.2*

Prepare Income Statements under Absorption costing and under Marginal costing from the following information relating to the year 1997–98:

Opening Stock = 1,000 units valued at Rs 70,000 including variable cost of Rs 50 per unit.
Fixed Cost = Rs 1,20,000
Variable Cost = Rs 60 per unit
Production = 10,000 units
Sales = 7,000 units @ Rs 100 per unit.
Stock is valued on the basis of FIFO. *(B. Com. Hons Delhi 1998)*

*Solution*

**Income Statement**
**(Absorption Costing)**

| | | (Rs) | (Rs) |
|---|---|---|---|
| | Sales | | 7,00,000 |
| *Less:* | Cost of goods sold: | | |
| | Opening stock (1,000 units × Rs 70) | 70,000 | |

| | | | |
|---|---|---|---|
| | Variable cost (10,000 units × Rs 60) | 6,00,000 | |
| | Fixed cost | 1,20,000 | |
| | | 7,90,000 | |
| *Less*: | Closing stock (4000 units) 4,000 units × Rs 72 = | 2,88,000 | 502000 |
| | | Net Income | 1,98,000 |

Income statement (Marginal Costing)

| | | Rs | (Rs) |
|---|---|---|---|
| | Sales | | 7,00,000 |
| *Less*: | Cost of goods sold: | | |
| | Opening stock (1,000 units × Rs 50) | 50,000 | |
| | Variable cost (10,000 units × Rs 60) | 6,00,000 | |
| | | 6,50,000 | |
| *Less*: | Closing stock (4000 units × Rs 60) | 2,40,000 | 4,10,000 |
| | Contribution margin | | 2,90,000 |
| *Less*: | Fixed Cost | | 1,20,000 |
| | Net Income | | 1,70,000 |

Difference in Net Income = Rs 198000 – 1,70,000
= Rs 28,000

This difference in net income is due to difference in inventony values:

| | *Absorption Costing (Rs)* | *Marginal Costing (Rs)* |
|---|---|---|
| Opening stock | Rs 70,000 | Rs 50,000 |
| Closing stock | Rs 2,88,000 | 2,40,000 |
| Difference | 2,18,000 | 1,90,000 |

Net difference = 2,18,000 – 1,90,000
= Rs 28,000

*Note:* 1. It has been assumed that fixed cost is fixed production cost.
2. It has been assumed that variable cost (Rs 60 per unit) is variable production cost.

### *Example 16.3*

Your company has a production capacity of 12,500 units and normal capacity utilisation is 80%. Opening inventory of finished goods on 1-1-1999 was 1,000 units. During the year ending 31-12-1999, it produced 11,000 units while it sold only 10,000 units.

Standard variable cost per unit is Rs 6.50 and standard fixed factory cost per unit Rs 1.50. Total fixed selling and administration overhead amounted to Rs 10,000. The company sells its product at Rs 10 per unit.

Prepare Income Statements under Absorption Costing and Marginal Costing. Explain the reasons for difference in profit, if any.

*(B. Com. Hons Delhi, 2000)*

*Solution*

**Income Statement for the year ended 31st Dec., 1999 (Under Absorption Costing Method)**

| | | Rs | Rs |
|---|---|---|---|
| *Sales:* | 10,000 Units @ Rs 10 per unit | | 1,00,000 |
| *Less:* | Marginal Cost: | | |
| | Variable Production Costs: | | |
| | 11,000 units @ Rs 6.50 per unit | 71,500 | |
| | Fixed factory cost @ Rs 1.50 per unit | | |
| | 11000 × 1.50 = | 16,500 | |
| | | 88,000 | |
| *Add:* | Opening stock: 1000 units @ Rs 8 per unit (i.e. Rs 6.50 + Rs 1.50) | 8,000 | |
| | Costs at goods available for sales | 96,000 | |
| *Less:* | Closing stock: 2000 units valued at current cost. | | |
| | $\frac{96,000 \times 2,000}{12,000}$ | 16,000 | 80,000 |
| | | Gross Profit | 20,000 |
| *Less:* | Fixed selling and administrative overhead. | | 10,000 |
| | Net Profit | | 10,000 |

**Income Statement for the year ended 31st December, 1999 (Under Marginal Costing Method)**

| | | Rs | Rs |
|---|---|---|---|
| *Sales:* | 10,000 Units @ Rs 10 per unit | | 1,00,000 |
| *Less:* | Marginal Cost: | | |
| | Variable production cost: | | |
| | 11,000 units @ Rs 6.50 per unit | 71,500 | |
| | Variable cost of opening stock of finished stock (1000 units @ Rs 6.50 per unit) | 6,500 | |
| | Cost of goods available for sales | 78,000 | |
| *Less:* | Closing stock of finished stock: 2000 units @ Rs. 6.50 per unit | 13,000 | |
| | | 65,000 | 65,000 |
| | Contribution | | 35,000 |
| *Less:* | Fixed selling and administrative overhead | 10,000 | |
| | Fixed factory cost @ Rs 1.50 per unit | 16,500 | 26,500 |
| | Net Profit | | 8,500 |

**Reason for difference** The difference in profits, Rs 1,500 (i.e. Rs 10,000 – Rs 8,500), as arrived at under absorption and marginal costing methods is due to the element of fixed cost included in the valuation of opening and closing stock under the absorption costing method.

### *Example 16.4*

'LMN' limited sells its product at Rs 3 per unit. The company uses a First-in, First-out actual costing system. A new fixed manufacturing overhead allocation rate is computed each year by dividing the actual fixed manufacturing overhead cost by the actual production costs. The following simplified data are related to its first two years of operation:

| | *Year I* | *Year II* |
|---|---|---|
| *Unit Data* | | |
| Sales | 1,000 | 1,200 |
| Production | 1,400 | 1,000 |
| *Cost* | Rs | Rs |
| Variable manufacturing | 700 | 500 |
| Fixed manufacturing | 700 | 700 |
| Variable marketing and administration | 1,000 | 1,200 |
| Fixed marketing and administration | 400 | 400 |

*Required:*

(i) Prepare income statements based on:
  (a) absorption costing and (b) variable costing for each year.

(ii) Give reasons for the differences in the answer.

*(B. Com. Hons, Delhi, 2001)*

*Solution*

**(i) Income Statement (Absorption Costing)**

| | *Year I* (Rs) | *Year II* (Rs) |
|---|---|---|
| Sales | 3000 | 3600 |
| *Less:* Cost of goods sold: | | |
| Opening stock | Nil | 400 |
| Variable manufacturing | 700 | 500 |
| Fixed manufacturing | 700 | 700 |
| Cost of goods available for sales | 1,400 | 1,600 |
| *Less:* Closing inventory $\frac{400}{1,400} \times$ Rs 1,400 | 400 | 240* |
| Cost of goods sold | 1,000 | 1,360 |
| Gross Profit | 2000 | 2240 |
| *Less:* Variable marketing & Administration | (1,000) | (1,200) |
| Fixed marketing and Administration | (400) | (400) |
| Net Income | 600 | 640 |

*Note:* In year II, FIFO method of inventory valuation is used. That is, closing inventory of 200 units belong to current production lot. Therefore, value of 200 units will be

$$\frac{200}{1000} \times \text{Rs } 1200 = \text{Rs } 240$$

**Income Statement**
**(Marginal Costing)**

| | | *Year I* | *Year II* |
|---|---|---|---|
| | Sales | 3000 | 3600 |
| *Less:* | Cost of goods sold: | | |
| | Opening stock | Nil | 200 |
| | Variable manufacturing | 700 | 500 |
| | Cost of goods available for sales | 700 | 700 |
| *Less:* | Closing stock @ Re 0.50 (400 units, 200 units) | 200 | 100 |
| | Cost of goods sold | 500 | 600 |
| | Contribution margin | 2500 | 3000 |
| *Less:* | Fixed manufacturing | (700) | (700) |
| | Variable marketing & Administration | (1000) | (1200) |
| | Fixed marketing & Administration | (400) | (400) |
| | Net Income | 400 | 700 |

(ii) The difference in profit figures between absorption costing and variable costing is due to the factory cost attached to inventory. Difference in Net Income is due to difference in inventory values. This is explained as below:

| | Year I (Rs) | Year II (Rs) |
|---|---|---|
| Absorption costing net income | 600 | 640 |
| Marginal costing net income | 400 | 700 |
| | 200 | 140 |
| Absorption costing inventory: Opening | Nil | 400 |
| Closing | 400 | 240 |
| Difference | 400 | 240 |
| Marginal costing inventory: Opening | Nil | 200 |
| Closing | 200 | 100 |
| Difference | 200 | 100 |
| Net difference | 200 | 140 |

***Example 16.5***

Hind General Corporation produces only one product which had the following costs.

| | |
|---|---|
| Variable manufacturing costs | Rs 4 per unit |
| Fixed Manufacturing costs | Rs 2,00,000 per year |

The normal capacity is set at 2,00,000 units. There are no work-in-progress inventories.

In 2001, the company produced 2,00,000 units and sold 90 per cent of them at a price of Rs 7 per unit. In 2002, the company produced 2,10,000 units and sold 2,15,000 units at the same price.

You are required to prepare income statements for 2001 and 2002 based on absorption costing and marginal costing.

*Solution:*

**Hind General Corporation**
**Income Statement (Marginal costing basis)**

| *Particulars* | *2001* | *2002* |
|---|---|---|
| | Rs | Rs |
| Sales at Rs 7 | 12,60,000 | 15,05,000 |
| Inventory-opening at Rs 4 | Nil | 80,000 |
| Variable manufacturing costs at Rs 4 | 8,00,000 | 8,40,000 |
| Standard variable cost of goods | 8,00,000 | 9,20,000 |
| Inventory-closing at Rs 4 | 80,000 | 60,000 |
| Standard variable cost of sales | 7,20,000 | 8,60,000 |
| Contribution margin | 5,40,000 | 6,45,000 |
| Fixed manufacturing costs | 2,00,000 | 2,00,000 |
| Net Income | 3,40,000 | 4,45,000 |

**Income Statement**
**(Absorption Costing Basis)**

| *Particulars* | *2001* | *2002* |
|---|---|---|
| | Rs | Rs |
| Sales at Rs 7 | 12,60,000 | 15,05,000 |
| Inventory opening at Rs 5 | Nil | 1,00,000 |
| Variable manufacturing costs at Rs 4 | 8,00,000 | 8,40,000 |
| Fixed manufacturing costs at Re 1 | 2,00,000 | 2,10,000 |
| Total goods at standard cost | 10,00,000 | 11,50,000 |
| Inventory closing at Rs 5 | 1,00,000 | 75,000 |
| Standard cost of sales | 9,00,000 | 10,75,000 |
| Under (over) absorbed fixed costs | Nil | (10,000) |
| Actual cost of sales | 9,00,000 | 10,65,000 |
| Net Income | 3,60,000 | 4,40,000 |

***Example 16.6***

The following cost information relates to factory X for two years.

| | *2001* | *2002* |
|---|---|---|
| Installed capacity (units) | 10,000 | 10,000 |
| Opening stock (units) | Nil | 1,000 |

*(Contd.)*

| | | |
|---|---|---|
| Closing stock (units) | 1,000 | Nil |
| Output (units) | 10,000 | 9,000 |
| Selling price per unit | 14 | 14 |
| Fixed costs for the year | 85,000 | 85,000 |
| Variable cost per unit | 2.90 | 2.90 |

Work out the profit under absorption costing and marginal costing for the two years. Also state any abnormality in the results disclosed by absorption costing. Assume FIFO basis.

*Solution*

**Income Statement**
**(Absorption Costing)**

| | | *2001 (Rs)* | *2002 (Rs)* |
|---|---|---|---|
| Sales | | 1,26,000 | 1,40,000 |
| *Less:* | Cost of goods sold: | | |
| | Opening stock | Nil | 11,400 |
| | Variable production cost | 29,000 | 26,100 |
| | Fixed cost | 85,000 | 85,000 |
| | Costs of goods available for sales | 1,14,000 | 1,22,500 |
| *Less:* | Closing stock | 11,400 | Nil |
| | Cost of goods sold | 1,02,600 | 1,22,500 |
| | Net profit | 23,400 | 17,500 |
| | Net profit as percentage of sales | 18.6% | 12.5% |

*Note:* It has been assumed that variable cost and fixed cost are production cost.

**Income Statement**
**(Marginal Costing)**

| | | *2001 (Rs)* | *2002 (Rs)* |
|---|---|---|---|
| Sales | | 1,26,000 | 1,40,000 |
| *Less:* | Cost of goods sold: | | |
| | Opening stock | Nil | 2,900 |
| | Variable production cost | 29,000 | 26,100 |
| | Cost of goods available for sales | 29,000 | 29,000 |
| *Less:* | Closing stock | 2,900 | Nil |
| | Cost of goods sold | 26,100 | 29,000 |
| | Contribution margin | 99,900 | 1,11,000 |
| *Less:* | Fixed Cost | 85,000 | 85,000 |
| | | 14,900 | 26,000 |
| Net profit as percentage of sales | | 11.8% | 18.6% |

### *Example 16.7*

Using the information below prepare profit statements for the months of June and July using (i) marginal costing (ii) full absorption costing. Also, explain why the two methods disclose different amounts of profit for June and July.

| *Data per unit:* | Rs |
|---|---|
| Selling price | 50 |
| Direct material cost | 18 |
| Direct labour cost | 4 |
| Variable production overheads | 3 |
| *Monthly costs:* | |
| Fixed production overheads | 99000 |
| Fixed selling expenses | 15000 |
| Fixed administration expenses | 25000 |

Variable selling costs are 10% of sales revenue and normal production capacity is 11,000 units per month.

| | *Sales (units)* | *Production (units)* |
|---|---|---|
| June | 10000 | 12000 |
| July | 12000 | 10000 |

*Solution*

**Profit Statement—Marginal Costing**

| | June | July |
|---|---|---|
| Sales units | 10000 | 12000 |
| Production units | 12000 | 10000 |
| Sales at Rs 50 | 5,00,000 | 6,00,000 |
| *Less:* Cost of goods sold: | | |
| Variable production costs at Rs 25 | 3,00,000 | 2,50,0009 |
| *Add:* Opening stock | — | 50,000 |
| Cost of goods available for sales | 3,00,000 | 3,00,000 |
| *Less:* Closing stock | 50,000 | — |
| Cost of goods sold | 2,50,000 | 3,00,000 |
| Contribution | 250000 | 300000 |
| *Less:* Fixed costs: | | |
| Production overheads | (99000) | (99000) |
| Selling expenses | (15000) | (15000) |
| Variable selling expenses | (50000) | (60000) |
| Administration expenses | (25000) | (25000) |
| Net profit | 61000 | 101000 |

**Working Note:**

| *Variable production costs:* | |
|---|---|
| Direct material cost | 18 |
| Direct wages | 4 |
| Variable production overheads | 3 |
| | Rs 25 |

**Profit Statement—Absorption Costing**

| | June | July |
|---|---|---|
| Sales units | 10000 | 12000 |
| Production units | 12000 | 10000 |
| Sales at Rs 50 | 500000 | 600000 |
| *Less:* Cost of goods sold: | | |
| Production costs absorbed at Rs 34 | 40800 | 340000 |
| *Add:* Opening stock | – | 68000 |
| Cost of goods available for sales | 408000 | 408000 |
| *Less:* Closing stock | 68000 | – |
| Cost of goods sold | 340000 | 408000 |
| (over) under-absorbed fixed Production overheads at Rs 9 | (9000) | 9000 |
| Adjusted cost of goods sold | 331000 | 417000 |
| Gross profit | 169000 | 183000 |
| *Less:* Variable selling expenses | (50000) | (60000) |
| Fixed selling expenses | (15000) | (15000) |
| Fixed administration expenses | (25000) | (25000) |
| Net profit | Rs 79000 | Rs 83000 |

**Working Note:**

| *Production costs:* | Rs | |
|---|---|---|
| Direct material cost | 18 | |
| Direct wages | 4 | |
| Variable production overheads | 3 | |
| Fixed production overheads | 9 | (Rs 99000 ÷ 11000 units) |
| | Rs 34 | |

Taken together, the two costing techniques disclose the same total profit for the two months.

In June marginal costing discloses Rs 18000 less profit than full absorption costing. This difference is caused by 2000 units being in stock. Under absorption costing the fixed production overheads absorbed by these units cost Rs 18000 (2000 × Rs 9), and this amount is carried forward in the cost of stock rather than being written off against profit in June as with the marginal costing.

In July, sales exceed production by 2000 units, and the Rs 18000 of fixed production overheads is charged against revenue, as the stocks created in June have been sold.

***Example 16.8***

ABC Motors assembles and sells motor vehicles. It uses an actual costing system, in which unit costs are calculated on a monthly basis. Data relating to March and April, 2000 are:

| | *March* | *April* |
|---|---|---|
| *Unit data:* | | |
| Beginning Inventory | 0 | 150 |
| Production | 500 | 400 |
| Sales | 350 | 520 |
| Variable-cost data: | | |
| Manufacturing Costs per unit produced | Rs 10,000 | Rs 10,000 |
| Distribution costs per unit sold | 3,000 | 3,000 |
| Fixed-cost data: | | |
| Manufacturing Costs | Rs 20,00,000 | Rs 20,00,000 |
| Marketing Costs | 6,00,000 | 6,00,000 |

The selling price per motor vehicle is Rs 24,000

*Required:*

(i) Present income statements for ABC Motors in March and April of 2000 under ($\alpha$) variable costing, and ($\beta$) absorption costing.

(ii) Explain the differences between ($\alpha$) and ($\beta$) for March and April.

*(C.A. Inter, May 2000)*

*Solution*

**(i) Income Statement (Variable Costing)**

| | | *March (Rs)* | *April (Rs)* |
|---|---|---|---|
| Sales | | 84,00,000 | 1,24,80,000 |
| *Less:* | Variable cost of goods sold: | | |
| | Opening stock | Nil | 15,00,000 |
| | Variable manufacturing cost | 50,00,000 | 40,00,000 |
| | Cost of goods available for sales | 50,00,000 | 55,00,000 |
| | *Less:* Closing stock | 15,00,000 | 3,00,000 |
| | Cost of goods sold | 35,00,000 | 52,00,000 |
| | Contribution Margin | 49,00,000 | 72,80,000 |
| *Less:* | Other costs: | | |
| | Fixed manufacturing | (20,00,000) | (20,00,000) |
| | Fixed marketing | (6,00,000) | (6,00,000) |
| | Variable distribution | (10,50,000) | (15,60,000) |
| | Net Income | 12,50,000 | 31,20,000 |

**Income Statement**
**(Absorption Costing)**

| | | March (Rs) | April (Rs) |
|---|---|---|---|
| Sales | | 84,00,000 | 1,24,80,000 |
| *Less:* | Cost of goods sold: | | |
| | Opening stock | Nil | 21,00,000 |
| | Variable manufacturing cost | 50,00,000 | 40,00,000 |
| | Fixed manufacturing cost | 20,00,000 | 20,00,000 |
| | Cost of goods available for sales | 70,00,000 | 81,00,000 |
| *Less:* | Closing stock | 21,00,000 | 4,50,000 |
| | Cost of goods sold | 49,00,000 | 76,50,000 |
| | Gross profit | 35,00,000 | 48,30,000 |
| *Less:* | Distribution Cost | (10,50,000) | (15,60,000) |
| | Fixed marketing | (6,00,000) | (6,00,000) |
| | Net Income | 18,50,000 | (26,70,000 |

*Note:* The company follows actual costing system and calculates unit costs on monthly basis. Therefore, for April month, inventory of 30 units has been valued as follows:

| | | |
|---|---|---|
| Variable manufacturing cost 30 × Rs 10,000 | = | 30,00,000 |
| Fixed manufacturing cost @ Rs 5000 × 30 (Rs 20,00,000 ÷ Current Production 400 units) | = | 15,00,000 |
| That is, inventory at Rs 15,000 per unit | = | 45,00,000 |

For March month, inventory of 150 units has been calculated as follows

| | | |
|---|---|---|
| Variable manufacturing Rs 10,000 × 150 | = | Rs 15,00,000 |
| Fixed manufacturing Rs 4000 × 150 | = | Rs 6,00,000 |
| That is, inventory at Rs 14,000 per unit | = | Rs 21,00,000 |

**(ii) Difference in Profit**

| | March | April |
|---|---|---|
| Absorption Costing profit | Rs 18,50,000 | Rs 26,70,000 |
| Variable costing profit | ↑ 12,50,000 | ↓ 31,20,000 |
| | 6,00,000 | 4,50,000 |

Difference in profit is due to difference in inventory values in the two costing techniques.

| | *March (Rs)* | *April (Rs)* |
|---|---|---|
| Absorption costing: | | |
| Opening stock | Nil | 21,00,000 |
| Closing stock | 21,00,000 | 4,50,000 |
| Difference | 21,00,000 | 16,50,000 |
| Variable costing: | | |
| Opening stock | Nil | 15,00,000 |

| | | |
|---|---|---|
| Closing stock | 15,00,000 | 3,00,000 |
| Difference | 15,00,000 | 12,00,000 |
| Net difference (effect) | 6,00,000 | 4,50,000 |

***Example 16.9***

The ratio of variable cost to sales is 70%. The break-even point occurs at 60% of the capacity sales. Find the capacity sales when fixed costs are Rs 90,000. Also compute profit at 75% of the capacity sales.

*(CA Inter Nov. 1997)*

*Solution*

Basic Calculations

$$\frac{\text{Variable Cost}}{\text{Sales}} = 70\%$$

Hence $\frac{\text{Contribution}}{\text{Sales}} = 30\%$ or P/V Ratio = 30%

**Computation of Capacity Sales**

Break-even Point $= \frac{\text{Fixed cost}}{\text{P/V ratio}} = \frac{\text{Rs } 90{,}000}{30\%} = \text{Rs } 3{,}00{,}000$ (i)

Break-even Point (as given) = 60% of capacity sales

Hence Capacity Sales $= \frac{\text{Rs } 3{,}00{,}000}{60\%} = \text{Rs } 5{,}00{,}000$

**Computation of Profit at 75% of the Capacity Sales**

| | Rs |
|---|---|
| 75% of Capacity sales (75% × Rs 5,00,000) | 3,75,000 |
| *Less:* Variable Cost (70% × Rs 3,75,000) | 2,62,500 |
| Contribution | 1,12,500 |
| *Less:* Fixed Cost | 90,000 |
| Profit | 22,500 |

***Example 16.10***

Profit/Volume Ratio of a company is 50%, while its margin of safety is 40%. If sales volume of the company is Rs 50 lakhs, find out its break-even point and net profit.

*(B.Com. Hons Delhi 1999)*

*Solution*

$$\text{Margin of safety} = \frac{\text{Excess Sales over Break-even Sales}}{\text{Actual Sales}}$$

$$40\% = \frac{x}{50 \text{ lakhs}}$$

or $x = 20$ lakhs

Hence (i) Break-even Sales = 50 lakhs – 20 lakhs = 30 lakhs
Variable Cost of Break-even Sales = Rs 15 lakhs.
Hence Fixed Costs = Rs 15 lakhs.
(ii) Net Profit = Contribution – Fixed Cost
= 50 lakhs × 50/100 – 15 lakhs
= 25 lakhs – 15 lakhs = Rs 10 lakhs.

### *Example 16.11*

X Ltd. has earned contribution of Rs 2,00,000 and net profit of Rs 1,50,000 on sales Rs 8,00,000. What is its margin of safety?

*(C.A. Inter May 1997)*

*Solution*

$$\text{P/V Ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100$$

$$= \frac{\text{Rs } 2,00,000}{\text{Rs } 8,00,000} \times 100 = 25\%$$

$$\text{Margin of Safety} = \frac{\text{Profit}}{\text{PV ratio}} = \frac{\text{Rs } 1,50,000}{25\%}$$

$$= \text{Rs } 6,00,000$$

### *Example 16.12*

If margin of safety is Rs 2,40,000 (40% of sales) and P/V ratio is 30% of AB Ltd. Calculate its (1) Break-even Sales and (2) Amount of profit on sales of Rs 9,00,000.

*(CA Inter May 1997)*

*Solution*

Basic Calculation

(i) Margin of Safety or Profit $= \frac{\text{Profit}}{\text{P/V Ratio}}$

= Margin of Safety × P/V Ratio
= Rs 2,40,000 × 30% = Rs 72,000

(ii) Total Sales $= \frac{\text{Margin of Safety}}{40\%}$

$= \frac{\text{Rs } 2,40,000}{40\%} = \text{Rs } 6,00,000$

(iii) Contribution = Sales × P/V Ratio
= Rs 6,00,000 × 30% = Rs 1,80,000

(iv) Fixed Cost = Contribution – Profit
= Rs 1,80,000 – Rs 72,000
= Rs 1,08,000

*Computation of Break-even Sales*

$$= \frac{\text{Fixed Cost}}{\text{P/V Ratio}} = \frac{\text{Rs } 1{,}08{,}000}{30\%} = \text{Rs } 3{,}60{,}000$$

Computation of Profit on Sales of Rs 9,00,000

= Sales × P/V Ratio – Fixed Cost

= Rs 9,00,000 × 30% – Rs 1,08,000

= Rs 2,70,000 – Rs 1,08,000 = Rs 1,62,000

***Example 16.13***

| | | |
|---|---|---|
| (i) | Ascertain profit, when sales | = Rs 2,00,000 |
| | Fixed Cost | = Rs 40,000 |
| | BEP | = Rs 1,60,000 |
| (ii) | Ascertain sales, when fixed cost | = Rs 20,000 |
| | Profit | = Rs 10,000 |
| | BEP | = Rs 40,000 |

*(CA Inter May 1999)*

*Solution*

(i) P/V ratio $= \frac{\text{Fixed Cost} \times 100}{\text{B. E. P.}} = \frac{\text{Rs } 40{,}000 \times 100}{\text{Rs } 1{,}60{,}000} = 25\%$

Contribution = Sales × P/V Ratio = F.C. + Profit

= Rs 2,00,000 × 25% = Rs 50,000 = Rs 40,000 + Profit

or Rs 50,000 = Rs 40,000 + Profit

or Profit = Rs 10,000

(ii) Contribution = F.C. + Profit = Rs 20,000 + Rs 10,000

= Rs 30,000

P/V ratio $= \frac{\text{Rs } 20{,}000}{\text{Rs } 40{,}000} \times 100 = 50\%$

Also, P/V ratio $= \frac{\text{Contribution}}{\text{Sales}} \times 100$

or Sales $= \frac{\text{C}}{\text{P/V ratio}} \times 100 = \frac{\text{Rs } 30{,}000}{50\%} = \text{Rs } 60{,}000$

***Example 16.14***

The profit volume ratio of X Ltd. is 50% and the margin of safety is 40%. You are required to calculate the net profit if the sales volume is Rs 1,00,000.

*(CA Inter Nov. 1998)*

*Solution*

Margin of Safety $= \frac{\text{Excess Sales Over Break-even Sales}}{\text{Actual Sales}}$

40/100 = X/1,00,000
or 100X = 40,00,000
or $X$ = Rs 40,000
Break-even Sales = Rs 1,00,000 – Rs 40,000 = Rs 60,000
Profit Volume Ratio = 50%
Variable Cost = 50%
Hence, Variable Cost is Rs 60,000 – 60,000 × 50/100 = Rs 30,000
Fixed Cost = Rs 60,000 – Rs 30,000 = Rs 30,000
Contribution on Sales of Rs 1,00,000 = Rs 50,000
*Less:* Fixed Cost = Rs 30,000
Profit = Rs 20,000

### *Example 16.15*

A company sells its product at Rs 15 per unit. In a period, if it produces and sells 8,000 units, it incurs a loss of Rs 5 per unit. If the volume is raised to 20,000 units, it earns a profit of Rs 4 per unit.

Calculate break-even point in terms of rupees as well as in units.

*(B. Com. Hons, Delhi 2001, CA Inter Nov 1996)*

*Solution*

I. Sales = 8000 Units × Rs 15 per Unit = Rs 1,20,000
Loss = 8000 Units × Rs 5 per Unit = Rs 40,000
II. Sales = 20,000 Units × Rs 15 per Unit = Rs 3,00,000
Profit = 20,000 Unit × Rs 4 per Unit = Rs 80,000

| | *Sales* | *Profit/Loss* |
|---|---|---|
| I. | 1,20,000 | (–) 40,000 |
| II. | 3,00,000 | (+) 80,000 |

$$\text{P/V Ratio} = \frac{\text{Change in Profit}}{\text{Change in Sales}}$$

$$= \frac{1,20,000}{1,80,000} = \frac{2}{3} \text{ or } 66\frac{2}{3}\%$$

Sales at Break even point (in Rs)

Fixed Cost = S × PV Ratio – Profit

(On the basis raised volume II)

$$\text{Fixed Cost} = \text{Rs } 3,00,000 \times \frac{2}{3} - 80,000$$

Fixed Cost = Rs 2,00,000 – Rs 80,000 = Rs 1,20,000

$$\text{B. E. P.} = \frac{F}{\text{P/V Ratio}} = \frac{1,20,000 \times 3}{2} = \text{Rs } 1,80,000$$

$$\text{Sales at Break-even point (in units)} = \frac{\text{Sales in Rs}}{\text{Selling price per unit}}$$

$$= \frac{\text{Rs } 1,80,000}{15} = 12,000$$

*Note:* (1) Re 5 per unit loss is given is the question, in the indirect way it is a variable cost per unit.
(2) Change in Profit is computed by adding loss of Rs 40,000 in the profit of Rs 80,000 because loss of Rs 40,000 has also been covered in the second period of time or in the second option if the volume is raised to 20,000 units.

***Example 16.16***

A company has earned a contribution of Rs 2,00,000 and net profit of Rs 8,00,000. What is the margin of safety?

*(B.Com. Hons, Delhi 2000)*

*Solution*

Given

$$\text{Contribution} = \text{Rs } 2,00,000$$
$$\text{Net Profit} = \text{Rs } 1,50,000$$
$$\text{Sales} = \text{Rs } 8,00,000$$

$$\text{P/V ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100$$
$$= \frac{2,00,000}{8,00,000} \times 100 = 25\%$$

$$\text{Margin of safety} = \frac{\text{Profit}}{\text{P/V Ration}} = \frac{1,50,000}{25} \times 100$$
$$= \text{Rs } 6,00,000$$
$$\text{Margin of safety} = \text{Rs } 6,00,000$$

Or

We know

$$S - V = F + P$$

or $$S - V = C$$

$\therefore$ $$C = F + P$$

Putting the values $$= 2,00,000 = F + 1,50,000$$

or $$F = 2,00,000 - 1,50,000$$
$$= \text{Rs } 50,000$$

$$\text{Break-even point} = \frac{\text{Fixed cost}}{\text{P/V Ratio}}$$

$$= \frac{\text{Rs } 50,000}{25} \times 100 = \text{Rs } 2,00,000$$

$$\text{Margin of safety} = \text{Actual sales} - \text{Break-even sales} = \text{Rs } 8,00,000 - \text{Rs } 2,00,000$$
$$= \text{Rs } 6,00,000$$

### Example 16.17

B & Co. has recorded the following data in the two most recent periods:

| *Total Cost of Production (Rs)* | *Volume of Production (units)* |
|---|---|
| 14,600 | 800 |
| 19,400 | 1,200 |

What is the best estimate of the firm's fixed costs per period?

*(CA Inter Nov 1995)*

*Solution*

| | *Period 1* | *Period 2* | *Difference* |
|---|---|---|---|
| Total Cost of Production (Rs) | 14,600 | 19,400 | 4,800 |
| Volume of Production (Units) | 800 | 1,200 | 400 |

$$\text{Variable Cost per unit} = \frac{\text{Difference in Total Cost of Production}}{\text{Defference in Volume of Production}}$$

$$= \frac{\text{Rs } 4,800}{400 \text{ units}} = \text{Rs } 12$$

Fixed Cost = Total Cost of Production of a period – Total Variable Cost

= Rs 14,600 – 800 units × Rs 12

= Rs 14,600 – Rs 9,600 = Rs 5,000

### Example 16.18

A Ltd. maintains a margin of safety of 37.5% with an overall contribution to sales ratio of 40%. Its fixed costs amount to Rs 5 lakhs. Calculate the following:

(i) Break-even Sales;
(ii) Total Sales;
(iii) Total Variable Costs;
(iv) Current Profit;
(v) New "Margin of Safety" if the sales volume is increased by $7\frac{1}{2}\%$.

*(I.C.W.A. Inter Dec. 1998)*

*Solution*

(i) $\text{Break-even Sales} = \frac{\text{Fixed Cost}}{\text{P/V Ratio}}$

$$= \frac{5 \text{ lakhs}}{40\%} = \text{Rs } 12.50 \text{ lakhs}$$

(ii) Total Sales = Break-even Sales + Margin of Safety

Margin of Safety = Actual sales – Break-even Sales

Let Actual Sales be Rs 100

Margin of Safety is Rs 37.5

Hence, Break-even Sales will be Rs 62.5

In case Break-even Sales are 62.5; Actual Sales are Rs 100

Hence, if Break-even Sales are Rs 12.5 lakhs

Actual sales will be $= \frac{100}{62.5} \times 12.5$

= Rs 20 lakhs

(iii) Contribution = Sales – Variable Costs

Hence, Total Variable Costs = 60% of Rs 20 lakhs

= Rs 12 lakhs

(iv) Current Profit = Sales – (Variable Costs + Fixed Costs)

= Rs 20 lakhs – (Rs 12 lakhs + Rs 5 lakhs)

= Rs 20 lakhs – Rs 17 lakhs

= Rs 3 lakhs

(v) New Margin of Safety if sales volume is increased by 7.5%

New Sales Value = Rs 20 lakhs + 7.5% of 20 lakhs = Rs 21.50 lakhs

Hence, New Margin of Safety = 21.50 lakhs – B.E. Sales of Rs 12.50 lakhs = Rs 9 lakhs.

***Example 16.19***

A company has annual fixed costs of Rs 14,00,000. In 1996 sales amounted to Rs 60,00,000 as compared with Rs 45,00,000 in 1995 and profit in 1996 was Rs 4,20,000 higher than in 1995.

(i) At what level of sales does the company break-even?

(ii) Determine profit or loss on a forecast sales volume of Rs 80,00,000.

(iii) If there is a reduction in selling price in 1997 by 10% and the company desires to earn the same profit as in 1996, what would be the required sales volume?

*(B.Com. Hons Delhi 1997)*

*Solution*

$$\text{PV Ratio} = \frac{\text{Increase in Profit}}{\text{Increase in Sales}} \times 100$$

$$= \frac{4,20,000}{15,00,000} \times 100 = 28\%$$

(i) Break-even Sales $= \frac{\text{Fixed Cost}}{PV \text{ Ratio}}$

$$= \frac{14,00,000}{28\%}$$

= Rs 50,00,000

(ii) Profit on sales of Rs 80,00,000

| | |
|---|---|
| Total Contribution 80,00,000 × 28/100 | = 22,40,000 |
| *Less:* Fixed Cost | 14,00,000 |
| Profit | 8,40,000 |

(iii) If Present Selling Price is — Rs 100
Variable Cost is (100 – 28) — Rs 72
New Selling Price (100 – 10) — Rs 90
New Contribution — Rs 18

New PV Ratio — $\frac{18}{90} \times 100 =$ 20%

Profit in 1996:

| | |
|---|---|
| Contribution 60,00,000 × 28/100 = | 16,80,000 |
| *Less:* Fixed Cost | 14,00,000 |
| Profit | 2,80,000 |

$$\text{Sales for Desired Profit of Rs 2,80,000} = \frac{\text{Fixed Cost + Desired Profit}}{\text{New } PV \text{ Ratio}}$$

$$= \frac{14,00,000 + 2,80000}{20\%}$$

$$= \frac{16,80000}{20\%} = \text{Rs } 84,00,000$$

### *Example 16.20*

A Company manufactures radios, which are sold at Rs 1,600 per unit. The total cost is composed of 30% for direct materials, 40% for direct wages and 30% for overheads. An increase in material price by 30% and in wage rates by 10% is expected in the forthcoming year, as a result of which the profit at current selling price may decrease by 40% of the present profit per unit. You are required to prepare a statement showing current and future profit at present Selling Price.

How much Selling Price should be increased to maintain the present rate of profit?

*(CA Inter May 2001)*

*Solution*

Let $X$ be the cost, $Y$ be the profit and Rs 1,600 selling price per unit of radio manufactured by a company. Hence

$$X + Y = \text{Rs } 1,600 \qquad \text{(i)}$$

**Statement of present and future cost of a radio**

| *Particulars* | *Present cost (Rs)* | *Increase in cost (Rs)* | *Anticipated future cost (Rs)* |
|---|---|---|---|
| | *(a)* | *(b)* | *(c) = (a) + (b)* |
| Direct material | 0.3 X | 0.09 X | 0.39 X |
| Direct labour | 0.4 X | 0.04 X | 0.44 X |
| Overheads | 0.3 X | – | 0.30 X |
| Total | X | 0.13 X | 1.13 X |

An increase in material price and wage rates resulted into a decrease in current profit by 40 percent at present selling price; therefore we have:

$$1.13\ X + 0.6\ Y = 1,600 \qquad \text{(ii)}$$

On solving (i) and (ii) we get:

$X$ = Rs 1,207.55

$Y$ = Rs 392.45

Current profit Rs 392.45 or 32.5% of cost

Future profit Rs 235.47

**Statement of revised selling price to maintain the present rate of profit**

| | Rs |
|---|---|
| Direct material cost<br>0.39 × Rs 1,207.55 | 470.94 |
| Direct labour cost<br>(0.44 × Rs 1207.55) | 531.32 |
| Overheads<br>0.30 × Rs 1,207.55 | 362.27 |
| Total cost | 1,364.53 |
| Profit<br>(32.5% of total cost) | 443.47 |
| Revised selling price | 1,808.00 |

***Example 16.21***

XYZ Ltd. furnishes you the following income information:

| *Particulars* | *Year 1994* | |
|---|---|---|
| | *First-half (Rs)* | *Second-half (Rs)* |
| Sales | 8,10,000 | 10,26,000 |
| Profit earned | 21,600 | 64,800 |

From the above, you are required to compute the following assuming that the fixed cost remains the same in both the periods:

(i) P/V Ratio
(ii) Fixed Costs
(iii) The amount of profit or loss where sales are Rs 6,48,000.
(iv) The amount of sales required to earn a profit of Rs 1,08,000.

*(B. Com. Hons Delhi 1996)*

*Solution*

(i) *Computation of PV Ratio*

$$\text{(i) PV Ratio} = \frac{\text{Change in Profit}}{\text{Change in Sales}} \times 100$$

$$= \frac{43,200}{2,16,000} \times 100 = 20\%$$

(ii) *Computation of Fixed Cost*

Fixed Cost = Contribution – Profit

(For 1st half) = 8,10,000 × 20% – 21,600

= 1,62,000 – 21,600

= Rs 1,40,400

(iii) Contribution = 20% × Rs 6,48,000 = Rs 12,9,600
Loss = Rs 1,29,600 – 1,40,400 = Rs 10,800

(iv) *Computation of sales to earn a profit of Rs 1,08,000.*

$$\frac{\text{Fixed Cost + Desired Profit}}{PV \text{ Ratio}}$$

$$= \frac{1,40,400 + \text{Rs } 108,000}{20\%} = \text{Rs } 12,42,000$$

### *Example 16.22*

The following costs and sales of a manufacturing company for the first half and second half of 1998-99 are given:

| | *First-half* Rs | *Second-half* Rs |
|---|---|---|
| Sales | 24,00,000 | 30,00,000 |
| Total Costs | 21,80,000 | 26,00,000 |

You are asked to determine:

(i) Contribution/Sales Ratio of the firm.
(ii) Annual Fixed Costs.
(iii) Break-even Point.
(iv) Margin of Safety as Percentage of Sales:

*(I.C.W.A. Inter June 1999)*

*Solution*

**(a) Computation of Contributions/Sales Ratio**

| *Particulars* | *First Half Rs* | *Second Half Rs* | *Change Rs* |
|---|---|---|---|
| Sales | 24,00,000 | 30,00,000 | 6,00,000 |
| Total Cost | 21,80,000 | 26,00,000 | 4,20,000 |
| Profit | 2,20,000 | 4,00,000 | 1,80,000 |

$$\text{Contribution/Sales Ratio} = \frac{\text{Change in Profit}}{\text{Change in Sales}}$$

$$= \frac{1,80,000}{6,00,000}$$

$$= 0.3 \text{ or } 30\%$$

(b) *Computation of Fixed Cost for 1998-99*

| | |
|---|---|
| Total Sales for the year | = Rs 54,00,000 |
| Total Costs | = Rs 47,80,000 |
| PV Ratio is | = 30% |
| Total Variable Costs | = 70% of Rs 54,00,000 |
| | = Rs 37,80,000 |
| Fixed Costs | = Total Costs – Variable Costs |
| | = Rs 47,80,000 – Rs 37,80,000 |
| | = Rs 10,00,000 |

(c) *Break-even Point*

$$= \frac{\text{Fixed Costs}}{PV \text{ Ratio}}$$

$$= \frac{\text{Rs } 10,00,000}{30\%}$$

$$= \text{Rs } 33,33,333$$

(d) *Margin of Safety as a percentage of Sales*

| | |
|---|---|
| Margin of Safety (MS) | = Sales – Break-even Sales |
| | = Rs 54,00,000 – Rs 33,33,333 |
| | = Rs 20,66,667 |
| Margin of Sofety as % of Sales | $= \frac{20,66,667}{54,00,000} \times 100 = 38.3\%$ |

### *Example 16.23*

Raj Ltd. manufactures three products X, Y and Z. The unit selling prices of these products are Rs 100. Rs 160 and Rs 75 respectively. The corresponding unit variable costs are Rs 50, Rs 80 and Rs 30. The proportions (quantity-wise) in which these products are manufactured and sold are 20%, 30% and 50% respectively. The total fixed costs are Rs 14,80,000.

Calculate overall break-even quantity and the product-wise break up of such quantity.

*(C.A. Inter May 1999)*

*Solution*

**Overall Break-Even Quantity**

| *Products* | *X* | *Y* | *Z* |
|---|---|---|---|
| Selling Price per unit (Rs) | 100 | 160 | 75 |
| Less: Variable Cost per unit (Rs) | 50 | 80 | 30 |
| Contribution per unit (Rs) | 50 | 80 | 45 |
| Share in Total Sales | 20% | 30% | 50% |
| Proportionate Contribution per unit | 10 | 24 | 22.50 |

Composite Contribution per unit = 56.5

$$\text{Composite Break-even Point} = \frac{\text{Total Fixed Cost}}{\text{Composite Contribution per unit}}$$

$$= \frac{\text{Rs } 14,80,000}{\text{Rs } 56.5} = 26,195 \text{ units.}$$

Product-wise break-up of overall break-even quantity:
Product X: 26,195 units × 20/100 = 5,239 units
Product Y: 26,195 units × 30/100 = 7,858 units
Product Z: 26,195 units × 50/100 = 13,098 units

***Example 16.24***

A single product company sells its products at Rs 60 per unit. In 1996, the company operated at a margin of safety of 40%. The fixed costs amounted to Rs 3,60,000 and the variable cost ratio to sales was 80%.

In 1997, it is estimated that the variable cost will go up by 10% and the fixed costs will increase by 5%.

Find the selling price required to be fixed in 1997 to earn the same P/V ratio as in 1996.

Assuming the same selling price of Rs 60 per unit in 1997, find the number of units required to be produced and sold to earn the same profit as in 1996.

*(CA Inter May 1998)*

*Solution*

*Basic Calculations*

1. P/V Ratio in 1996

$$\text{P/V Ratio} = \frac{\text{Selling Price per unit} - \text{Variable Cost per unit}}{\text{Selling Price per unit}} \times 100$$

$$= \frac{\text{Rs } 60 - \text{Rs } 48}{\text{Rs } 60} \times 100 = \frac{\text{Rs } 12}{\text{Rs } 60} \times 100 = 20\%$$

2. *Number of units sold (in 1996)*

$$\text{Break-even Point} = \frac{\text{Fixed cost}}{\text{Contribution per unit}} = \frac{\text{Rs } 3,60,000}{\text{Rs } 12} = 30,000 \text{ units}$$

The margin of safety is 40%. Hence break-even point is at 60% of units sold.

$$\text{or} \quad \text{No. of units sold} = \frac{\text{Break-even point}}{60\%} = \frac{30,000 \text{ units}}{60} \times 100 = 50,000 \text{ units}$$

3. Profit earned in 1996

Profit = Units sold in 1996 × Contribution per unit – Fixed costs
= 50,000 units × Rs 12 – Rs 3,60,000
= Rs 6,00,000 – Rs 3,60,000 = Rs 2,40,000

*Fixation of Selling Price in 1997*

Variable Cost per unit in 1997 = Rs 48 + Rs 4.80 = Rs 52.80

Fixed cost in 1997 = Rs 3,60,000 + Rs 18,000 = Rs 3,78,000

P/V Ratio in 1996 = 20%

Since P/V ratio is 20%, Hence, Variable cost is 80%

$$\text{Hence, the required selling price} = \frac{\text{Rs } 52.80}{80\%} = \text{Rs } 66$$

*Number of units to be produced and sold in 1997 to earn the same profit as in 1996*

Profit in 1996 = Rs 2,40,000

Fixed cost in 1997 = Rs 3,78,000

Desired contribution in 1997 (Rs 2,40,000 + Rs 3,78,000) = Rs 6,18,000

Contribution per unit in 1997 = Selling price per unit – Variable cost per unit
= Rs 60 – Rs 52.80 = Rs 7.20

$$\text{Number of units to be produced and sold in 1997} = \frac{\text{Fixed cost in 1997}}{\text{Contribution per unit in 1997}}$$

$$= \frac{\text{Rs } 6,18,000}{\text{Rs } 7.20} = 85,833 \text{ units.}$$

***Example 16.25***

A company producing a single product sells it at Rs 50 per unit. Unit variable cost is Rs 35 and fixed cost amounts to Rs 12 lakhs per annum. With this data you are required to calculate the following, treating each independent of the other:

(a) P/V Ratio and Break-even Sales
(b) New Break-even Sales if variable cost increases by Rs 3 per unit, without increase in selling price.
(c) Increase in sales required if profits are to be increased by Rs 24 lakhs.
(d) Percentage increase/decrease in sales volume units to off-set
  (i) an increase of Rs 3 in the variable cost per unit.
  (ii) a 10% increase in selling price without affecting existing profits quantum.
(e) Quantum of advertisement expenditure permissible to increase sales by Rs 1.2 lakhs, without affecting existing profits quantum.

*(CA Inter June 1995)*

*Solution*

$$\text{(a) PV Ratio} = \frac{\text{Contribution per unit}}{\text{Selling Price per unit}}$$

$$= \frac{50 - 35}{50} = 30\%$$

Break Even Sales $= \dfrac{\text{Fixed Cost}}{\text{P. V. Ratio}}$

$$= \frac{12.00}{30\%} = \text{Rs } 40 \text{ lakhs}$$

(b) Revised PV Ratio $= \dfrac{\text{Existing Contribution per unit}}{\text{Selling price per unit}}$

$$= \frac{15 - 3}{50} = \frac{12}{50} = 24\%$$

Revised Break Even Sales $= \dfrac{12}{24\%} = \text{Rs } 50 \text{ lakhs}$

(c) Increase in Sales Required $= \dfrac{\text{Increase in Contribution}}{\text{PV Ratio}}$

$$= \frac{24}{30\%} = \text{Rs } 8 \text{ lakhs}$$

(d) (i) Percentage in Sales Volume (units) $= \dfrac{\text{Reduction in Contribution}}{\text{New Contribution per unit}}$

$$= \frac{3}{12} \times 100$$

$$= 25\%$$

(ii) Percentage Decrease in Sales Volume (units)

$$= \frac{\text{Increase in Contribution per unit}}{\text{New Contribution per unit}}$$

$$= \frac{5\ (i.e. 10\% \text{ of Rs } 50)}{20\ i.e.\ (55 - 35)}$$

$$= 25\%$$

(e) The contribution by sales arising out of advertisement expenses should be equal to amount of Rs 1.2 lakhs the sale increase to avoid profit or loss. Hence, 30% of 1.2 lakhs or Rs 36,000 should be the maximum permissible advertisement expenditure for being incurred to get an increase of sale of Rs 1.2 lakhs without affecting existing profits.

***Example 16.26***

A company has three factories situated in North, East and South with its Head Office in Mumbai. The Management has received the following summary report on the operations of each factory for a period:

| Particulars | Sales | | (Rs in 1000) Profit | |
|---|---|---|---|---|
| | Actual | Over/(Under) Budget | Actual | Over/(Under) Budget |
| North | 1,100 | (400) | 135 | (180) |
| East | 1,450 | 150 | 210 | 90 |
| South | 1,200 | (200) | 330 | (110) |

Calculate for each factory and for the company as a whole for the period:

(i) Fixed Costs.
(ii) Break-even Sales

*(CA Inter Nov. 1996)*

*Solution*

**Computation of Profit Volume Ratio**

| | Sales | | | Profit | | | P/V Ratio |
|---|---|---|---|---|---|---|---|
| | Actual | Over/ (Under) Budget | Budgeted Sales | Actual | Over/ (Under) Budget | Budgeted Profit | (Diff. between Profit) (Diff. between Sales) |
| North | 1,100 | (400) | 1,500 | 135 | (180) | 315 | 45% (180/400 × 100) |
| East | 1,450 | 150 | 1,300 | 210 | 90 | 120 | (60%) (90/150 × 100) |
| South | 1,200 | (200) | 1,400 | 330 | (110) | 440 | 55% (110/200 × 100) |

**(i) Computation of Fixed Costs**

(Rs '000)

| Particulars | Actual sales | P/V Ratio | Contribution | Actual Profit | Fixed Cost |
|---|---|---|---|---|---|
| | (1) | (2) | (3) = (1) × (2) | (4) | (5) = (3) – (4) |
| North | 1,100 | 45 | 495 | 135 | 360 |
| East | 1,450 | 60 | 870 | 210 | 660 |
| South | 1,200 | 55 | 660 | 330 | 330 |
| Total | 3,750 | 54 | 2,025 | 675 | 1,350 |

**(ii) Computation of Break-Even Sales**

(Rs '000)

| Particulars | Fixed Cost (a) | P/V Ratio (b) | Break-even Sales (a)/(b) |
|---|---|---|---|
| North | 360 | 45 | 800 |
| East | 660 | 60 | 1,100 |
| South | 330 | 55 | 600 |
| | | | 2,500 |

Break-even Sales (company as whole): $\frac{\text{Fixed Cost}}{\text{Composite P/V Ratio}} = \frac{1350}{54} = 2{,}500$ (in Rs '000).

### *Example 16.27*

A company wants to buy a new machine to replace one which is having frequent breakdown. It received offers for two models M1 and M2. Further details regarding these models are given below:

| | *M1* | *M2* |
|---|---|---|
| Installed capacity (units) | 10,000 | 10,000 |
| Fixed overhead per annum (Rs) | 2,40,000 | 1,00,000 |
| Estimated profit at the above capacity (Rs) | 1,60,000 | 1,00,000 |

The product manufactured using this type of machine (M1 or M2) is sold at Rs 100 per unit. You are required to determine:

(a) Break even level of sales for each model.
(b) The level of sales at which both the models will earn the same profit.
(c) The model suitable for different levels of demand for the product.

*(I.C.W.A. Inter Dec. 1997)*

*Solution*

(a) *Basic Calculations*

**Statement showing Comparative Parameters of two Machines**

| *Type of Machines* | *Model M1* | *Model M2* |
|---|---|---|
| 1. Installed Capacity (units) | 10,000 | 10,000 |
| 2. Fixed Overhead per annum (Rs) | 2,40,000 | 1,00,000 |
| 3. Selling Price of the Product (Rs) | 100 | 100 |
| 4. Estimated Profit at the above Capacity (Rs) | 1,60,000 | 1,00,000 |
| 5. Total Sales Value (Rs) | 10,00,000 | 10,00,000 |
| 6. Total Contribution (Rs) (2) + (4) | 4,00,000 | 2,00,000 |
| 7. Variable Cost | 6,00,000 | 8,00,000 |
| 8. Variable Cost per unit | Rs 60 | Rs 80 |
| 9. P/V Ratio = Contribution/Sales | 0.40 | 0.20 |

**Computation of Break-even Sales**

| | *Model M1* | *Model M2* |
|---|---|---|
| Break-even Sales | $\frac{\text{Fixed Cost}}{PV \text{ Ratio}}$ | $\frac{\text{Fixed Cost}}{PV \text{ Ratio}}$ |
| | $= \frac{\text{Rs } 2{,}40{,}000}{.40}$ | $\frac{\text{Rs } 1{,}00{,}000}{.20}$ |
| | = Rs 6,00,000 | Rs 5,00,000 |
| BEP in units | = 6,000 units | 5,000 units |

(b) *Sales at which both models will earn the same profit.*

Let the units sold be taken as $x$

Total Cost for Model 1 = $60x$ = 2,40,000

Total Cost for Model 2 = $80x$ = 1,00,000

On putting these figures in the form of a simultaneous equation:

$60x + 2{,}40{,}000 = 80x + 1{,}00{,}000$

or $20x = 1{,}40{,}000$

or $x = 7{,}000$ units

Thus, at 7,000 units of output, the total costs under both the machines will be the same and hence earn the same profit.

(c) *Model Suitable for different levels of Demand* In view of the above stated comparative parameters Model M2 is suitable for low demand since it has a lower Break Even Point and Lower Fixed Cost and makes higher profit between 5,000 units and 7,000 units than Model M1. In case the level of demand for the product exceeds 7,000 units, Model M1 is better since it makes higher profit.

This can be substantiated by profitability of two models of Machines at different levels (6,000 units and 8,000 units) as being depicted below:

| *Levels of Demand* | *6,000 units* | | *8,000 units* | |
|---|---|---|---|---|
| Types of Machines | *M1* | *M2* | *M1* | *M2* |
| Total Contribution (Rs) | 2,40,000 | 1,20,000 | 3,20,000 | 160,000 |
| *Less:* Fixed Cost (Rs) | 2,40,000 | 1,00,000 | 2,40,000 | 1,00,000 |
| Profit | – | 20,000 | 80,000 | 60,000 |

### *Example 16.28*

The variable cost structure of a product manufactured by a company during the current year is as under:

| | *Rs per unit* |
|---|---|
| Material | 120 |
| Labour | 30 |
| Overheads | 12 |

The selling price per unit is Rs 270 and the fixed cost and sales during the current year are Rs 14 lakhs and Rs 40.5 lakhs respectively.

During the forthcoming year, the direct workers will be entitled to a wage increase of 10% from the beginning of the year and the material cost, variable overhead and fixed overhead are expected to increase by 7.5%, 5% and 3% respectively.

The following are required to be computed:

(a) New sale price in the forthcoming year if the current P/V ratio is to be maintained.

(b) Number of units that would require to be sold during the forthcoming year so as to yield the same amount of profit in the current year, assuming that selling price per unit will not be increased.

*(I.C.W.A. Inter June 1997)*

*Solution*

**Current Year's Statement of Profitability**

*Units sold 15,000*

| *Particulars* | | *Rs* | *Total* |
|---|---|---|---|
| Selling Price per unit (Rs) | | 270 | |
| *Less:* Variable Cost per unit: | | | |
| Material | 120 | | |
| Labour | 30 | | |
| Overheads | 12 | | |
| | | 162 | |
| Contribution per unit | | 108 | |
| Total Contribution (15,000 units × Rs 108) | | | 16,20,000 |
| *Less:* Fixed Cost | | | 14,00,000 |
| Profit | | | 2,20,000 |
| P/V Ratio (108/270) | | | 40% |

**(a) Statement Showing New Selling Price for the Forthcoming Year (Retaining Current Year's P/V Ratio)**

| *Particulars* | | *Rs* |
|---|---|---|
| (1) Variable Cost per unit: | | |
| Material | 129.00 | |
| Labour | 33.00 | |
| Overhead | 12.60 | |
| | | 174.60 |
| (2) Selling Price (174.60 × 100/60) | | 291.00 |
| (3) Contribution (2) – (1) | | 116.40 |
| (4) P.V. Ratio | | 40% |

**(b) Computation of Number of Units to be Sold during Forthcoming Year (Maintaining the Current Year's Profit)**

| *Particulars* | *Rs* | *Rs* |
|---|---|---|
| (i) Current Year Profit | 2,20,000 | |
| (ii) Revised Fixed Cost | 14,42,000 | 16,62,000 |
| (iii) Required Contribution (Rs 270 – Rs 174.60) | | 95.40 |
| (iv) Number of Units to be sold (16,62,000/95.40) | | 17,422 units |

**Working Note:**

**Computation of Variable Cost per Unit**

| | *Current Year* | *Forthcoming Year* | |
|---|---|---|---|
| | *Rs* | *Increase %* | *Total (Rs)* |
| Material | 120.00 | 7.5 (120 × 1.075) | 129.00 |
| Labour | 30.00 | 10 (30 × 1.10) | 33.00 |
| Overhead | 12.00 | 5 (12 × 1.05) | 12.60 |
| | 162.00 | | 174.60 |
| Fixed Cost | Rs 14,00,000 | 3 (14,00,000 × 1.03) | 14,42,000 |

***Example 16.29***

The comparative profit statement of two quarters of a firm is as under:

| | *Quarter I* | *Quarter II* |
|---|---|---|
| Units sold | 2,500 | 3,750 |
| | Rs | Rs |
| Direct materials | 87,500 | ? |
| Direct wages | 62,500 | ? |
| Fixed and variable Factory overheads | 75,000 | 95,000 |
| Sales | 2,75,000 | ? |
| Profit | 50,000 | 66,250 |

In the second quarter, the direct material price has increased by 20%. There was a saving of Rs 5,000 in fixed overheads in the second quarter. The other costs and selling price remained the same. Determine the quantity that should have been sold in the second quarter to maintain the same amount of profit per unit as in the first quarter.

*(CA Inter, May 2000)*

*Solution*

**Working Notes:**

1. *Direct material, Direct wages, Selling price and Profit per unit*

$$\text{Direct material (p.u)} = \frac{\text{Rs } 87,500}{2,500 \text{ units}} = \text{Rs } 35/-$$

$$\text{Direct wages (p.u)} = \frac{\text{Rs } 62,500}{2,500 \text{ units}} = \text{Rs } 25/-$$

$$\text{Selling price (p.u)} = \frac{\text{Rs } 2,75,000}{2,500 \text{ units}} = \text{Rs } 110/-$$

$$\text{Profit (p.u)} = \frac{\text{Rs } 50,000}{2,500 \text{ units}} = \text{Rs } 20/-$$

2. *Variable factory overhead per unit and Fixed factory overheads for II Quarter*

$$\text{Variable factory overhead (p.u)} = \frac{\text{Changes in semi-variable overheads}}{\text{Changes in production volume}}$$

$$= \frac{\text{Rs } 1{,}00{,}000^{**} - \text{Rs } 75{,}000}{3{,}750 \text{ units} - 2{,}500 \text{ units}}$$

$$= \frac{\text{Rs } 25{,}000}{1{,}250 \text{ units}} = \text{Rs } 20/-$$

** In fact the fixed and variable factory overheads during the quarter (II) were Rs 1,00,000 but due to saving of Rs 5,000 the balance amount of Rs 95,000 was paid.

*Fixed factory overheads for II Quarter*

| | Rs |
|---|---|
| Total factory overheads of II quarter | 1,00,000 |
| *Less:* Variable factory overheads (3,750 units × Rs 20) | 75,000 |
| Total fixed factory overheads for II quarter | 25,000 |
| *Less:* Saving of fixed factory overheads | 5,000 |
| Net fixed factory overheads for II quarter | 20,000 |

**Statement of quantity of units to be sold in second quarter to maintain same amount of profit per unit as in the first Quarter**

| | *Rs* | *Rs* |
|---|---|---|
| Selling price per unit: (A) *(Refer to working note 1)* | | 110 |
| Variable costs: (per unit): | | |
| Direct materials $\left(\text{Rs } 35 \times \frac{120}{100}\right)$ | 42 | |
| Direct wages | 25 | |
| Variable factory overheads *(Refer to working note 2)* | 20 | |
| Total variable cost: (B) | | 87 |
| Contribution per unit: {(A – D)} | | 23 |
| *Less:* Profit per unit *(Refer to working note 1)* | | 20 |
| Balance for fixed cost per unit | | 3 |
| Total fixed cost | | 20,000 |

Hence the number of units to be sold in the second quarter to maintain the same amount of profit p.u. as in the first quarter $= \frac{\text{Total fixed cost}}{\text{Balance for fixed cost p.u.}}$.

$$= \frac{\text{Rs } 20{,}000}{\text{Rs } 3 \text{ per unit}} = 6{,}667 \text{ units (approx.)}$$

*Example 16.30*

A Company manufactures a product, currently utilising 80% capacity with a turnover of Rs 8,00,000 at Rs 25 per unit. The cost data are as under:

Material cost Rs 7.50 per unit, Labour cost Rs 6.25 per unit.

Semi-variable cost (Including variable cost of Rs 3.75 per unit) Rs 1,80,000.

Fixed cost Rs 90,000 upto 80% level of output, beyond this an additional Rs 20,000 will be incurred.

*Calculate:*

(i) Activity level at Break-Even-Point
(ii) Number of units to be sold to earn a net income of 8% of sales
(iii) Activity level needed to earn a profit of Rs 95,000
(iv) What should be the selling price per unit, if break-even-point is to be brought down to 40% activity level?

*(C.A. Inter Nov. 2000)*

*Solution*

**Working Notes:**

1. (i) *Number of units sold at 80% capacity*

$$= \frac{\text{Turnover}}{\text{Selling price p.u}} = \frac{\text{Rs } 80{,}000}{\text{Rs } 25} = \text{Rs } 32{,}000 \text{ units}$$

(ii) *Number of units sold at 100% capacity*

$$= \frac{32{,}000 \text{ units}}{80} \times 100 = 40{,}000 \text{ units}$$

2. *Component of fixed cost included in semi-variable cost of 32,000 units*

Fixed cost = {Total semi-variable cost – Total variable cost}
= Rs 1,80,000 – 32,000 units × Rs 3.75
= Rs 1,80,000 – Rs 1,20,000
= Rs 60,000

3. (i) *Total fixed cost beyond 80% capacity*

= Fixed cost + Component of fixed cost included in semi-variable cost *(Refer to working note 2)*
= Rs 90,000 + Rs 60,000 = Rs 1,50,000

(ii) *Total fixed cost beyond 80% capacity*

= Total fixed cost at 80% capacity + Additional fixed cost to be incurred
= Rs 1,50,000 + Rs 20,000 = Rs 1,70,000

4. *Variable cost and contribution per unit*

Variable cost per unit = Material cost + Labour cost + Variable cost component in semi-variable cost
= Rs 7.50 + Rs 6.25 + Rs 3.75 = Rs 17.50

Contribution per unit = Selling price per unit – Variable cost per unit
= Rs 25 – Rs 17.50 = Rs 7.50

5. *Profit at 80% capacity level*

= Sales revenue – Variable cost – Fixed cost

= Rs 8,00,000 – Rs 5,60,000 (32,000 units × Rs 17.50) – Rs 1,50,000 = Rs 90,000

(i) *Activity level at Break – Even-Point*

$$\text{Break-even point (units)} = \frac{\text{Fixed cost}}{\text{Contribution per unit}} = \frac{\text{Rs } 1,50,000}{\text{Rs } 7.50} = 20,000 \text{ units}$$

*(Refer to working notes 3 & 4)*

$$\text{Activity level at Break-Even-Point} = \frac{\text{Break-Even point (units)}}{\text{No. of units at 100\% capcity level}} \times 100$$

*(Refer to working note 1(ii))*

$$= \frac{20,000 \text{ units}}{40,000 \text{ units}} \times 100 = 50\%$$

(ii) *Number of units to be sold to earn a net income of 8% of sales*

Let $x$ be the number of units sold to earn a net income of 8% of sales.

*Mathematically, it means that:*

(Sales revenue of $x$ units) = Variable cost of $x$ units + Fixed cost + Net income

$$\text{or Rs } 25x = \text{Rs } 17.5x + \text{Rs } 1,50,000 + \frac{8}{100} \times (\text{Rs } 25x)$$

$$\text{or Rs } 25x = \text{Rs } 17.5x + \text{Rs } 1,50,000 + \text{Rs } 2x$$

$$\text{or } x = (\text{Rs } 1,50,000/ \text{ Rs } 5.5) \text{ units}$$

$$\text{or } x = 27,273 \text{ units.}$$

(iii) *Activity level needed to earn a profit of Rs 95,000*

The profit at 80% capacity level, is Rs 90,000 which is less than the desired profit of Rs 95,000, therefore the needed activity level would be more than 80%. Thus the fixed cost to be taken to determine the activity level needed should be Rs 1,70,000 *(Refer to Working note 3(ii))*

$$\text{Units to be sold to earn a profit of Rs } 95,000 = \frac{\text{Fixed cost + Desired profit}}{\text{Contribution per unit}}$$

$$\therefore = \frac{\text{Rs } 1,70,000 + \text{Rs } 95,000}{\text{Rs } 7.5}$$

$$= 35,333.33 \text{ units}$$

$$\text{Activity level needed to earn a profit of Rs } 95,000 = \frac{35,333.33}{40,000 \text{ units}} \times 100$$

$$= 88.33\%$$

(iv) *Selling price per unit, if break-even-point is to be brought down to 40% (16,000 units) activity level*

Let $x$ be the selling price per unit

Units at Break-even-point = 16,000 units

| | |
|---|---|
| Break-even-point | $= \frac{\text{Fixed cost}}{\text{Contribution per unit}}$ |
| At 16,000 units | $= \frac{\text{Rs } 1,50,000}{(x - \text{Rs } 17.50)}$ |
| or $(x - \text{Rs } 17.50)$ | $= \frac{\text{Rs } 1,50,000}{16,000 \text{ units}}$ |
| or $(x - \text{Rs } 17.50)$ | $= \frac{\text{Rs } 75}{8 \text{ units}}$ |
| or $8x - 8 \times \text{Rs } 17.50$ | = Rs 75 |
| or $8x - \text{Rs } 140$ | = Rs 75 |
| or $8x$ | = Rs 215 |
| or $x$ | = Rs 26.875 |
| Hence, S.P. (per unit) | = Rs 26.875 |

***Example 16.31***

Fill in the blanks for each of the following independent situations:

| | *A* | *B* | *C* | *D* | *E* |
|---|---|---|---|---|---|
| Selling Price per unit | ... | Rs 50 | Rs 20 | ... | Rs 30 |
| Variable Cost as % of Selling Price | 60 | .. | 75 | 75 | ... |
| No. of units sold | 10,000 | 4,000 | ... | 6,000 | 5,000 |
| Marginal contribution | Rs 20,000 | Rs 80,000 | ... | Rs 25,000 | Rs 50,000 |
| Fixed Costs | Rs 12,000 | | Rs 1,20,000 | Rs 10,000 | ... |
| Profit/Loss | – | Rs 20,000 | Rs 30,000 | ... | Rs 15,000 |

*(CA Inter May 2001)*

*Solution*

| *Independent situation* | *Blank space to be filled* | *Figure of blank* |
|---|---|---|
| A | Profit/(Loss) | Rs 8,000 |
| | *[Refer to working note 1(i)]* | |
| | Selling price per unit | Rs 5 |
| | *[Refer to working note 1(ii)]* | |
| B | Fixed costs | Rs 60,000 |
| | *[Refer to working note 2(i)]* | |
| | Variable cost as % of selling price | 60% |
| | *[Refer to working note 2(ii)]* | |
| C | No. of units sold | 30,000 units |
| | *[Refer to working 3(ii)]* | |
| | Marginal contribution | Rs 1,50,000 |

*(Contd.)*

| *Independent situation* | *Blank space to be filled* | *Figure of blank* |
|---|---|---|
| D | *[Refer to working note 3(i)]* Selling price per unit | Rs 16.66 |
| | *[Refer to working note 4(ii)]* Profit/(Loss) | Rs 15,000 |
| E | *[Refer to working note 4(i)]* Variable cost as % of selling price | 66.66% |
| | *[Refer to working note 5(ii)]* Fixed costs | Rs 35,000 |
| | *[Refer to working note 5(i)]* | |

**Working Notes:**

1. (i) Profit/(Loss) = Contribution – Fixed costs
= Rs 20,000 – Rs 12,000 = Rs 8,000

(ii) Let selling price per unit be ($x$)
(Selling price per unit – Variable cost per unit) No. of units sold = Marginal contribution

or $\left(x - \frac{3}{5}x\right) \times 10{,}000 \text{ units} = \text{Rs } 20{,}000$

Variable Cost as %

or $\frac{2}{5}x = \text{Rs } 2$

or $x = \text{Rs } 5$

2. (i) Fixed costs = Marginal contribution – Profit
= Rs 80,000 – Rs 20,000 = Rs 60,000

(ii) Variable Cost as % of selling price

$$= \frac{\text{Selling price per unit} - \text{Marginal contribution per unit}}{\text{Selling price per unit}} \times 100$$

$$\therefore = \frac{\text{Rs } 50 - \text{Rs } 20}{\text{Rs } 50} \times 100 = 60\%$$

3 (i) Marginal contribution = Fixed costs + Profit
= Rs 1,20,000 + Rs 30,000 = Rs 1,50,000

(ii) No. of units sold $= \frac{\text{Marginal Contribution}}{\text{Contribution per unit}}$

$$= \frac{\text{Rs } 1{,}50{,}000}{(\text{Rs } 20 - \text{Rs } 15)} = \frac{\text{Rs } 1{,}50{,}000}{\text{Rs } 5}$$

$$= 30{,}000 \text{ units}$$

4 (i) Profit/(Loss) = Marginal contribution – Fixed costs

= Rs 25,000 – Rs 10,000 = Rs 15,000

(ii) Selling price per unit ($x$)

(Selling price per unit – Variable cost per unit) No. of units sold = Marginal contribution

or $\left(x - \frac{3}{4}x\right)$ 6,000 units = Rs 25,000

or $\frac{x}{4} \times 6{,}000$ = Rs 25,000

or $x$ = Rs 16.66 per unit

5 (i) Fixed costs = Marginal contribution – Profit

= Rs 50,000 – Rs 15,000 = Rs 35,000

(ii) Variable cost per unit = Selling price – Marginal contribution per unit

= (Rs 30 – Rs 50,000/5,000)

= Rs 20

Variable costs as % of selling price $= \frac{\text{Variable cost per unit}}{\text{Selling price per unit}} \times 100$

$$= \frac{\text{Rs } 20}{\text{Rs } 30} \times 100 = 66.66$$

***Example 16.32***

ABC Ltd. which produces three products furnishes the following data for the year 1998.

| | *Products* | | |
|---|---|---|---|
| | *Alfa* | *Beta* | *Gama* |
| Selling Price per unit | Rs 100 | 75 | 50 |
| Profit/Volume Ratio | 10% | 20% | 40% |
| Maximum Sales Potential (units) | 40,000 | 25,000 | 10,000 |
| Raw Material as % of Variable Cost | 50% | 50% | 50% |

The company uses the same raw material for all the three products. Raw material is in short supply and the company has a quota for supply of raw material of the value of Rs 18,00,000 for the year 1998 for manufacture of its products to meet its sales. Total fixed cost is Rs 6,80,000.

You are required to:

(a) Determine a sales mix which will give the maximum overall profit keeping in view the short supply of raw material.

(b) Compute the maximum profit.

*(B.Com. Hons Delhi 1999)*

*Solution*

| *Particulars* | | *Products* | | |
|---|---|---|---|---|
| | | *Alfa* | *Beta* | *Gama* |
| Selling Price per unit | Rs | 100 | 75 | 50 |
| Profit Volume Ratio | | 10% | 20% | 40% |
| Contribution per unit | Rs | 10 | 15 | 20 |
| Variable Cost per unit | Rs | 90 | 60 | 30 |
| Raw Material per unit | Rs | 45 | 30 | 15 |
| Contribution per rupee of raw material | = | 10/45 | 15/30 | 20/15 |
| | = | 2/9 | 1/2 | 4/3 |
| Ranking | | 3 | 2 | 1 |

**(a) Computation of Sales Mix**

| *Product* | *Units* Rs | *Sales* Rs | *Raw Material used* |
|---|---|---|---|
| Gama | 10,000 | 5,00,000 | 1,50,000 |
| Beta | 25,000 | 18,75,000 | 7,50,000 |
| Alfa | 20,000 | 20,00,000 | 9,00,000 |
| Balance | 55,000 | 43,75,000 | 18,00,000 |

**(b) Computation of Profit**

| *Product* | *Sales* Rs | *P/V Ratio* | *Contribution* |
|---|---|---|---|
| Gama | 5,00,000 | 40 | 2,00,000 |
| Beta | 18,75,000 | 20 | 3,75,000 |
| Alfa | 20,00,000 | 10 | 2,00,000 |
| | | | 7,75,000 |
| | *Less:* Fixed Cost | | 6,80,000 |
| | Net Profit | | 95,000 |

### *Example 16.33*

A company has two Plants at Locations I and II, operating at 100% and 75% of their capacities respectively. The company is considering a proposal to merge the two plants at one location to optimise available capacity. The following details are available in respect of the two plants, regarding their present performance/operations:

| *Particulars* | *Location I* | *Location II* |
|---|---|---|
| Sales (Rs in lakhs) | 200 | 75 |
| Variable Cost (Rs in lakhs) | 140 | 54 |
| Fixed Cost (Rs in lakhs) | 30 | 14 |

For decision-making purposes you are required to work out the following information:

(a) The capacity at which the merged plant will break-even.
(b) The profit of the merged plant working at 80% capacity.
(c) Sales required if the merged plant is required to earn an overall profit of Rs 22 lakhs.

*(I.C.W.A. Inter Dec. 1996)*

*Solution*

**Comparative Performance of Plant at 100% Capacity**

Rs in lakhs

| *Plants* | *Plant Location-I* | *Plant Location-II* | *Merged Plant* |
|---|---|---|---|
| Capacity Levels | 100% | 100% | 100% |
| Sales | 200 | 100 | 300 |
| *Less:* Variable Cost | 140 | 72 | 212 |
| Contribution | 60 | 28 | 88 |
| *Less:* Fixed Cost | 30 | 14 | 44 |
| Profit/ (Loss) | 30 | 14 | 44 |
| P/V Ratio: (%): (Contribution/Sales) | 30% | 28% | 29.33 |
| Break-even Sales (Fixed Cost/P/V Ratio) | 44/29.33% | | 150 |

(a) Capacity at BEP (%): $\frac{150}{300} \times 100 = 50\%$

(b) Computation of Profitability of the Merged Plant at 80% Capacity

*(Rs in lakhs)*

| *Particulars* | *Rs* |
|---|---|
| Sales (80% of 300) | 240.00 |
| *Less:* Variable Cost | 169.60 |
| Contribution | 70.40 |
| *Less:* Fixed Cost | 44.00 |
| Profit | 26.40 |

(c) Computation of sales required to earn Desired Profit of Rs 22 lakhs:

Contribution required (Rs in lakhs):

| | | |
|---|---|---|
| Fixed Cost | 44.00 | |
| Desired Profit | 22.00 | 66.00 |
| P/V Ratio (%) | | 29.33% |
| Desired Sales Level (Rs in lakhs) | $\frac{66 \times 100}{29.33}$ | = 225.00 |

### *Example 16.34*

An automobile manufacturing company produces different models of cars .The budget in respect of model 118 for the month of September, 1996 is as under:

| *Budgeted Output* | *(Rs in lakhs)* | *40,000 units (Rs in lakhs)* |
|---|---|---|
| Net Realisation | | 700 |
| Variable Costs: | | |
| Materials | 264 | |
| Labour | 52 | |
| Direct Expenses | 124 | |
| | 90 | 440 |
| Specific Fixed Costs | | |
| Allocated Fixed Costs | 112.50 | 202.50 |
| Total Costs | | 642.50 |
| Profit | | 57.50 |
| Sales | | 700.00 |

*Calculate:*

(i) Profit with 10 per cent increase in selling price with a 10 per cent reduction in sales volume.

(ii) Volume to be achieved to maintain the original profit after a 10 per cent rise in material costs, at the originally budgeted selling price per unit.

*(C.A. Inter Nov. 1996)*

*Solution:*

**(i) Statement of Profit**

(with 10 per cent increase in selling price with a 10 per cent reduction in sales-volume)

| | (Rs in Lakhs) |
|---|---|
| Sale Revenue: (A) *(See WN 1)* | 693 |
| *Less:* Variable Costs: (B) *(See WN 2)* | 396 |
| Contribution [(A) – (B)] | 297 |
| *Less:* Total Fixed Costs | 202.5 |
| Profit | 94.5 |

**Working Notes:**

1. Selling Price (per unit) $= \frac{\text{Rs } 7,00,00,000}{40,000 \text{ units}} = \text{Rs } 1,750$

   New Selling Price (per unit) = Rs 1,750 + Rs 175 = Rs 1,925

   Reduced Sales Volume = 36,000 units

   Total Sales Revenue = Rs 1,925 × 36,000 = Rs 693 lakhs

2. (i) *Variable Costs per Unit*

| | Rs |
|---|---|
| Materials Cost | = 660 |

| | Rs |
|---|---|
| Labour Cost | = 130 |
| Direct Expenses | = 310 |
| Total Variable Cost | = 1,100 |

(ii) *Volume to be achieved to maintain original profit*

| | Rs | Rs |
|---|---|---|
| Selling Price (per unit) (as per Working Note) | | 1,750 |
| *Less: Variable Costs* | | |
| Material Cost (Rs 660 + Rs 66) | 726 | |
| Labour Cost | 130 | |
| Direct Expenses | 310 | 1,166 |
| Contribution per unit | | 584 |

Desired Contribution = Fixed Cost + Original Profit
= Rs 202.50 + Rs 57.50
= Rs 260 lakhs

$$\text{No. of cars to be sold to maintain original profit at original sales price} = \frac{\text{Rs 260 lakhs}}{\text{Rs 584}}$$

= 44,520.547 or say 44,521 cars.

### *Example 16.35*

(a) A Company had incurred fixed expenses of Rs 4,50,000, with sales of Rs 15,00,000 and earned a profit of Rs 3,00,000 during the first half year. In the second half, it suffered a loss of Rs 1,50,000.

*Calculate:*

(i) The profit-volume ratio, break-even point and margin of safety for the first half year.

(ii) Expected sales volume for the second half year assuming that selling price and fixed expenses remained unchanged during the second half year.

(iii) The break-even point and margin of safety for the whole year.

(b) A company manufactures and markets three products X, Y and Z. All the three products are made from the same set of machines. Production is limited by machine capacity. From the data given below, indicate priorities for Products X, Y and Z with a view to maximising profits:

| *Particulars* | | *Products* | | |
|---|---|---|---|---|
| | | *X* | *Y* | *Z* |
| Raw Material Cost per unit | (Rs) | 11.25 | 16.25 | 21.25 |
| Direct Labour Cost per unit | (Rs) | 2.50 | 2.50 | 2.50 |
| Other Variable Cost per unit | (Rs) | 1.50 | 2.25 | 3.55 |
| Selling Price per unit | (Rs) | 25.00 | 30.00 | 35.00 |
| Standard Machine time required per unit in minutes | | 39 | 20 | 28 |

*(C.A. Inter May 1996)*

*Solution*

(a) (i) *Computation of Profit-Volume Ratio, Break-even Point and Margin of Safety: (for the first half year)*

Profit-volume Ratio $= \frac{\text{Contribution}}{\text{Sales}} \times 100$

$= \frac{\text{Fixed Expenses + Profit}}{\text{Sales}} \times 100$

$= \frac{\text{Rs } 4,50,000 + \text{Rs } 3,00,000}{\text{Rs } 15,00,000} \times 100$

$= 50\%$

Break-even Point $= \frac{\text{Fixed Expenses}}{P/V \text{ Ratio}}$

$= \frac{\text{Rs } 4,50,000}{50\%}$

$= \text{Rs } 9,00,000$

Margin of Safety = Actual Sales – Break-even Sales

= Rs 15,00,000 – Rs 9,00,000

= Rs 6,00,000

(ii) *Computation of Expected Sales Volume*

Expected Sales Volume $= \frac{\text{Fixed Expenses} - \text{Loss}}{\text{P/V Ratio}}$

$= \frac{\text{Rs } 4,50,000 - \text{Rs } 1,50,000}{50\%}$

$= \text{Rs } 6,00,000$

(iii) *Computation of Break-even Point and Margin of Safety (for the whole year)*

Break-even Point $= \frac{\text{Fixed Expenses for the whole year}}{P/V \text{ Ratio}}$

$= \frac{\text{Rs } 9,00,000}{50\%} = \text{Rs } 18,00,000$

Margin of Safety $= \frac{\text{Profit for the year}}{P/V \text{ Ratio}}$

$$= \frac{\text{Rs } 3,00,000 - \text{Rs } 1,50,000}{50\%}$$

$$= \text{Rs } 3,00,000$$

**(b) Statement showing Priorities for Products X, Y and Z to Maximise Profits**

| *Products* | | | *X* | *Y* | *Z* |
|---|---|---|---|---|---|
| Selling Price per unit | (Rs) | | 25.00 | 30.00 | 35.00 |
| Less: Variable Cost per unit (*See working note*) | (Rs) | | 15.25 | 21 | 27.30 |
| Contribution per unit | (Rs) | (A) | 9.75 | 9 | 7.70 |
| Std. Machine time required in minutes per unit | | (B) | 30 | 20 | 28 |
| Contribution per minute | (Rs) | (A)/(B) | 0.25 | 0.45 | 0.275 |
| Priorities for Products | | | III | I | II |

**Working Note:**

**Computation of Variable Cost per Unit**

| *Particulars* | *Products* | | |
|---|---|---|---|
| | *X* | *Y* | *Z* |
| | Rs | Rs | Rs |
| Raw Material Cost | 11.25 | 16.25 | 21.25 |
| Direct Labour Cost | 2.50 | 2.50 | 2.50 |
| Other Variable Cost | 1.50 | 2.25 | 3.55 |
| Total Variable Cost per unit | 15.25 | 21.00 | 27.30 |

***Example 16.36***

Two firms A & Co. and B & Co. sell the same type of product in the same market. Their budgeted Profit & Loss Account for the year ending 31st March, 1996 are as follows:

| *Particulars* | *A & Co.* | | *B & Co.* | |
|---|---|---|---|---|
| | *Rs* | *Rs* | *Rs* | *Rs* |
| Sales | | 5,00,000 | | 6,00,000 |
| Variable Costs | 4,00,000 | | 4,00,000 | |
| Fixed Costs | 30,000 | 4,30,0000 | 70,000 | 4,70,000 |
| Net Profit | | 70,000 | | 1,30,000 |

*Required:*

1. Calculate at which sales volume both the firms will earn equal profit.

2. State which firm is likely to earn greater profits in condition of:
   (i) heavy demand for the product, and
   (ii) low demand for the product

Give reasons.

*(CA Inter Nov. 1995)*

*Solution*

**1. Computation of Sales Volume for Equal Profits**

| *Particulars* | *A & Co.* | *B & Co.* |
|---|---|---|
| Sales (Rs) | 5,00,000 | 6,00,000 |
| *Less:* Variable Costs (Rs) | 4,00,000 | 4,00,000 |
| Contribution (Rs) | 1,00,000 | 2,00,000 |
| P/V Ratio (C/S × 100) | 20% | 33.33% |

$$\text{Sales Volume (for both the firms to earn equal profit)} = \frac{\text{Difference in Fixed Cost}}{\text{Difference in P/V Ratio}}$$

$$= \frac{\text{Rs } 40,000}{13.33\%}$$

$$= \text{Rs } 3,00,000$$

2. The P/V ratio of B & Co. at 33.33% is higher than that of A & Co. at 20% and therefore B & Co. will earn higher profit if the sales volume exceeds the level of Rs 3,00,000.

As a matter of fact for each additional unit of product's sale above Rs 3,00,000 the profit of B & Co. will rise by Rs 33.33 which exceeds by Rs 13.33, the profit of A & Co. under similar circumstances. However, below that level, profit for A & Co. will be greater. Hence, it can generally be concluded that B & Co. is likely to earn higher profits under conditions of heavy demand for the product above Rs 3,00,000. On the other hand A & Co. is expected to make higher profits under conditions of low demand for the product below sales volume of Rs 3,00,000.

### *Example 16.37*

A manufacturing company has an installed capacity of 1,20,000 units per annum. The cost structure of the product manufactured is as under:

| | Rs |
|---|---|
| (i) Variable cost per unit— | |
| Materials | 8 |
| Labour (Subject to a minimum of Rs 56,000 per month) | 8 |
| Overheads | 3 |

(ii) Fixed overheads – Rs 1,68,750 per annum.

(iii) Semi-variable overheads Rs 48,000 per annum at 60% capacity, which increase by Rs 6,000 per annum for increase of every 10% of the capacity utilisation or any part thereof for the year as a whole.

The capacity utilisation for the next year is estimated at 60% for two months, 75% for six months and 80% for the remaining part of the year. If the company is planning to have a profit of 25% on the selling price, calculate the selling price per unit. Assume that there are no opening and closing stocks.

*(C.A. Inter Nov. 1997)*

*Solution*

**Statement of Selling Price and Profit**

| | Rs |
|---|---|
| Materials<br>89,000 units × Rs 8 per unit (WN 1) | 7,12.000 |
| Labour Cost (WN 2) | 7,28,000 |
| Variable Overheads (89,000 units × Rs 3) | 2,67,000 |
| Semi-variable overheads (WN 3) | 60,000 |
| Fixed Overheads | 1,68,750 |
| Total Cost | 19,35,750 |
| *Add:* Profit @ 25% of selling price or 33 1/3% on cost | 6,45,250 |
| Total Sales Value | 25,81,000 |
| Selling Price per unit<br>(Rs 25,81,000/89,000 units) | 29,00 |

**Working Notes:**

1. *Computation of Capacity Utilisation (for the next year):*

| | | |
|---|---|---|
| 60% of capacity for first two months | = 2 months × 6,000 units | = 12,000 units |
| 75% of capacity for next six months | = 6 months × 7,500 units | = 45,000 units |
| 80% of capacity for the remaining four months | = 4 months × 8,000 units | = 32,000 units |
| Total capacity utilisation | | = 89,000 units |

$$\text{Capacity utilisation} = \frac{89{,}000 \text{ units}}{1{,}20{,}000 \text{ units}} \times 100 = 74\ \frac{1}{6}\%$$

2. *Computation of labour cost (subject to a minimum of Rs 56,000 p.m.)*

| | Rs |
|---|---|
| Labour Cost of first two months<br>12,000 units × Rs 8 = Rs 96,000<br>However Minimum is 56,000 × 2 | 1,12,000 |
| Labour cost of next six months<br>45,000 units × Rs 8 | 3,60,000 |
| Labour cost of last four months<br>32,000 units × Rs 8 | 2,56,000 |
| Total Labour Cost | 7,28,000 |

3. *Computation of semi-variable overheads (per annum):*

| | Rs |
|---|---|
| Semi-variable Overheads (at 60% capacity) | 48,000 |
| Semi-variable Overheads for additional (14 – 1/6% capacity are the same as that for 20% of the capacity utilisation for the entire year) | 12,000 |
| | 60,000 |

### *Example 16.38*

Indian Plastics make plastic buckets. An analysis of their accounting reveals:

| | |
|---|---|
| Variable cost per bucket | Rs 20 |
| Fixed cost | Rs 50,000 for the year |
| Capacity | 2,000 buckets per year |
| Selling price per bucket | Rs 70 |

*Required:*

(i) Find the break-even point.
(ii) Find the number of buckets to be sold to get a profit of Rs 30,000.
(iii) If the company can manufacture 600 buckets more per year with an additional fixed cost of Rs 2,000, what should be the selling price to maintain the profit per bucket as at (ii) above?

*(B.Com. (Hons), Delhi)*

*Solution*

(i) BEP = Fixed cost/contribution per unit

= 50,000/50 = 1,000 buckets.

(ii) Buckets to be sold for desired profit of Rs 30,000.

$$\text{Sales for Desired Profit} = \frac{\text{Fixed cost + Desired profit}}{\text{Contribution per unit}}$$

$$= \frac{50,000 + 30,000}{50}$$

= 80,000/50

= 1,600 buckets

(iii) Computation of new selling price:

Profit per bucket at sales of 1600 buckets:

| | | Rs |
|---|---|---|
| | Sales (1,600 × 70) | 1,12,000 |
| *Less:* | Variable cost 1,600 × 20 | 32,000 |
| | Contribution | 80,000 |
| *Less:* | Fixed costs | 50,000 |
| | Profit | 30,000 |

Profit per bucket 30,000/1,600 = 18.75
Total sales 1,600 + 600 = 2,200 buckets.
Total profit desired = 2,200 × 18.75 = Rs 41,250
Let selling price be '$x$'
The following equation can be made:

| | |
|---|---|
| Total sales | = Total cost + Profit |
| 2,200$x$ | = 20 (2,200) + 52,000 + 41,250 |
| 2,200$x$ | = 1,37,250 |
| or $x$ | = Rs 62.39 per bucket |

*Note:* It has been assumed that 600 more buckets to be manufactured are in addition to 1,600 buckets as computed under (ii) above.

***Example 16.39***

A retail dealer in garments is currently selling 24,000 shirts annually. He supplies the following details for the year ended 31st December, 2001

| | Rs |
|---|---|
| Selling price per shirt | 40 |
| Variable cost per shirt | 25 |
| Fixed Cost: Staff salaries for the year | 1,20,000 |
| General office costs for the year | 80,000 |
| Advertising costs for the year | 40,000 |

As a cost accountant of the firm, you are required to answer the following each part independently:

(i) Calculate the break-even point and margin of safety in sales revenue and number of shirts sold.
(ii) Assume that 20,000 shirts were sold in a year. Find out the net profit of the firm.
(iii) If it is decided to introduce selling commission of Rs 3 per shirt, how many shirts would require to be sold in a year to earn a net income of Rs 15,000.
(iv) Assuming that for the year 1992 an additional staff salary of Rs 33,000 is anticipated, and price of a shirt is likely to be increased by 15% what should be the break-even point in number of shirts and sales revenue?

*(B. Com. (Hons), Delhi,)*

*Solution*

(i) BEP = Fixed cost/Contribution per unit
= 2,40,000/15 = 16,000 units or
= 16,000 × 40 = Rs 6,40,000

Margin of Safety (MS) = Actual sales – Break-even sales
= 24,000 × 40 – 6,40,000
= 9,60,000 – 6,40,000
= Rs 3,20,000

(ii) Net profit when 20,000 shirts are sold:

| | |
|---|---|
| Contribution: 20,000 × 15 | Rs 3,00,000 |
| *Less:* Fixed costs | Rs 2,40,000 |
| Profit | Rs 60,000 |

(iii) Sales for desired profit:

$$= \frac{\text{Fixed cost + Desired profit}}{\text{New contribution per unit}}$$

$$= \frac{2,40,000 + 15,000}{15 - 3}$$

$$= \frac{2,55,000}{12} = 21,250 \text{ shirts}$$

(iv) New break-even point:
In units: New fixed cost/New contribution per unit

$$= \frac{2,40,000 + 33,000}{46 - 25}$$

$$= 2,73,000/21 = 13,000 \text{ shirts}$$

In Rs = 13,000 × 46 = Rs 5,98,000

***Example 16.40***

An enthusiastic marketing manager suggests to his managing director that only if he is permitted to reduce the selling price of a product by 20%, he would be able to achieve a 30% increase in sales volume. The managing director, finding that the sales volume increase exceeds in percentage the extent of requested reduction in price, gives the clearance.

You are given the following information:

| | | |
|---|---|---|
| Present selling price per unit | Rs 7.50 | |
| Present volume of sales | 2,00,000 | Nos. |
| Total variable costs | Rs 10,50,000 | |
| Total fixed costs | Rs 3,60,000 | |

Assuming no changes in the costs pattern in the coming period.

(i) Examine the consequences of the managing director's decision assuming that 30% increase in sales is realised.

(ii) At what volume of sales can the present quantum of profits be sustained, after effecting the price reduction.

*(B. Com. (Hons), Delhi)*

*Solution*

**Statement Showing the Present Result and Result after Price Reduction**

| | *Present result* | *Proposed result* |
|---|---|---|
| | Rs | Rs |
| Selling price per unit | 7.50 | 6.00 |
| Sales volume | 2,00,000 units | 2,60,000 units |
| Variable cost per unit | 5.25 | 5.25 |
| Contribution per unit | 2.25 | 0.75 |
| Total contribution | 4,50,000 | 1,95,000 |
| Total fixed costs | 3,60,000 | 3,60,000 |
| Profit (loss) | 90,000 | (1,65,000) |

(i) The above statement shows that on account of reduction in the selling price there will be loss of Rs 1,65,000 as compared to the present profit of Rs 90,000, in spite of increase in the sales volume. Thus, there will be an effective drop of profit of Rs 2,55,000 on account of the decision taken by the managing director on the suggestion made by the marketing manager.

(ii) Statement showing the volume of sales at which the present profit can be retained after price reduction.

$$\text{Volume of sales for the profit} = \frac{\text{Fixed cost} + \text{Desired profit}}{\text{Contribution per unit}}$$

$$= \frac{3,60,000 + 90,000}{0.75^*} = 6,00,000 \text{ units}$$

*Rs 6 – Rs 5.25

The above statement shows that 200 per cent increase is required to justify a reduction of selling price by 20% without in any way affecting the present profit.

### *Example 16.41*

Cadbury Schweppes Limited, a British chocolate and soft drink company, is planning to establish a subsidiary company in India to produce, Schweppes Mineral Water.

Based on the estimated annual sales of 40,000 bottles of the mineral water, cost studies produced the following estimates for the Indian subsidiary:

| | *Total annual costs* | *Per cent of total annual cost that is variable* |
|---|---|---|
| Material | Rs 1,93,600 | 100% |
| Labour | 90,000 | 70% |
| Overhead | 80,000 | 64% |
| Administration | 30,000 | 30% |

The Indian production will be sold by manufacturer's representatives who will receive a commission of 8 per cent of the sale price. No portion of the British office expenses is to be allocated to the Indian subsidiary.

It is required to:

(i) compute the sale price per bottle to enable management to realise an estimated 10 per cent profit on sale proceeds in India, and

(ii) calculate the break-even point in rupee sales for the Indian subsidiary on the assumption that the sale price is Rs 11 per bottle.

*(B.Com. (Hons), Delhi, CA Inter)*

*Solution*

**(i) Computation of Selling Price per Unit**

Let the selling price per unit be $x$

| | |
|---|---|
| Total sales | $40,000\ x$ |
| Total Commission | $3,200\ x$ |
| Total profit | $4,000\ x$ |

Total sales = Total cost + Profit

$40,000\ x = 1,93,600 + 90,000 + 80,000 + 30,000 + 3,200\ x + 4,000\ x$

or $40,000\ x = 3,93,600 + 7,200\ x$

or $32,800\ x = 3,93,600$

or $x =$ Rs 12

**(ii) Computation of Break-even Point**

| | | |
|---|---|---|
| Sales (40,000 × 11) | | Rs 4,40,000 |
| *Less:* Marginal cost | | |
| Material | Rs 1,93,600 | |
| Labour 90,000 × 70/100 | 63,000 | |
| Overhead 80,000 × 64/100 | 51,200 | |
| Administration $30,000 \times \frac{30}{100}$ | 9,000 | |
| Sales commission 4,40,000 × 8/100 | 35,200 | 3,52,000 |
| Total contribution | | 88,000 |

$$\text{Break-even sales} = \frac{\text{Fixed cost} \times \text{Total sales}}{\text{Total contribution}}$$

$$= \frac{27,000 + 28,800 + 21,000 \times 4,40,000}{88,000}$$

$$= \frac{76,800}{88,000} \times 4,40,000 = \text{Rs } 3,84,000$$

### *Example 16.42*

A factory engaged in manufacturing plastic buckets is working to 40% capacity and produces 10,000 buckets per annum.

The present cost break-up for one bucket is as under:

| | |
|---|---|
| Material | Rs 10 |
| Labour cost | 3 |
| Overheads | 5 (60% fixed) |

The selling prices Rs 20 per bucket.

If it is decided to work the factory at 50% capacity the selling price falls by 3%. At 90% capacity, the selling price falls by 5% accompanied by a similar fall in the prices of material.

You are required to calculate the profit at 50% and 90% capacities and also calculate break-even points for the same capacity productions.

*(CA Inter)*

*Solution*

**Statement Showing Profit and Break-even Point at Different Capacity Levels**

| *Capacity levels* | | *50%* | | *90%* | |
|---|---|---|---|---|---|
| *Production (units)* | | *12,500* | | *22,500* | |
| | | *Per unit* | *Total* | *Per unit* | *Total* |
| (i) | Sales | Rs 19.40 | Rs 2,42,500 | Rs 19.00 | Rs 4,27,500 |
| Variable cost: | | | | | |
| | Materials | 10.00 | 1,25,000 | 9.50 | 2,13,750 |
| | Wages | 3.00 | 37,500 | 3.00 | 67,500 |
| Variable overheads | | 2.00 | 25,000 | 2.00 | 45,000 |
| (ii) | Total variable cost | 15.00 | 1,87,500 | 14.50 | 3,26,250 |
| (iii) | Contribution (i — ii) | 4.40 | 55,000 | 4.50 | 1,01,250 |
| (iv) | Fixed costs | | 30,000 | | 30,000 |
| (v) | Net profit (iii — iv) | | 25,000 | | 71,250 |

| | Break-even point; at 50% capacity | at 90% capacity |
|---|---|---|
| | $\frac{\text{Fixed cost}}{\text{Contribution per unit}}$ | $\frac{\text{Fixed cost}}{\text{Contribution per unit}}$ |
| Units | $\frac{30,000}{4.40}$ = 6,818 units | $\frac{30,000}{4.50}$ = 6,667 units |
| Sales value | Rs 1,32,270 | Rs 1,26,673 |

### *Example 16.43*

Triple X company produces these products with the following characteristics:

| | *Product I* | *Product II* | *Product III* |
|---|---|---|---|
| Price per unit | Rs 5 | Rs 6 | Rs 7 |
| Variable cost per unit | 3 | 2 | 4 |
| Expected sales (units) | 100,000 | 150,000 | 250,000 |

Total fixed costs for the company are Rs 12,40,000.

Assuming that the product mix would be the same at the break-even point, compute the break-even point in:

(a) Unit (total and by product line)
(b) Sales Rupees (total and by product line)

*Solution*

(a) Compute weighted-average contribution margin:

| | *Product I* | *Product II* | *Product III* |
|---|---|---|---|
| Product mix | $\frac{100000 \text{ units}}{500000 \text{ units}} = .20$ | $\frac{150000 \text{ units}}{500000 \text{ units}} = .30$ | $\frac{250000 \text{ units}}{500000 \text{ units}} = .50$ |

Weighted-average contribution margin = .20 (Rs 2) + .30 (Rs 4) + .50 (Rs 3) = Rs 3.10

or

$$\frac{(100000 \text{ units})\,(\text{Rs } 2) + (150000)\,(\text{Rs } 4) + (250000)\,(\text{Rs } 3)}{500000 \text{ units}}$$

$$= \text{Rs } 3.10$$

$$x = \frac{\text{Rs } 1240000}{\text{Rs } 3.10}$$

$$x = 400000 \text{ units}$$

(b) To compute break-even sales Rupees, find the weighted-average price and variable costs;

$$P = (.20)\,(\text{Rs } 5) + (.30)\,(\text{Rs } 6) + .50\,(\text{Rs } 7)$$

$$= \text{Rs } 6.30$$

$$V = (.2)\,(\text{Rs } 3) + (.30)\,(\text{Rs } 2) + (.50)\,(\text{Rs } 4)$$

$$= \text{Rs } 3.20$$

$$\text{Break-even point} = \frac{F}{\frac{P - V}{P}} = \frac{\text{Rs } 12,40,000}{\text{Rs } 3.10/\text{Rs } 6.30} = \text{Rs } 12,40,000$$

$$= \frac{\text{Rs } 12,40,000}{.492}$$

$$= \text{Rs } 25,20,000 \text{ approx.}$$

(Check 400000 units × Rs (6.30 = 2520000)

Product line amounts:

| | *Total* | *Product I* | *Product II* | *Product III* |
|---|---|---|---|---|
| | (100%) | (20%) | (30%) | (40%) |
| Units | 400000 | 80000 | 120000 | 200000 |
| Units price (Rs) | 6.30 | 5 | 6 | 7 |
| Sales Rupees | 2520000 | 400000 | 720000 | 1400000 |

***Example 16.44***

The Chief Cost Accountant of Vikas Limited found to his surprise that the actual profit for the period ending 30th June 1997 was the same as budgeted in spite of realising 10% more than the budgeted selling prices. The following were the results:

| *Particulars* | *Budget* | *Actuals* |
|---|---|---|
| | Rs | Rs |
| Sales | 5,00,000 | 8,25,000 |
| Variable costs of sales | 3,00,000 | 5,75,000 |
| Fixed costs | 1,00,000 | 1,50,000 |
| Profit | 1,00,000 | 1,00,000 |

You are required to assist the Chief Cost Accountant in preparing the necessary explanations as to why the profit remained the same despite an increase in sales.

*(ICWA Inter)*

*Solution*

In order to assist the Chief Acountant of Vikas Ltd., in preparing the necessary explanations, for the profit remaining the same, in spite of an increase in sale revenue, the following factors may be considered.

Factors contributing to the increase in profit:

| | Rs |
|---|---|
| (i) Increase in sales revenue due to increased selling price (Working Note 1) | 75,000 |
| (ii) Increase in contribution on account of increased sales volume (Working Note 4) | 1,00,000 |
| | 1,75,000 |

Factors contributing to the increase in cost:

| | |
|---|---|
| (i) Increase in variable costs: (Working Note 5) | 1,25,000 |
| (ii) Increase in fixed cost | 50,000 |
| | 1,75,000 |

**Working Notes:**

1. Increase in sales revenue due to price increase (10% more than the budgeted)

$$= \frac{\text{Rs } 8,25,000 \times 100}{110} = \text{Rs } 75,000$$

2. Increase in sales volume = (Actual sales-Sales revenue due to increased selling price – Budgeted sales)

= Rs 8,25,000–Rs 75,000 – 5,00,000

= Rs 2,50,000

3. Budgeted P/V Ratio $= \dfrac{\text{Budgeted contribution} \times 100}{\text{Budgeted sales}}$

$$= \frac{\text{Rs } 5,00,000 - \text{Rs } 3,00,000 \times 100}{\text{Rs } 5,00,000}$$

$$= 40\%$$

4. Increase in contribution due to higher sales volume = Rs 2,50,000 × 40% = Rs 1,00,000
5. Budgeted proportion of variable cost (on the sale of Rs 7,50,000)

$$= \frac{\text{Budgeted cost}}{\text{Budgeted sales}} \times \text{Actual sales volume}$$

$$= \frac{\text{Rs } 3,00,000}{\text{Rs } 5,00,000} \times \text{Rs } 7,50,000$$

$$= \text{Rs } 4,50,000$$

Increase in variable cost

= (Actual variable cost of sales – Budgeted proportion of variable cost)

= Rs 5,75,000 – Rs 4,50,000 = Rs 1,25,000

A perusal of the above mentioned factors clearly shows that the profit of M/s Vikas Ltd., has increased by Rs 1,75,000 due to increase in selling price (Rs 75,000) and contribution on increased volume (Rs 1,00,000). At the same time the cost of the firm has also increased to the tune of Rs 1,75,000 (increase in variable cost Rs 1,25,000 and increase in fixed cost Rs 50,000). Since the increase in profit equals to the increase in cost, therefore, the profit of the firm has remained the same as shown in the budget.

***Example 16.45***

Taurus Ltd. produces three products—A, B and C, from the same manufacturing facilities. The cost and other details of the three products are as follows:

| | A | B | C |
|---|---|---|---|
| Selling price/unit (Rs) | 200 | 160 | 100 |
| Variable cost/unit (Rs) | 120 | 120 | 40 |
| Fixed expenses/month (Rs) | | | 2,76,000 |
| Maximum production per month (units) | 5,000 | 8,000 | 6,000 |
| Total hours available for the month | 200 hours | | |
| Maximum demand per month (units) | 2,000 | 4,000 | 2,400 |

The processing hours cannot be increased beyond 200 hours per month.

You are required to:

(a) Compute the most profitable product-mix:

(b) Compute the overall break-even sales of the company for the month based on the mix calculated

in (a) above. *(CA Inter)*

*Solution*

**M/s Taurus Limited**

(a) Computation of Most Profitable Product Mix:

| *Products* | *Number of units to be produced (Note I)* | *Contribution per unit* | *Total contribution* |
|---|---|---|---|
| | | *Rs* | *Rs* |
| A | 2,000 | 80 | 1,60,000 |
| B | 1,600 | 40 | 64,000 |
| C | 2,400 | 60 | 1,44,000 |
| | | Total contribution: | 3,68,000 |
| | | *Less:* Fixed expenses: | 2,76,000 |
| | | Profit: | 92,000 |

(b) Computation of Over all Break-even Sales

$$\text{Break-even sales} = \frac{\text{Fixed costs}}{\text{Total contribution}} \times \text{Total sales}$$

$$= \frac{\text{Rs } 2,76,000}{\text{Rs } 3,68,000} \times \text{Rs } 8,96,000$$

$$= \text{Rs } 6,72,000$$

**Working Notes:**

(1) Statement showing units to be produced

| *Products* | A | B | C |
|---|---|---|---|
| (i) Selling price per unit (Rs) | 200 | 160 | 100 |
| (ii) Variable cost per unit (Rs) | 120 | 120 | 40 |
| (iii) Contribution per unit (i) – (ii) | 80 | 40 | 60 |
| (iv) Maximum production per hour (units) | 5000 | 8,000 | 6,000 |
| | 200 | 200 | 200 |
| | = 25 | = 40 | = 30 |
| (v) Contribution per hour (Rs) (Maximum production per hour × Contribution per unit) | Rs 80 × 25 | Rs 40 × 40 | Rs 60 × 30 |
| | 2,000 | 1,600 | 1,800 |
| (vi) Ranking | I | III | II |
| (vii) Units to be produced | 2,000 | 1,600 | 2,400 |
| (viii) Time required for the units to be produced (hrs) | 80 | 40 | 80 |

**(2) Statement of Contribution**

| *Products* | *Units* | *Selling price per unit* | *Variable cost per unit* | *Sales revenue* | *Variable cost* | *Contribution* |
|---|---|---|---|---|---|---|
| *(i)* | *(ii)* | *(iii)* | *(iv)* | *(v)* | *(vi)* | *(vii)* |
| A | 2,000 | 200 | 120 | 4,00,000 | 2,40,000 | 1,60,000 |
| B | 1,600 | 160 | 120 | 2,56,000 | 1,92,000 | 64,000 |
| C | 2,400 | 100 | 40 | 2,40,000 | 96,000 | 1,44,000 |
| | Total | | | 8,96,000 | 5,28,000 | 3,68,000 |

***Example 16.46***

The budgeted income statement by product lines of Multiproducts Ltd. for 2001 is as follows:

| | *Product A* | *Product B* | *Product C* |
|---|---|---|---|
| | Rs | Rs | Rs |
| Sales | 2,00,000 | 5,00,000 | 3,00,000 |
| Variable Expenses: | | | |
| Cost of goods sold | 90,000 | 2,70,000 | 1,50,000 |
| Selling | 30,000 | 90,000 | 45,000 |
| Fixed Expenses: | | | |
| Overhead | 36,000 | 90,000 | 54,000 |
| Administrative | 16,000 | 40,000 | 24,000 |
| Income before tax | 28,000 | 10,000 | 27,000 |
| Income tax @ 40% | 11,200 | 4,000 | 10,800 |
| Net income | 16,800 | 6,000 | 16,200 |

All products are manufactured in the same facilities under common administrative control. Fixed expenses are allocated among the products in proportion of their budgeted sales volume:

(a) Compute the budgeted break-even point of the company as a whole, from the data provided.

(b) What would be the effect on Budgeted Income, if half of the budgeted sales volume of product B were shifted to product A and C in equal rupee amounts, so that the total budgeted sales in rupees remain the same.

(c) What would be the effect of the shift in the product mix suggested in (b) above on the budgeted break-even point of the whole company?

*Solution*

(a) Budgeted BEP for the company as a whole

$$\text{Composite PV ratio} = \frac{\text{Total contribution}}{\text{Total sales}} \times 100$$

$$= \frac{80,000 + 1,40,000 + 1,05,000}{10,00,000} \times 100$$

$$= \frac{3,25,000}{10,00,000} \times 100 = 32.5\%$$

$$\text{BEP for the company} = \frac{\text{Total fixed costs}}{\text{Composite PV ratio}}$$

$$= \frac{52,000 + 1,30,000 + 78,000}{32.5\%}$$

$$= \frac{2,60,000}{32.5} \times 100 = \text{Rs } 8,00,000$$

(b) Effect on Budgeted Income if half the sales of Product B are shifted equally to Products A and C.

| | Product A | Product B | Product C |
|---|---|---|---|
| Sales (i) | 3,25,000 | 2,50,000 | 4,25,000 |
| Variable Expenses | | | |
| Cost of goods sold | 1,46,250 | 1,35,000 | 2,12,500 |
| Selling | 48,750 | 45,000 | 63,750 |
| Fixed Expenses (Apportioned according to sales): | | | |
| Overhead | 58,500 | 45,000 | 76,500 |
| Administrative | 26,000 | 20,000 | 34,000 |
| Total Cost (ii) | 2,79,500 | 2,45,000 | 3,86,750 |
| Income before tax (i) – (ii) | 45,500 | 5,000 | 32,250 |
| Income tax @ 40% | 18,200 | 2,000 | 15,300 |
| Net Income | 27,300 | 3,000 | 22,950 |
| Total Net Income | | | Rs 53,250 |

The original budgeted income is Rs 39,000. Hence, the income would increase by Rs 14,250 as a result of the proposed change.

(c) Break-even after shift in the product mix

$$\text{Composite PV Ratio} = \frac{\text{Total contribution}}{\text{Total sales}} \times 100$$

$$= \frac{1,30,000 + 70,000 + 1,48,750}{10,00,000} \times 100$$

$$= \frac{3,48,750}{10,00,000} \times 100 = 34.875\%$$

Break-even point of the company as a whole

$$= \frac{\text{Total fixed expenses}}{\text{Composite PV ratio}}$$

$$= \frac{2,60,000}{34.475\%}$$

= Rs 7,45,520

Rs Thus, the break-even point will stand reduced to sales of Rs 7,45,520 from Rs 8,00,000 as a result of shift in the total production-mix.

***Example 16.47***

A company manufactures a single product with a capacity of 1,50,000 units per annum. The summarised profitability statement for the year is as under:

| | Rs | Rs |
|---|---|---|
| Sales: 1,00,000 units @ Rs 15 per unit | | 15,00,000 |
| Cost of Sales: | | |
| Direct Materials | 3,00,000 | |
| Direct Labour | 2,00,000 | |
| Production Overhead: Variable | 60,000 | |
| Fixed | 3,00,000 | |
| Administration Overheads (Fixed) | 1,50,000 | |
| Selling and Distribution Overheads: Variable | 90,000 | |
| Fixed | 1,50,000 | 12,50,000 |
| Profit | | 2,50,000 |

You are required to evaluate the following options:

(i) What will be the amount of sales required to earn a target profit of 25% on Sales, if the packing is improved at a cost of Re. 1 per unit?

(ii) There is an offer from a large retailer for purchasing 30,000 units per annum, subject to providing a packing with a different brand name at a cost of Rs 2 per unit. However, in this case there will be no selling and distribution expenses. Also this will not, in any way, affect the company's existing business. What will be the break-even price for this additional offer?

(iii) If an expenditure of Rs 3,00,000 is made on advertising, the sales would increase from the present level of 1,00,000 units to 1,20,000 units at a price of Rs 18 per unit. Will that expenditure be justified?

(iv) If the selling price is reduced by Rs 2 per unit, there will be 100% capacity utilization. Will the reduction in selling price be justified?

*(C.A. Inter May 2001)*

*Solution*

**Working Notes:**

| | Rs |
|---|---|
| (1) *Contribution per unit:* | |
| Sell[illegible] price per unit: (A) | 15.00 |

| | |
|---|---|
| *Variable cost per unit:* | |
| Direct materials (Rs 3,00,000/1,00,000 units) | 3.00 |
| Direct labour (Rs 2,00,000/1,00,000 units) | 2.00 |
| Variable production overheads (Rs 60,000/1,00,000 units) | 0.60 |
| Variable selling and distribution overheads (Rs 90,000/1,00,000 units) | 0.90 |
| Total variable cost per unit: (B) | 6.50 |
| Contribution per unit: {(A) – (B)} (Rs 15 – Rs 6.50) | 8.50 |

| | Rs |
|---|---|
| (2) *Total fixed cost:* | |
| Production overheads | 3,00,000 |
| Administration overheads | 1,50,000 |
| Selling and distribution overheads | 1,50,000 |
| Total fixed cost | 6,00,000 |

**(i) Amount of sales required to earn a target profit of 25% on sales after improving the packing**

| | Rs |
|---|---|
| Present variable cost per unit *(Refer to working note 1)* | 6.50 |
| Improved packing cost per unit | 1.00 |
| Revised variable cost per unit | 7.50 |

$$\text{P/V ratio} = \frac{\text{Contribution}}{\text{Sales}} \times 100 = \left\{\frac{\text{Rs } 15 - \text{Rs } 7.50}{\text{Rs } 15} \times 100\right\} = 50\%$$

Let $x$ is the desired sales revenue to earn a target profit of 25% on sales; then the desired contribution would be: Total fixed cost + 25% × $x$

$$\text{Since P/V ratio} = \frac{C}{S} \times 100 = \frac{\text{Fixed Cost + Profit}}{x} \times 100$$

$$\therefore x = \frac{\text{Rs } 6,00,000 + 25\%\, x}{50\%} \quad \textit{(Refer to working note 2)}$$

$$\text{or } x \times 50\% = \text{Rs } 6,00,000 + 25\%\, x$$

$$\text{or } \left[\frac{x}{2} - \frac{x}{4}\right] = \text{Rs } 6,00,000$$

$$\text{or } x = \text{Rs } 24,00,000$$

Hence, the desired amount of sales required to earn a target profit of 25% on sales is Rs 24,00,000. On the sale of Rs 24,00,000, the desired contribution is 50% of sales i.e. Rs 12,00,000 and profit is 25% of sales i.e. Rs 6,00,000.

**(ii) Evaluation of an offer of purchasing 30,000 units per annum (subject to providing a packing with a different brand name at a cost of Rs 2 per unit) from a large retailer. Determine also the break-even price for this additional offer.**

| | Rs |
|---|---|
| Present variable cost per unit | 6.50 |
| *Less:* Variable selling and distribution overheads per unit | 0.90 |
| | 5.60 |
| *Add:* Special packing cost per unit | 2.00 |
| Revised variable cost per unit | 7.60 |

The break-even price per unit for this additional offer of 30,000 units would be Rs 7.60 per unit. In other words the break-even price for this additional offer here means the price per unit at which 30,000 units offer can be accepted without earning any profit on it.

*Note:* The existing business will bear the impact of fixed cost. Fixed costs will not affect this additional offer of 30,000 units.

**(iii) Justification of incurring advertisement expenses of Rs 3,00,000 for increasing the sale from 1,00,000 units to 1,20,000 units.**

| | Rs |
|---|---|
| New selling price per unit | 18.00 |
| *Less:* Variable cost per unit | 6.50 |
| *(Refer to working note 1)* | |
| Contribution per unit | 11.50 |
| Total contribution | 13,80,000 |
| *(1,20,000 units × Rs 11.50)* | |
| *Less:* Present fixed cost | (6,00,000) |
| *Less:* Additional expenditure on advertising | (3,00,000) |
| Profit | 4,80,000 |

**Justification:** The amount of profit on the sale of 1,00,000 units was Rs 2,50,000 *(Refer to the statement of the question)*. On increasing the sale of product units from 1,00,000 to 1,20,000 the profit of the concern increased from Rs 2,50,000 to Rs 4,80,000 therefore, the expenditure on advertisement is justifiable and the proposal under consideration is viable.

**(iv) Justification of reduction in selling price to increase capacity utilisation to 100%**

| | Rs |
|---|---|
| Revised selling price per unit | 13.00 |
| *Less:* Variable cost per unit | 6.50 |
| *(Refer to working note 1)* | |
| Contribution per unit | 6.50 |
| Total contribution at 100% capacity utilization | 9,75,000 |

| | |
|---|---|
| *(1,50,000 units × Rs 6.50)* | |
| *Less:* Fixed cost | 6,00,000 |
| Profit | 3,75,000 |

**Justification:** A reduction in selling price by Rs 2/- per unit for 100% capacity utilization, increases the present profit of Rs 2,50,000/- to Rs 3,75,000. Hence the reduction in selling price is justified.

### *Example 16.48*

The PTO Division of XYZ manufacturing company produces power take-off units for the farm equipment business. The PTO Division headquartered in Mumbai has a newly renovated, automated plant in Mumbai and an older, less-automated plant in Pune. Both plants produce the same power take-off units for farm tractors that are sold to most domestic and foreign tractor manufacturers.

The PTO Division expects to produce and sell 1,92,000 power take-off units during the coming year. The division production manager has the following data available regarding the unit costs, unit prices and production capacities for the two plants:

- All fixed costs are based on a normal year of 240 working days. When the number of working days exceed 240, variable manufacturing costs increase by Rs 3 per unit in Mumbai and Rs 8 per unit in Pune. Capacity for each plant is 300 working days.
- XYZ manufacturing Co. charges each of its plants a per unit fee for administrative services such as payroll, general accounting and purchasing, because management considers these services to be a function of work performed at the plants. For each of the plants at Mumbai and Pune, the fee is Rs 6.50 and represents the variable portion of general and administrative expense.

Wishing to maximize the higher unit profit at Pune, the PTO's production manager has decided to manufacture 96,000 units at each plant. This production plan results in Pune's operating at capacity and Mumbai's operating at its normal volume. XYZ's Corporate Controller is not happy with this plan, because she does not believe it represents optimal usage of PTO's plants.

| | Mumbai | Pune |
|---|---|---|
| Selling price | Rs 150.00 | Rs 150.00 |
| Variable manufacturing cost | 72.00 | 88.00 |
| Fixed manufacturing cost | 30.00 | 15.00 |
| Commission (5%) | 7.50 | 7.50 |
| General & Administrative expenses | 25.50 | 21.00 |
| Total unit cost | 135.00 | 131.00 |
| Unit profit | Rs 15.00 | Rs 18.50 |
| Production rate per day | 400 units | 320 units |

*Required:*

(i) Determine the annual break-even units for each of the PTO's plants.

(ii) Determine the operating income that would result from the division production manager's plan to produce 96,000 units at each plant.

(iii) Determine the optimal production plan to produce the 1,92,000 units at PTO's plants in Mumbai and Pune and determine the resulting operating income for the PTO Division.

*(CA Inter, May 2000)*

*Solution*

**(b) Working Note:**

Total fixed cost based on a normal year of 240 working days

| | *Mumbai plant* | *Pune plant* |
|---|---|---|
| Production rate per day (units) | 400 | 320 |
| No. of days | 240 | 240 |
| Total production (units) in 240 days | 96,000 (400 units × 240 days) | 76,800 (320 units × 240 days) |
| Fixed manufacturing cost per unit (Rs) | 30 | 15 |
| Total fixed manufacturing cost based on a normal year of 240 working days (Rs): (A) | 28,80,000 (96,000 units × Rs 30) | 11,52,000 (76,800 units × Rs 15) |
| Fixed General & Administrative expenses (Rs): (B) | 18,24,000 (96,000 units × Rs 19) | 11,13,600 (76,800 × Rs 14.50) |
| Total fixed cost (Rs): {(A) + (B)} | 47,04,000 | 22,65,600 |

**(i) Annual Break-even units for each of the P.T.O's plants**

| | *Mumbai plant* | *Pune plant* |
|---|---|---|
| Selling price p.u. (Rs): (A) | 150.00 | 150.00 |
| *Total variable cost:* | | |
| Variable manufacturing cost at normal volume (p.u.) (Rs) | 72.00 | 88.00 |
| Commission (p.u.) (Rs) | 7.50 | 7.50 |
| Variable General & Administrative expenses (p.u.): (Rs) | 6.50 | 6.50 |
| Total variable cost (p.u) (Rs): (B) | 86.00 | 102.00 |
| Contribution (p.u.) (Rs): {(A) – (B)} | 64.00 | 48.00 |
| Annual-break-even (units) | 73,500 | 47,200 |
| Fixed cost/Contribution (p.u.) (Refer to working note) | (Rs 47,04,000/Rs 64) | (Rs 22,65,600/Rs 48) |

**(ii) Operating Income Statement**

**(as a result of Divisional Production Manager's plan to produce 96,000 units at each plant)**

| | *Mumbai plant* | *Pune Plant* |
|---|---|---|
| Normal capacity (units) | 96,000 (400 units × 240 days) | 76,800 (320 units × 240 days) |
| Full capacity (units) | 1,20,000 (400 units × 300 days) | 96,000 (320 units × 300 days) |
| Sales revenue (Rs): (A) | 1,44,00,000 (96,000 units × Rs 150) | 1,44,00,000 (96,000 units × Rs 150) |

| | *Mumbai plant* | *Pune Plant* |
|---|---|---|
| Variable costs: | | |
| Variable manufacturing cost (Rs) | 69,12,000 (96,000 units × Rs 72) | 92,16,000 (96,000 units × (Rs 88 + Rs 8) |
| Commission (Rs) | 7,20,000 (96,000 units × Rs 7.50) | 7,20,000 (96,000 units × Rs 7.50) |
| Variable general & administrative expenses (Rs) | 6,24,000 (96,000 units × Rs 6.50) | 6,24,000 (96,000 units × Rs 6.50) |
| Total variable cost (Rs): (B) | 82,56,000 | 1,05,60,000 |
| Contribution margin (Rs): {(A) – (B)} | 61,44,000 | 38,40,000 |
| *Less:* Fixed cost (Rs) *(Refer to working note 3)* | 47,04,000 | 22,65,600 |
| Operating Income (Rs) | 14,40,000 | 15,74,400 |
| Total Operating income of both the plants | = Rs 14,40,000 + Rs 15,74,400 = Rs 30,14,400 | |

*Note:* The question does not clarify that whether the variable cost will increase in respect of additional units only when the working days exceeds 240 days or against all the units. Operating income in the above statement of Pune plant, has been arrived at by assuming an increase in variable cost by Rs 8 on all the units produced in the plant. An alternative operating income figure of Pune plant can also be obtained by considering increase in variable cost on only 19,200 units. In the alternative case the operating income of Pune plant will come to Rs 21,88,800 (Rs 15,74,400 + 76,800 units × Rs 8)

**(iii) Statement of Resulting Operating Income (for the PTO's plants in Mumbai and Pune)**

| | *Mumbai plant* | *Pune plant* |
|---|---|---|
| *Optimal production plan* | | |
| Capacity of production (units) | 1,20,000* | 72,000 |
| Sales revenue (Rs): (A) | 1,80,00,000 (1,20,000 units × Rs 150) | 1,08,00,000 (72,000 units × Rs 150) |
| *Variable cost:* | | |
| Variable manufacturing cost (Rs) | 90,00,000 (1,20,000 units × Rs 72 + Rs 3) | 63,36,000 (72,000 units × Rs 88) |
| Commission | 9,00,000 (1,20,000 units × Rs 7.50) | 5,40,000 (72,000 units × Rs 7.50) |
| Variable general & administrative expenses (Rs) | 7,80,000 (1,20,000 units × Rs 6.50) | 4,68,000 (72,000 units × Rs 6.50) |
| Total variable cost (Rs): (B) | 1,06,80,000 | 73,44,000 |
| Contribution margin (Rs): {(A) – (B)} | 73,20,000 | 34,56,000 |
| *Less:* Fixed cost *(Refer to working note)* | 47,04,000 | 22,65,600 |
| Operating Income | 26,16,000 | 11,90,400 |
| Total Operating Income for PTO's division = Rs 38,06,400 | | |

* Mumbai plant is utilized at full capacity level because the variable cost of manufacturing is lower vis-a-vis Pune plant.

*Note:* The operating income of the Mumbai plant in the above statement has been arrived at by assuming an increase in variable cost by Rs 3 on all the units produced in the plant. An alternative operating income figure of the Mumbai plant can also be obtained by considering increase in variable cost on only 24,000 units (i.e. in respect of additional units when working days exceeds 240 days). In the alternative case the operating income of Mumbai plant will come to Rs 29,04,000 (Rs 26,16,000 + 96000 units × Rs 3).

## THEORY QUESTIONS

1. What do you mean by marginal costing? Discuss its usefulness and limitations.
*(B. Com. (Hons), Delhi)*
2. Write a lucid note on marginal costing indicating its effect on profit computations.
*(B. Com. (Hons), Delhi)*
3. What are the most important areas of management decisions opened up by the application of the marginal (direct) costing method? Answer briefly and to the point.
*(ICWA Inter)*
4. Marginal costs reveal the lowest price at which a product can be sold during a trade depression, but they also reveal to management the most profitable lines during the period of intense trade activity. Explain with examples, the second part of this statement.
*(ICWA Inter)*
5. Discuss the following terms in relation to marginal costing.
(a) Key factor, (b) P/V ratio, and (c) Margin of safety.
*(ICWA Inter)*
6. (a) What do you understand by the term "margin of safety" with reference to volume of production?
(b) How do the following reflect on a break-even volume and on a P/V ratio; (i) increase in total fixed cost; (ii) increase in total physical sales; (iii) decrease in variable costs per unit.
*(ICWA Inter)*
7. What do you understand by the term "break-even analysis"? Enumerate its uses.
*(B.Com. (Hons), Delhi)*
8. How do income statements prepared under the absorption costing and marginal costing concepts differ?
9. Compared with absorption costing when will variable costing report lower profits, higher profits, the same profits?
10. In what ways is variable costing better adapted to managerial use in profit planning, decision-making and control?
11. Why do the supporters of marginal costing state that fixed costs are not to be included in inventories?
12. Discuss the uses of CVP analysis and its significance to management.
13. "In classifying a particular cost as fixed or variable, the volume or activity level is extremely important." Discuss and illustrate this statement.
14. "The contribution approach is the foundation of CVP logic and related techniques." Discuss.
15. Discuss the role of contribution in marginal costing in decisions relating to fixation of selling price.
*(ICWA Inter)*
16. State with reasons whether the following propositions are correct.
    (a) In an undertaking with a high fixed cost, break-even point can be attained at a lower level of activity.
    (b) Profit is represented by the product of the margin of safety and the P/V ratio.
    (c) In relation to normal sales, a low margin of safety along with a high P/V ratio is generally an indication of high fixed costs.
*(ICWA Inter)*

17. Distinguish between "marginal costing" and "absorption costing".

*(B.Com. (Hons), Delhi, 1999)*

18. "The effect of a price reduction is always to reduce the P/V ratio, to raise the break-even point, and to shorten the margin of safety." Explain with a suitable illustration.

*(CA Inter)*

19. Define break-even point. How can the break-even point. How can the break-even point be computed?
20. How is a break-even chart prepared? What information does the break-even chart give?
21. What are the basic assumptions in cost-volume-profit analysis under (a) absorption costing, and (b) variable costing?
22. Describe how a P/V chart is drawn. How does the P/V chart differ from a break-even chart?
23. For product-mix decisions, what criteria can be used to select products that will maximise net income?
24. Break-even analysis assumes that variable costs and revenues are linear and that fixed costs are fixed. Briefly explain why these assumptions may not be realistic.

*(B. Com. (Hons), Delhi)*

25. "Marginal costs reveal the lowest price at which a product can be sold during a trade depression, but they also reveal to management the most profitable lines during a period of intense trade activity." Explain, with examples, the second part of this statement.
26. Can there be two break-even points show with the help of a graph

*(B. Com. (Hons), Delhi, 1999)*

27. Distinguish between contribution and profit.

*(B. Com. (Hons), Delhi 2001)*

## SELF-EVALUATION QUESTIONS

I. Choose the correct answer for the following multiple choice questions:

(i) To obtain the break-even point in rupee sales value, total fixed costs are divided by:
   (a) Variable cost per unit;
   (b) Contribution margin per unit;
   (c) Fixed cost per unit;
   (d) Profit/volume ratio.

(ii) The break-even point is the point at which:
   (a) There is no profit, no loss;
   (b) Contribution margin is equal to total faixed cost;
   (c) Total revenue is equal to total cost;
   (d) All of the above.

(iii) The primary difference between a fixed budget and a variable (flexible) budget is that a fixed budget:
   (a) includes only fixed costs, while a variable budget includes only variable costs.
   (b) is concerned with only further acquisitions of fixed costs, while a variable budget is concerned with expenses which vary with sales.
   (c) cannot be changed after the period begins, while a variable budget can be changed after the period begins.
   (d) is a plan for a single level of sales (or other measure of activity), while a variable budget consists of several plans, one for each of several levels of sales (or other measures of activity).

(iv) Margin of safety is referred to as:
   (a) Excess of actual sales over fixed expenses;
   (b) Excess of actual sales over variable expenses;
   (c) Excess of actual sales over break-even sales;

(d) Excess of budgeted sales over fixed costs.

*(B. Com. Hons Delhi 1997)*

II. Chose the correct answer for the following multiple choice questions:

(i) Contribution margin is known as
  (a) Marginal income
  (b) Gross profit
  (c) Net income
  (d) Net profit

(ii) The break-even analysis may be described as
  (a) Comparison between production and sales
  (b) Comparison to make out capacity utilisation
  (c) Comparison between target set and actual achievement
  (d) Comparison between sales and costs

(iii) An increase in sales price
  (a) Does not affect the break-even point
  (b) Lowers the net profit
  (c) Increases, the break-even point
  (d) Lowers the break-even point

(iv) Profit under traditional costing and marginal costing system will be the same if
  (a) There are no opening and closing stocks
  (b) There is opening stock and no closing stock
  (c) There is closing stock and no opening stock
  (d) There are opening and closing stocks

(v) A decrease in sales price
  (a) Does not affect the break-even point
  (b) Lowers the net profit
  (c) Increases the break-even point
  (d) Lowers the break-even point

(vi) Fixed cost per unit decrease when
  (a) Production volume increases
  (b) Production volume decreases
  (c) Variable costs per unit decreases
  (d) Prime costs per unit decreases

(vii) Within a relevant range, the amount of variable costs per unit
  (a) Differs at each production level
  (b) Remains constant at each production level
  (c) Increases as production increases
  (d) Decreases as production increases

(viii) Margin of safety is referred to as
  (a) Excess of budgeted or actual sales over the variable expenses and fixed expense, at break even.
  (b) Excess of budgeted or actual sales revenue over the fixed expenses.
  (c) Excess of actual sales over budgeted sales.
  (d) Excess of sales revenue over the variable expenses.

(ix) The most useful information derived from a break-even chart is the
  (a) Amount of sales revenue needed to cover variable costs.
  (b) Amount of sales revenue needed to cover fixed costs.
  (c) Relationship among revenues, variable costs and fixed costs at various levels of activity.

(d) Volume or output level at which the enterprise break-even.

(x) Each of the following would affect the break-even point except a change in the
- (a) Number of units sold
- (b) Variable cost per unit
- (c) Total fixed costs
- (d) Sales price per unit

(xi) Under marginal costing system, the contribution margin discloses the excess of
- (a) Revenue over fixed costs
- (b) Projected revenues over the break-even point
- (c) Revenues over variable costs
- (d) Variable costs over fixed costs

(xii) The method of cost accounting that lends itself to break-even analysis is
- (a) Variable (Marginal)
- (b) Standard
- (c) Absolute
- (d) Absorption

(xiii) Cost volume profit analysis allows management to determine relative profitability of a product by
- (a) Highlighting potential bottlenecks in the production process.
- (b) Keeping fixed costs to an absolute minimum.
- (c) Determining contribution margin per unit and projected profits at various levels of production.
- (d) Assigning costs to a product in a manner that maximises the contribution margin.

(xiv) To obtain the break-even point in rupees, total fixed costs are divided by which of the following:
- (a) Variable cost per unit
- (b) Fixed cost per unit
- (c) Variable cost per unit ÷ Sales price per unit
- (d) (Sales price per unit – Variable cost per unit) ÷ Sales price per unit.

(xv) Given the following notations, what is the break-even sales in rupees?

(a) $\frac{SP}{FC \div VC}$ (b) $\frac{VC}{SP - FC}$

(c) $\frac{FC}{VC \div SP}$ (d) $\frac{FC}{(SP - VC) \div SP}$

(xvi) What is the term that means all manufacturing costs (direct and indirect, variable and fixed) which contribute to the production of the product and are traced to output and inventories.
- (a) Job-order costing
- (b) Process costing
- (c) Full or absorption costing
- (d) Variable or marginal or direct costing

(xvii) What costs are treated as product costs under variable (marginal) costing?
- (a) Only direct costs
- (b) Only variable production costs
- (c) All variable costs
- (d) All variable and fixed manufacturing costs

**III.** A company sold 1,00,000 units of its product at Rs 20 per unit. Variable costs are Rs 14 per unit (manufacturing costs of Rs 11 and selling costs of Rs 3). Fixed costs are incurred uniformly throughout the year and amount to Rs 792,000 (manufacturing costs of Rs 500,000 and selling costs of Rs 292,000). There are no beginning or ending inventories.

(i) The break-even point for this product is

(a) Rs 3,640,000 or 1,82,000 units
(b) Rs 2,600,000 or 1,30,000 units
(c) Rs 1,80,000 or 90,000 units
(d) Rs 1,760,000 or 88,000 units
(e) None of the above

(ii) The number of units that must be sold to earn a net income of Rs 60,000 for the year before income taxes would be Rs
(a) 1,42,000
(b) 1,32,000
(c) 1,00,000
(d) 88,000
(e) None of the above

(iii) If the income tax rate is 40% the number of units that must be sold to earn an after-tax income of Rs 90,000 would be
(a) 1,69,600
(b) 1,57,000
(c) 1,44,500
(d) 1,04,777
(e) None of the above

(iv) If labour costs are 50% of variable costs and 20% of fixed costs, a 10% increase in wages and salaries would increase the number of units required to break-even (in fraction form) to
(a) 8,07,840/5.3
(b) 8,31,600/5.78
(c) 8,07,840/14.7
(d) 8,31,6001/14.28
(e) None of the above

## PROBLEMS

1. The following data has been taken from the records of a company. You are required to find out net profit using the technique of marginal costing.

| | | Rs |
|---|---|---|
| Sales | | 75000 |
| Variable costs: | | |
| Direct materials | Rs 22500 | |
| Direct wages | 12500 | |
| Factory overheads | 5250 | |
| Administration, selling and distribution overheads | 8000 | |
| | 48250 | |
| Fixed costs: | | |
| Factory overheads | 2000 | |

| | | |
|---|---|---|
| Administrative and other overheads | 3350 | |
| | 5350 | |
| Total cost | | 53600 |
| Profit | | 21400 |

2. Using the information given below, calculate the net income for the months of October, November and December and the value of finished goods on hand at the end of period using absorption costing and marginal costing. Also, comment on the differences in profits under these two methods.

| | October | November | December |
|---|---|---|---|
| Production | 45000 | 36000 | 45000 |
| Sales | 36000 | 42000 | 48000 |
| Opening stock | – | 9000 | 3000 |
| Closing stock | 9000 | 3000 | – |

Additional information:

| | |
|---|---|
| Selling price per unit | Rs 50 |
| Variable cost per unit | Rs 30 |
| Fixed cost per unit | Rs 10 |
| Total fixed costs per month | Rs 390000 |
| Normal output per month | 39000 units |

*(CA Inter)*

*Ans:* Profit under absorption costing, October Rs 4,20,000, November Rs 3,90,000, December Rs 5,40,000. Profit under marginal costing, October Rs 33,000, November Rs 4,50,000, December Rs 5,70,000. Difference in profits of different months is due to differences in values of closing stocks which are determined differently under both the methods.

3. The following data were taken from the cost and production records of a company at the end of an accounting period:

| | | Rs |
|---|---|---|
| Sales revenue | | 1,28,000 |
| Cost of goods manufactured: | | |
| Fixed | 32,000 | |
| Variable | 48,000 | 80,000 |
| Selling and administrative expenses: | | |
| Fixed | 20,000 | |
| Variable | 0 | 20,000 |
| Opening inventory of finished goods | | Nil |
| Normal and actual production | | 10,000 units |
| Closing inventory of finished goods | | 2,000 units |

Calculate the net income for the period and the value of the finished goods on hand at the end of the period using (a) absorption costing, and (b) marginal costing.

*Ans:* Net profit, Absorption costing Rs 44,000, Variable costing Rs 37,600, Closing stock absorption costing Rs 16000, Variable costing Rs 9,600.

4. A company produces a single product that sells for Rs 1.50 per unit. Standard capacity is 1,00,000 units per year. On Jan. 1, 2002 there was no inventory of finished goods, production and sales for the year were as follows:

| | Number of units | |
|---|---|---|
| *Quarter* | *Produced* | *Sold* |
| First | 2,00,000 | 1,00,000 |
| Second | 3,00,000 | 2,50,000 |
| Third | 2,00,000 | 2,50,000 |
| Fourth | 3,00,000 | 4,00,000 |
| | 10,00,000 | 10,00,000 |

Manufacturing costs and selling and administrative expenses were as follows:

| | *Fixed (per unit)* | *Variable (per unit)* |
|---|---|---|
| Raw material | – | 0.27 |
| Direct labour | – | 0.25 |
| Indirect manufacturing cost | Rs 2,00,000 | 0.18 |
| Selling and administrative expenses | 80,000 | 0.20 |
| | Rs 2,80,000 | Re 0.90 |

Prepare: (a) Quarterly income statements under absorption costing and variable costing; (b) account for the difference between the net incomes reported under each concept.

5. The directors of a company have been studying the following condensed profit reports for the years 2001 and 2002:

| | 2001 | 2002 |
|---|---|---|
| Sales (Rs) | 3,00,000 | 4,50,000 |
| Profit (or loss) (Rs) | 55,000 | 35,000 |

The directors are perturbed over the trend, for a 50% increase in sales resulted in a decrease in profit in 2002. The chief cost accountant explains that unabsorbed overhead was charged to 2002 operations. His statement was based on the following data:

| *Data* | *2001* | *2002* |
|---|---|---|
| Sales (units) | 20,000 | 30,000 |
| Production (units) | 30,000 | 20,000 |
| Sales price per unit (Rs) | 15 | 15 |
| Variable cost per unit (Rs) | 5 | 5 |
| Fixed factory overhead (Rs) | 1,80,000 | 1,80,000 |
| Fixed factory overhead per unit (standard) | 6 | 6 |
| Fixed selling and administrative expenses | 25,000 | 25,000 |

Prepare: (a) income statement by the conventional method to which the chief cost accountant referred; (b) income statements by variable costing method.

*Ans:* Net profit, Absorption costing 2001, Rs 55,000; 2002, Rs 35000. Variable costing 2001, Rs 5000 loss; 2002 Rs 95000.

6. From the following data calculate:
   (i) P/V ratio
   (ii) Profit when sales are Rs 20,000

(iii) New break-even point if selling price is reduced by 20%

| | |
|---|---|
| Fixed expenses | Rs 4,000 |
| Break-even point | Rs 10,000 |

*(B. Com. (Hons). Delhi)*

*Ans:* P/V ratio 40%; Profit Rs 4,000; BEP Rs 16,000.

7. Calculate from the following data (i) the value of output at which the business breaks-even and (ii) the percentage capacity at which it breaks-even:

| | *Budget for year 2003 based on 100% capacity (Rs)* | *Estimated shut-down expenditure (Rs)* |
|---|---|---|
| Direct wages | 2,09,964 | |
| Direct materials | 2,44,552 | |
| Works expenses | 1,81,820 | 93,528 |
| Selling and distribution expenses | 61,188 | 40,188 |
| Administration expenses | 30,000 | 20,508 |
| Net sales | 8,40,000 | |

*Ans:* (i) BEP sales Rs 485746
(ii) 57.83%
shutdown expenditures should be treated as fixed costs.

8. The following figures are available from the records of Venus Enterprises as at 31st March:

| | *2001* Rs lakhs | *2002* Rs lakhs |
|---|---|---|
| Sales | 150 | 200 |
| Profit | 30 | 50 |

Calculate:
(a) The P/V ratio and total fixed expenses;
(b) The break-even level of sales:
(c) Sales required to earn a profit of Rs 90 lakhs;
(d) Profit or loss that would arise if the sales were Rs 280 lakhs.

*(CA Inter, B. Com., Delhi)*

*Ans:* (a) 40% 130 lakhs (b) Rs 75 lakhs
(c) Rs 300 lakhs (d) Rs 82 lakhs

9. Two manufacturing companies which have the following operating details decide to merge.

| | *Company No. 1* | *Company No. 2* |
|---|---|---|
| Capacity utilization % | 90 | 60 |
| Sales (Rs lakhs) | 540 | 300 |
| Variable cost (Rs lakhs) | 396 | 225 |
| Fixed costs (Rs lakhs) | 80 | 50 |

Assuming that the proposal is implemented, calculate:
(i) Break-even sales of the merged plant and the capacity utilization at that stage.
(ii) Profitability of the merged plant at 80% capacity utilization.
(iii) Sales turn over of the merged plant to earn a profit of Rs 75 lakhs.

(iv) When the merged plant is working at a capacity to earn a profit of Rs 75 lakhs what percentage increase in selling price is required to sustain an increase of 5% of fixed overheads.

*(ICWA Inter.)*

*Ans:* (i) 25.909% P/V ratio, Rs 501.67 lakhs, 45.6% (ii) Rs 98 lakhs (iii) Rs 791.23 lakhs (iv) 0.8215%

10. Company A and Company B, both under the same management, make and sell the same type of product. Their budgeted profit and loss accounts for January—June 2002 are as under:

| | *Company A* | | *Company B* | |
|---|---|---|---|---|
| | Rs | Rs | Rs | Rs |
| Sales | | 3,00,000 | | 3,00,000 |
| *Less:* Variable cost | 2,40,000 | | 2,00,000 | |
| Fixed costs | 30,000 | 2,70,000 | 70,000 | 2,70,000 |
| | | 30,000 | | 30,000 |

You are required to

(i) Calculate the break-even point for each company.

(ii) Calculate the sales volume at which each of the two companies will make a profit of Rs 10,000.

(iii) Assess how their profitability will change with decrease or increase in volume.

*(ICWA Inter)*

*Ans:* (i) A Rs 1,50,000 B Rs 2,10,000 (ii) A Rs 2,00,000 B Rs 2,40,000

11. The following figures relate to a company manufacturing a varied range of products:

| | *Total cost* | *Total sales* |
|---|---|---|
| Year ending 31st Dec., 2001 | 19,83,600 | 22,23,000 |
| Year ending 31st Dec., 2002 | 21,43,200 | 24,51,000 |

Assuming stability in prices, with variable costs carefully controlled to reflect predetermined relationships, and an unvarying figure for fixed costs, calculate:

(a) The profit/volume ratio, to reflect the rates of growth for profit and sales

(b) Fixed cost

(c) Fixed cost % to sales

(d) Break-even point

(e) Margin of safety for the year 2001 and the year 2002.

*Ans:* (a) 30% (b) Rs 4,27,500

(c) 2001, 19.23%, 2002, 17.44% (d) Rs 14,25,000

(e) 2001, Rs 7,98,000, 2002, Rs 10,26,000

12. A company has a P/V ratio of 40 per cent. By what percentage must sales be increased to offset—

(i) 10 per cent reduction in selling price, and

(ii) 20 per cent reduction in selling price?

*(B. Com. (Hons), Delhi)*

*Ans: Hint*

| Let the present units sold be 100 @ Re 1/- per unit | Rs |
|---|---|
| Present total sales | 100 |
| Present variable cost | 60 |
| Present contribution | 40 |
| (P/V ratio 40%) | |

(i) If selling price is reduced by 10%

| | |
|---|---|
| Selling price per unit | 0.90 |
| Variable cost per unit | 0.60 |
| Contribution per unit | 0.30 |

In order to maintain the same contribution, viz Rs 40 the volume of sales should be:

$$\frac{\text{Present total contribution}}{\text{New contribution per unit}} \times \text{New selling price per unit}$$

$$\frac{40}{30} \times 90 = 120 \text{ or } \frac{1200}{.90} \text{ units or } 133\frac{1}{3} \text{ units}$$

Thus, the volume of sales will have to be increased by 33% from the existing level if the selling price is reduced by 10%.

(ii) If the selling price is reduced by 20%

| | Re |
|---|---|
| Selling price per unit | 0.80 |
| Variable cost per unit | 0.60 |
| Contribution per unit | 0.20 |

For maintaining the same contribution the volume of sales should be:

$$\frac{40}{0.20} \times 0.80 = \text{Rs } 160 \text{ or } \frac{1604}{.80} = 200 \text{ units}$$

Thus, the volume of sales will have to be increased by 100% over the existing, if the selling price is reduced by 20%.

13. Two competing companies ABC Ltd. and XYZ Ltd. produce and sell in the same type of product in the same market. For the year ending March 1994, their forecasted profit and loss accounts are as follows:

| | *ABC Ltd.* | | *XYZ Ltd.* | |
|---|---|---|---|---|
| Sales | | Rs 2,50,000 | | Rs 2,50,000 |
| *Less:* Variable costs of sales | Rs 2,00,000 | | 1,50,000 | |
| Fixed costs | 25,000 | 2,25,000 | 75,000 | 2,25,000 |
| Forecasted net profit before tax | | 25,000 | | 25,000 |

You are required to compute:

1. P/V ratio
2. Break-even sales volume

You are also required to state which company is likely to earn greater profits in conditions of:

(a) low demand, and

(b) high demand.

*Ans:* P/V Ratio ABC Ltd. 20%, XYZ Ltd. 40%; Break-even sales volume ABC Ltd. Rs 125000, XYZ Ltd, Rs 187500. In case of low demand, profit situation for ABC Ltd. will be better as it has a larger safety margin and lower amount of fixed costs. In case of high demand, XYZ will do better since additional sales will give profit at 40% (P/V ratio) whereas in case of ABC Ltd. additional sales will give profit at 20% (P/V ratio).

14. The budgeted sales of three products of a company are as follows:

| | Product X | Y | Z |
|---|---|---|---|
| Budgeted sales in units | 10,000 | 15,000 | 20,000 |
| Budgeted selling price per unit | 4 | 4 | 4 |
| Budgeted variable cost per unit | 2.5 | 3 | 3.5 |
| Budgeted fixed expenses total | 12,000 | 9,000 | 7,500 |

From the information you are required to compute the following for each product:

(a) The budgeted profit
(b) The budgeted break-even sales
(c) The budgeted margin of safety in terms of sales value.

*(CA Inter)*

*Ans:*

| | X | Y | Z |
|---|---|---|---|
| Profit | 3,000 | 6,000 | 2,500 |
| Break-even sales | Rs 32,000 | 36,000 | 60,000 |
| Margin of safety | Rs 8,000 | 24,000 | 20,000 |

15. Tractors Ltd. have an installed capacity of 5000 tractors per annum. They are presently operating at about 35% of installed capacity. For the coming year, they have budgeted as follows:

| | 4,000 units |
|---|---|
| Production/Sales | *Rs (Crores)* |
| *Costs* | |
| Direct materials | 8.00 |
| Direct wages | 0.60 |
| Factory expenses | 0.80 |
| Administrative expenses | 0.20 |
| Selling expenses | 0.20 |
| Profit | 1.00 |

Factory expenses as well as selling expenses are variable to the extent of 20%.
Calculate the break-even capacity utilisation percentage.

*Ans:* 40%

16. From the following data, calculate break-even point expressed in terms of units and also the new B.E.P. if selling price is reduced by 10%.

| | |
|---|---|
| Fixed expenses: | |
| Depreciation | Rs 1,00,000 |
| Salaries | Rs 1,00,000 |
| Variable expenses: | |
| Materials | Rs 3 per unit |
| Labour | Rs 2 per unit |
| Selling price | Rs 10 per unit |

*Ans:* (i) 40,000 units (ii) 50,000 units

17. From the following information relating to Quick Standards Ltd., you are required to find out: (a) Contribution, (b) Break-even point in units, (c) Margin of safety, (d) Profit.

| | |
|---|---|
| Total fixed costs | Rs 4,500 |
| Total variable costs | 7,500 |
| Total sales | 15,000 |
| Units sold | 5,000 (Units) |

Also calculate the volume of sales to earn profit of Rs 6,000.

*Ans:* (a) Rs 75000 (b) 3000 units
(c) Rs 6000, 40% (d) Rs 3000

18. S. Ltd. furnishes you the following information relation to the half year ended 30th June, 2001

| | |
|---|---|
| Fixed expenses | Rs 45,000 |
| Sales value | 1,50,000 |
| Profit | 30,000 |

During the second half of the year, the company has projected a loss of Rs 10,000.
Calculate:
(i) The break-even point and margin of safety for six months ending 30th June, 2001
(ii) Expected sales volume for second half of the year assuming that the P/V ratio and fixed expenses remain constant in the second half year also.
(iii) The break-even point and margin of safety for the whole year 2001.

*(CA Inter)*

*Ans:* (i) BEP Rs 90,000, margin of safety Rs 60000.
(ii) Sales Rs 70,000
(iii) BEP Rs 1,80,000
Margin of safety Rs 40000

19. S.M. Ltd. produces two products and the Budget for 60% level of activity for the year 2001–2002 gives the following information:

| | *Product A* | *Product B* |
|---|---|---|
| | Rs | Rs |
| Raw material cost per unit | 7.50 | 3.50 |
| Direct labour cost per unit | 4.00 | 3.00 |
| Variable overheads per unit | 2.00 | 1.50 |
| Fixed overheads per unit | 6.00 | 4.50 |
| Selling price per unit | 20.00 | 15.00 |
| Production and sales | 4,000 units | 6,000 units |

The Managing Director not being satisfied with the projected results as stated above, referred the budget to the marketing director for improvement of the performance. The marketing director proposed that the sales quantities of Product A and B could each be increased by 50% provided the selling prices were reduced by 5% in the case of Product A and 10% in the case of Product B. The price reduction should be made applicable to the entire quantity of sales of each of the two products.
*Required:* (i) Present the overall profitability under the original budget and the revised budget after taking the increased sales into consideration.
(ii) Find the over all Break-even sales under the original budget and the revised budget.

*(CA Inter)*

20. Mansarovar Auto products produces and sells two small components P and Q used in automobiles. The details regarding unit income and costs of these components are as under:

| | *Products* | |
|---|---|---|
| | *P* | *Q* |
| Selling price | Rs 12 | Rs 20 |
| Direct materials | 2 | 4 |
| Direct labour | 2 | 1 |
| Variable factory overhead | 2 | 4 |
| Fixed factory overhead | 2 | 4 |
| Total cost of goods sold | 8 | 13 |
| Gross profit per unit | 4 | 7 |

Factory overheads, both fixed and variable, have been accounted for on a machine hour basis. As far as can be determined, the sales outlook is such that the plant could operate at full capacity on either or both products. Both P and Q are processed through the same cost centres. Selling costs are all fixed.

Which product should be preferred? Give a brief explanation in support of your answer.

*(B. Com. (Hons), Delhi)*

21. Delhi Equipments Ltd., manufactures four components, the cost particulars of which are given below:

| | *Components* | | | |
|---|---|---|---|---|
| | *A* | *B* | *C* | *D* |
| Elements of cost: | | | | |
| Direct material | Rs 80 | 100 | 100 | 120 |
| Direct labour | 20 | 25 | 25 | 30 |
| Variable overhead | 10 | 12 | 15 | 10 |
| Fixed overhead | 15 | 23 | 20 | 20 |
| | 125 | 160 | 160 | 180 |
| Output per machine hour (units) | 4 | 2 | 3 | 3 |

The key factor is shortage of machine capacity.

You are required to advise management as to whether they should continue to produce all or some of these components (which are used in its main product) or they should buy them from a supplier who has quoted the following prices:

A = Rs 115; B = Rs 175; C = Rs 135; D = Rs 185.

*Ans: Hint:*

**Statement of Profitability**

| | *Components* | | | |
|---|---|---|---|---|
| | *A* | *B* | *C* | *D* |
| Direct material | Rs 80 | Rs 100 | Rs 100 | Rs 120 |
| Direct labour | 20 | 25 | 25 | 30 |
| Variable overhead | 10 | 12 | 15 | 10 |
| Marginal cost per unit | 110 | 137 | 140 | 160 |
| Purchase price per unit | 115 | 175 | 135 | 185 |
| Excess of purchase price Over marginal cost | 5 | 38 | — | 25 |
| Excess of marginal cost over purchase price | — | — | 5 | — |

| | | | | |
|---|---|---|---|---|
| Decline in profitability per machine hour if purchase is made from outside | 5 × 4 = 20 | 38 × 2 = 76 | — | 25 × 3 = 75 |
| Increase in profitability per machine hour if purchase is made from outside | | | – 5 × 3 = 15 | |

The above analysis shows:

(i) Component C should be purchased from outside whether there is a key factor or not since its marginal cost is more than its purchase price. Purchasing from outside will push up the profitability by Rs 15 per machine hour.

(ii) Continue the production of components A, B and D is case shortage of machine capacity is not the key factor.

(iii) In case shortage of machine capacity is the key factor as given in the question, the management must decide about the ranking of the three components. The above analysis shows that ranking should be in the order of A, D and B.

This is because in case of A, if it is purchased from outside, the loss of profitability will be only Rs 20 per machine hour, while in case of D and B it will be Rs 75 and Rs 76 per machine hour respectively.

22. (a) From, the following data, which product would you recommend for manufacture in the factory?

| Per unit of | *Product A* | *Product B* |
|---|---|---|
| Standard manufacturing time | 2 hours | 3 hours |
| Direct materials | 50 | 30 |
| Direct labour @ Rs 10 per hour | 20 | 30 |
| Variable over head @ Rs 6 per hour | 12 | 18 |
| Selling price | 200 | 240 |

Total machine hours available in the factory are 60,000.

(b) Calculate the effect on profit of a proposed change in "Sales Mix" from the following data:

| *Existing sales mix* | *M* | *N* | *O* | *P* | *Total* |
|---|---|---|---|---|---|
| Sales (in Rs) | 80,000 | 1,00,000 | 40,000 | 20,000 | 2,40,000 |
| Variable cost (in Rs) | 48,000 | 68,000 | 32,000 | 8,000 | 1,56,000 |
| Fixed cost (in Rs) | – | – | – | – | 58,800 |
| Proposed sales mix | Rs 60,000 | 88,000 | 80,000 | 12,000 | 2,40,000 |

*(ICWA Inter)*

*Ans:* Hint:

(a) Machine capacity seems to be the limiting factor and since Product A uses minimum machine time, it is more profitable to produce Product A than Product B.

**Comparative Profitability Statement**

| | *Product A* | *Product B* |
|---|---|---|
| Selling price | 200 | 240 |
| Total variable costs | 82 | 78 |
| Contribution magin | 118 | 162 |

| | | |
|---|---|---|
| Contribution per machine hour | 59 | 54 |
| Total output possible(units) | 30,000 | 20,000 |
| Total contribution possible (Rs) | 35,40,000 | 32,40,000 |

Product A may, therefore, be recommended for manufacture provided its selling is not a problem.

**(b) Computation of Estimated Profit on the Proposed Change**

| *Products* | *M* | *N* | *O* | *P* | *Total* |
|---|---|---|---|---|---|
| Proposed sales mix | 60,000 | 88,000 | 80,000 | 12,000 | 2,40,000 |
| Variable cost | 36,000 | 59,840 | 64,0009 | 4,800 | 1,64,640 |
| Proposed contribution | 24,000 | 28,160 | 16,000 | 7,200 | 75,360 |
| Fixed costs | | | | | 58,800 |
| Proposed profit | | | | | 16,560 |
| Present contributions | 32,000 | 32,000 | 8,000 | 12,000 | 84,000 |
| Fixed costs | | | | | 58,800 |
| present profit | | | | | 25,200 |
| Profit/Volume ratio | 40% | 32% | 20% | 60% | |

The sales-mix proposed is less profitable since the sale of Product D, which is the least profitable, is proposed to be doubled while that of Product P which is most profitable, is proposed to be reduced. Similarly sale of products M and N which are relatively more profitable than Product D is proposed to be reduced while that of Product D is being doubled. The overall effect has been a decline in profit by Rs 8,640.

23. (a) The following particulars are extracted from the records of a company:

| | *Product A* | *Product B* |
|---|---|---|
| Sales (per unit) | Rs 100 | Rs 120 |
| Consumption of material | 2 kg | 3 kg |
| Material cost | Rs 10 | Rs 15 |
| Direct wages cost | 15 | 10 |
| Direct expenses | 5 | 6 |
| Machine hours used | 3 | 2 |
| Overhead expenses: | | |
| Fixed | 5 | 10 |
| Variable | 15 | 20 |

Direct wage per hour is Rs 5. Comment on the profitability of each product (both use the same raw material) when (i) Total sales potential in units is limited; (ii) Total sales potential in value is limited; (iii) Raw material is in short supply; and (iv) Production capacity (in terms of machine hours) is the limiting factor.

(b) Assuming raw material as the key factor, availability of which is 10,000 kg and maximum sales potential of each product being 3,500 units, find out the product mix which will yield the maximum profit. *(ICWA Inter)*

*Ans: Hint:*

| | *Per unit of* | |
|---|---|---|
| | *A* | *B* |
| Sales | Rs 100 | Rs 120 |
| Direct material | 10 | 15 |

| | | |
|---|---|---|
| Direct wages | 15 | 10 |
| Direct expenses | 5 | 6 |
| Variable overhead | 15 | 20 |
| Marginal cost | 45 | 51 |
| Contribution per unit | 55 | 69 |
| P/V ratio | 55% | 57.5% |
| Contribution per kg of material | 27.5 | 23 |
| Contribution per machine hour | 18.3 | 34.5 |

(i) In case total sales potential in units is a limiting factor, B is more profitable as it is making a larger contribution per unit as compared to A.

(ii) In case total sales potential in value is a limiting factor, still B is more profitable since its P/V ratio is higher than that of A.

(iii) In case raw material is in short supply, A is more profitable as its contribution per kg of material is higher than that of Product B.

(iv) In case production capacity is limited, B is more profitable since it gives higher contribution per machine hour than A.

*Note:* Best situation is obtained when contribution per unit of key factor is the maximum.

(b) In case raw material is the key factor, A is more profitable to produce as its contribution per kg of material is higher than that of B. If 3,500 units of A are manufactured, total material consumption will be 7,000 kg (i.e. 3,500 × 2 kg). The balance of 3,000 kg of material can be used to manufacture 1,000 units (3,000 ÷ 3) of B. The total profit by this product mix will be as follows:

*Contribution:*

| | | |
|---|---|---|
| Product A 3,500 units @ Rs 55 each | Rs 1,92,500 | |
| Product B 1,000 units @ Rs 69 each | 69,000 | |
| Total Contribution: | 2,61,500 | |
| Total fixed costs: | | |
| Product A 5 × 3,500 | = Rs 17,500 | |
| Product B 10 × 3,500 | = 35,000 | 52,500 |
| Total profit | | 2,09,000 |

24. A, B and C are three similar plants under the same management who want them to merge for better operation. The details are as under:

| | A | B | C |
|---|---|---|---|
| Plant | | | |
| Capacity operated | 100% | 70% | 50% |
| | Rs (in lakhs) | Rs (in lakhs) | Rs (in lakhs) |
| Turnover | 300 | 280 | 150 |
| Variable cost | 200 | 210 | 75 |
| Fixed cost | 70 | 50 | 62 |

Find out:

(i) The capacity of the merged plant for break even.

(ii) The profit at 75% capacity of the merged plant.

(iii) The turnover, from the merged plant to give a profit of Rs 28 lakhs.

(Figure in lakhs)

*Ans:* (i) 52% (ii) Profit Rs 80.5 (lakhs)
(iii) Rs 600 lakhs.

25. Sunita Manufacturing Company produces chairs. An analysis of their accounting reveals:

| | |
|---|---|
| Fixed cost | Rs 50,000 for the year |
| Variable cost | Rs 20 per chair |
| Capacity | 2,000 chairs per year |
| Selling price | Rs 70 per chair |

(i) Find the break-even point
(ii) Find the number of chairs to be sold to get a profit of Rs 30,000.
(iii) What will be the answer for (i) and (ii) if selling price changes to Rs 60 per chair?
(iv) If the company can manufacture 600 chairs more per year with an additional fixed cost of Rs 2,000, what should be the selling price to maintain the profit per chair as at (ii) above?

26. SV Ltd., a multi-product company furnishes you the following data relating to the year 1994:

| | *First half of the year* Rs | *Second half of the year* Rs |
|---|---|---|
| Sales | 45,000 | 50,000 |
| Total Cost | 40,000 | 43,000 |

Assuming that there is no change in prices and variable cost and that the fixed expenses are incurred equally in the two half year periods, calculate for the year 1994:

(i) The P/V ratio
(ii) Fixed expenses
(iii) Break-even sales
(iv) Percentage of margin of safety

*Ans:* (i) 40% (ii) 26,000;
(iii) 65,000 (iv) 31.58%

*(CA Inter)*



# Alternative Choices Decisions

## DECISION MAKING

Decision making is the process of evaluating two or more alternatives leading to a final choice, popularly known as Alternative Choices Decisions. Decision making is closely associated with planning for the future and is directed towards a specific objective or goal.

## DIFFERENTIAL ANALYSIS

Differential analysis may be defined as the use of relevant costs and relevant revenues in making decisions. Relevant costs and benefits are very important in evaluating alternatives, in ascertaining the effect of various alternatives on profit and selecting the alternative with the greatest benefit. The relevant costs and revenues are the differences between the alternatives under consideration. The amount of such differenes are called differentials and the accounting analysis concerned with the effect of alternatives on revenues and costs is called differential analysis. Relevant revenues and relevant costs are also known as differential revenues and differential costs. Differential revenue is the amount of increase or decrease in revenue expected from a particular course of action as compared with an alternative. Differential analysis provides a decision rule to managers in decision making which is: the alternative that gives the greatest incremental profit should be selected. Incremental profit is the difference between the relevant revenues and relevant costs of each alternative.

In case, decision affects both revenue and costs, management must estimate the changes in each to estimate the change in profit. In many decisions, only costs will change. In this case, the most beneficial (profitable) decision will be the one with the lowest cost because the lowest cost alternative will give the highest profit, provided all other factors and situations remain constant.

## RELEVANT COSTS

Whatever alternatives are evaluated, the decision-maker has to decide which costs are relevant. Relevant costs are those that are pertinent, and bear upon the decision to be made. Relevant costs are the costs that will change as a result of the decision. Relevant costs are also known as decision-making costs. The relevant costs vary with the type of decision. However, the following are the common characteristics of relevant costs:

1. Relevant costs are expected future costs
2. They differ between different decision alternatives.

Expected future costs imply that the costs are expected to occur during the time period covered by the decision. For example, new product will need the incurrence of direct material, direct labour and other costs. Relevant costs also differ between decision alternatives. For example, a graduate may choose between advanced education and immediate employment. The costs that are relevant in this decision and which differ between the two decisions are the costs of books, fees, etc., because these costs will not be incurred if the graduate takes up employment. However, irrelevant costs are costs of accommodation, clothes, etc. which will have to be incurred under both the decisions.

Relevant costs are also known as differential costs. Differential cost is the difference in the total costs between alternative choices. It is the difference in total costs between two volumes. When a decision results in an increased cost, the differential cost may be referred to as an incremental cost. The incremental cost includes the change in fixed component as well as the variable component. Assume that a company has physical facilities to manufacture 20,000 units of a product; production beyond that point would require the installation of additional equipment, that is, fixed costs as well as variable costs will have to be incurred if management desires to produce more than 20,000 units.

## TYPES OF CHOICES DECISIONS

Most management decisions may be referred to as alternative choice decisions. Alternative choice decisions cover situations with two or more alternative courses of action from whch the manager (decision-maker) must select the best alternative. A decision involving more than two alternatives is called a multiple alternative choice decision. Some examples of alternative choice decisions are: make or buy, own or lease, retain or replace, repair or renovate, now or later, change versus status quo, slower or faster, export versus local sales, shutdown or continue, expand or contract, change the produce-mix, take or refuse orders, place special orders, select sales territories, replace present equipment with new machinery, sell at split-up point or process further, etc.

Some of the above alternative choices decisions and the information relevant to the decisions are discussed below.

## MAKE OR BUY

Make or buy decisions arise when a company with unused production capacity consider the following alternatives:

(a) To buy certain raw materials or subassemblies from outside suppliers.
(b) To use available capacity to produce the items within the company.

A make or buy decision is basically one of determining which alternative is economically most desirable and most effectively utilises the firm's resources. These decisions can effect the firm's production methods and capacities, available working capital, cost of borrowing funds, and competitive position. Costs that will be incurred under both alternatives are not relevant to the analysis. The firm should make an analysis of the cost, quality and quantity considerations of the individual make or buy decisions. Differential cost analysis is especially useful if the company has idle capacity and idle workers that can be used to make the tools or parts. Other potential use of available capacity should also be considered; and qualitative factors must be evaluated in the decision process. These considerations include price

stability from suppliers, reliability of delivery and quality of the material or component involved. Qualitative factors are not included in differential cost analyses, but they should be used to test the reasonableness of any decision based purely on quantitative cost studies.

For example, assume that a company can make a part that it has been purchasing at a unit cost of Rs 30. The company has been operating at 75% of normal capacities and in the foreseeable future no use for the excess capacity is contemplated except for the possible production of the part. Fixed manufacturing cost amounts to Rs 17,00,000 a year whether the plant operates at 75% or 100% of capacity. The cost to manufacture 50,000 units of the part that will be needed has been estimated as follows:

| | *Units cost* | *Total cost* |
|---|---|---|
| Direct materials | 12.5 | 6,25,000 |
| Direct labour | 8.0 | 4,00,000 |
| Variable manufacturing overhead | 5.0 | 2,50,000 |
| Total incremental cost | 25.5 | 12,75,000 |
| Cost to purchase part | 30.0 | 15,00,000 |
| Net advantage in parts production | 4.5 | 2,25,000 |

In the above analysis the fixed manufacturing overhead has not been considered because it has to be incurred under both alternatives. Logically, the costs that will be increased or decreased as a result of making the part should be considered. In some cases, both the variable and fixed costs will be affected.

## Add or Drop Products

The decision to eliminate an unprofitable product is a special case of product profitability evaluation. To evaluate the financial consequences of eliminating a product, it is necessary to concentrate on the differential or incremental profit effect of the decision. An important factor in the decision to add or drop a product is whether it will increase or decrease the future income of the business. Appropriate cost and profit measures must be developed for each alternative.

Assume a company is considering dropping product *B* from its line because accounting statements show that product *B* is being sold at a loss.

**Income Statement**

| | *Product A* | *Product B* | *Product C* | *Total* |
|---|---|---|---|---|
| Sales revenue | 50,000 | 7,500 | 12,500 | 70,000 |
| Cost of sales: | | | | |
| Direct material | 7,500 | 1,000 | 1,500 | 10,000 |
| Direct labour | 15,000 | 2,000 | 2,500 | 19,500 |
| Indirect manufacturing cost (50% of direct labour) | 7,500 | 1,000 | 1,250 | 9,750 |
| | 30,000 | 4,000 | 5,250 | 39,250 |
| Gross margin on sales | 20,000 | 3,500 | 7,250 | 30,750 |

| | | | | |
|---|---|---|---|---|
| Selling and administrative expenses | 12,500 | 4,500 | 4,000 | 21,000 |
| (allocation on arbitrary basis) | – | – | – | – |
| Net income (loss) | 7,500 | (1,000) | 3,250 | 9,750 |

### *Additional Information*

(i) Factory overhead costs are made up of fixed costs of Rs 5,850 and variable costs of Rs 3,900. Variable costs by products are; product A Rs 3,000, product B, Rs 400, and product C Rs 500.
(ii) Fixed costs and expenses will not be changed if product B is eliminated.
(iii) Variable selling and administrative expenses to the extent of Rs 11,000 can be traced to the product as follows: A, Rs 7,500; B, Rs 1,500; C, Rs 2,000.
(iv) Fixed selling and administrative expenses are Rs 10,000.

The decision to drop product B cannot be reasonably made from the above data prepared under a conventional income statement. This information together with the following statement may be helpful to management.

| | *Product A* Rs | *Product B* Rs | *Product C* Rs | *Total* Rs |
|---|---|---|---|---|
| Sales revenue | 50,000 | 7,500 | 12,500 | 70,000 |
| *Less:* Variable product Costs: | | | | |
| Direct material | 7,500 | 1,000 | 1,500 | 10,000 |
| Direct labour | 15,000 | 2,000 | 2,500 | 19,500 |
| Factory overhead | 3,000 | 400 | 500 | 3,900 |
| Selling and administrative expenses | 7,500 | 1,500 | 2,000 | 11,000 |
| | 33,000 | 4,900 | 6,500 | 44,400 |
| Contribution margin | 17,000 | 2,600 | 6,000 | 25,600 |
| *Less:* Fixed costs: | | | | |
| Factory overhead | | | | 5,850 |
| Selling and administrative expenses | | | | 10,000 |
| Total fixed costs | | | | 15,850 |
| Net income | | | | 9,750 |

This statement shows that product B exceeds its variable costs by Rs 2,600. If the sale of product B were discontinued, this marginal contribution would be lost and the net income of the firm would be reduced by Rs 2,600. That is, net income will be Rs 7,150 (Rs 9,750 – Rs 2,600). In this illustration it has been assumed that sales of products A and C will not be increased after product B is dropped. Further, it has been assumed that dropping product B will not change the fixed costs and expense. If these assumptions are not true, new analysis must be made. Assume, for example, that after dropping product B, the sales of product A increase by 10%. The total profit of the firm will not increase by this sales increase. Product A makes only a marginal contribution of 34%.

| | | |
|---|---|---|
| Sales revenue | Rs 50,000 | 100% |
| Variable costs | 33,000 | 66% |
| Marginal contribution | 17,000 | 34% |

On additional sales of Rs 5,000, the marginal contribution would be Rs 1,700;

| | |
|---|---|
| Sales revenue | Rs 5,000 |
| Variable costs (66%) | 3,300 |
| Marignal contribution (34%) | 1,700 |

This contribution is less than Rs 2,600 now being realised on the sales of product B. It would take additional sales of product A of approximately Rs 7,647 to equal the marginal contribution of Rs 2,600 now being made by product B:

$$\frac{\text{Marginal contribution of product B}}{\text{Marginal contribution of product A}} = \frac{2,600}{34\%} = \text{Rs } 7,647$$

It is possible that dropping product B may result in reduction in some of the fixed costs. Product B now contribute Rs 2,600 towards recovery of fixed costs and expenses. Only if the fixed costs and expenses can be reduced by more than this amount will it be advisable to drop product B.

## Sell or Process Further

The decision whether a product should be sold at the split-off point or processed further is faced by many manufacturers. The choice between selling a product at split-off or processing it further is a short-run operating decision. Additional processing adds value to a product and increases its selling price above the amount for which it could be sold at split-off. The decision to process further depends upon whether the increase in total revenues exceeds the additional costs incurred for processing beyond split-off. Generally speaking, there are two general conditions under which a sell or process further decision could occur.

1. The company is evaluating the possibility of processing beyond split-off and must incur certain equipment costs and other fixed costs if additional processing is to occur.
2. The company already processes a product beyond split-off and has invested in the equipment and required personnel.

The first situation is really a capital budgeting problem and here it is not sufficient to determine whether incremental revenues exceed incremental costs. Since new investments in machinery and building are involved, the rate of return on this investment must also be considered.

In the second situation, the relevent costs are only those costs which relate to the additional processing of each product beyond the split-off point. The joint costs are relevant to the further processing decisions. Certain fixed costs such as supervisory salaries are related to additional processing. If these costs are eliminated by selling products at split-off, they are incremental and should be included in the decision analysis. If salaried personnel are assigned other duties in the company when additional processing is discontinued, the salary costs are not incremental since they are incurred under either decision alternative. If the equipment used for additional processing sits idle or can be used in other processes, it should be ignored in the decision analysis. Depreciation expense is never relevant in short-run operating decisions, since depreciation is an allocation of costs incurred in a past period.

In deciding upon which course of action to follow, the company compares the contribution margin from the sale of the partially processed product with the contribution margin from the sale of the completely processed product. The revenue to be derived from the sale of the partially processed product is the opportunity cost attached to the decision of further processing. Assume, for example, a partially processed product can be sold for Rs 90 per unit which is manufactured at a cost of Rs 60. Further

processing can be done at an additional cost of Rs 30 per unit and the final product can be sold at Rs 150 per unit. The firm can produce 10,000 units. The analysis is shown below:

| | *Sell* | *Process and Sell* |
|---|---|---|
| Sales revenue (10,000 units) | Rs 900000 | Rs 1500000 |
| *Less:* Manufacturing costs | 600000 | 900000 |
| | 30,0000 | 60,0000 |

Net advantage in further processing Rs 6,00,000 – 3,00,000 = Rs 30,0000

Thus, there is a net advantage of Rs 30,000 in processing the product further. The market value of the partially processed product (Rs 9,00,000) is considered to be the opportunity cost of further processing.

The figure of net advantage of Rs 3,00,000 can be arrived at in the following manner also:

| | | |
|---|---|---|
| Revenue from sale of final product (10,000 × 15) | | Rs 15,00,000 |
| *Less:* Additional processing cost (10,000 × 3) | 3,00,000 | |
| Revenue from sale of intermediate product | 9,00,000 | 12,00,000 |
| Net advantage in further processing | | 3,00,000 |

## Operate or Shutdown

Differential cost analysis is also used when a business is confronted with the possibility of a temporary shutdown. This type of analysis has to determine whether in the short-run a firm is better off operating than not operating. As long as the products sold recover their variable costs and make a contribution towards the recovery of fixed costs, it may be preferable to operate and not to shutdown. Also management should consider the investment in the training of its employees which would be lost in the event of a temporary shutdown. Recruiting and training new workers would add to present costs. Another factor is the loss of established markets. Also, a temporary shutdown does not eliminate all costs. Depreciation, taxes, interest, and insurance costs are incurred during shutdown also. The other points (benefits) which should be considered are the following: avoiding operating losses, savings in maintenance and repair costs, savings in indirect labour costs, savings in fixed costs.

A company operating below 50% of its capacity expects that the volume of sales will drop below the present level of 10,000 units per month. Management is concerned that a further drop in sales volume will create a loss and has under consideration a recommendation that operations be suspended, until better market conditions prevail and also a better selling price. The present operating income statement is as follows:

| | | |
|---|---|---|
| Sales revenue (10,000 units @ Rs 3.00) | | Rs 30,000 |
| *Less:* Variable costs @ Rs 2.00 per unit | 20,000 | |
| Fixed costs | 10,000 | 30,000 |
| Net Income | | 0 |

The following income statements have been prepared for sales at different capacities:

| | Units Produced | | | | | |
|---|---|---|---|---|---|---|
| | Shutdown | 2,000 | 4,000 | 6,000 | 8,000 | 10,000 |
| Sales revenue @ Rs 3 | 0 | 6,000 | 12,000 | 18,000 | 24,000 | 30,000 |
| Variable costs @ Rs 2 | 0 | 4,000 | 8,000 | 12,000 | 16,000 | 20,000 |
| Contribution | 0 | 2,000 | 4,000 | 6,000 | 8,000 | 10,000 |
| Fixed costs | 4,000 | 10,000 | 10,000 | 10,000 | 10,000 | 10,000 |
| Loss | 4,000 | 8,000 | 6,000 | 4,000 | 2,000 | 0 |

It would appear that shutdown is desirable when the sales volume drops below 6,000 units per month, the point at which operating losses exceed the shutdown cost. This volume of 6,000 units could be arrived at without an income statement as follows:

| | |
|---|---|
| Fixed costs if plant operates | Rs 10,000 |
| Fixed costs if plant shutsdown | 4,000 |
| Additional cost to be recovered when operating | 6,000 |

Each unit of product sold contributes Re 1.00 to fixed costs recovery:

| | |
|---|---|
| Selling price per unit | Rs 3.00 |
| Variable cost per unit | Rs 2.00 |
| Contribution | Rs 1.00 |

Sale of 6,000 units is necessary to recover Rs 6,000 of fixed costs.

$$\frac{\text{Rs } 6{,}000}{\text{Re } 1.00} = 6{,}000 \text{ units}$$

If the selling price is cut to Rs 2.80, the contribution margin will be Re 0.80 per unit. Required sale to recover an additional Rs 6,000 of fixed costs.

$$\frac{\text{Rs } 6{,}000}{\text{Re } 0.80} = 7{,}500 \text{ units}$$

That is, sales of 7,500 units would be necessary to recover an additional Rs 6,000 of fixed costs.

## Special Orders

The question of special orders or one time orders arises when a company has excess or idle production capacity and management considers the possibility of selling additional products at less than normal selling prices, provided that such a special order will not affect the regular sales of the same product.

The basic problem is to determine an acceptable price for the special order units. Cost analysis using the contribution approach is a useful technique to determine the short-run profit effects of special order transactions. In deciding the pricing of special orders where normal operations are not disturbed and where unused production capacity exists, it is not advisable to attach fixed costs to products. Price determination should take into account the recovery of incremental (variable) costs caused by accepting the special order. If the normal fixed costs are included in the price of the special order, the price may be too high and the business firm could lose the entire order and the contribution margin to be earned on the special order. Only the relevant (variable) costs should be used in the decision analysis to arrive at an appropriate price. Fixed costs are relevant only if incurred to facilitate the special order.

The following example illustrates the special order decisions.

A manufacturing company produces 20,000 units by operating at 60% of the capacity and sells at a price of 30 per unit. The budgeted figures for the year 2003 are as follows:

| | *Production* (20,000 units) |
|---|---|
| Raw material @ Rs 4.25 | Rs 85,000 |
| Direct labour @ Rs 5.75 | 1,15,000 |
| Variable factory overhead @ 7.75 | 1,55,000 |
| Fixed factory overhead | |
| Variable selling costs 2.75% of selling price | 1,25,000 |
| Fixed selling and administrative costs | 72,500 |

The company receives a special order for 10,000 units from a firm. The company desires to earn a profit of Re 1.00 per unit and no selling expenses are to be incurred for the special order. The minimum price on the special order and income statements are as follows:

**Pricing of Special Order**

| | *(10,000 units)* (Rs) |
|---|---|
| Variable costs to be incurred: | |
| Raw materials | 4.25 |
| Direct labour | 5.75 |
| Variable overhead | 7.75 |
| Variable cost per unit | 17.75 |
| (no selling expenses) | 1.00 |
| Desired profit | 18.75 |
| Minimum price | |

Increase in sales = 10,000 units × Rs 18.75 = Rs 1,87,500

**Income Statement**

| | *Without special order* (Rs) | *Special order* (Rs) | *With special order* (Rs) |
|---|---|---|---|
| Sales | 6,00,000 | 1,87,500 | 7,87,500 |
| *Less:* Variable costs: | | | |
| Raw materials | 85,000 | 42,500 | 1,27,500 |
| Direct labour | 1,15,000 | 57,500 | 1,72,500 |
| Variable factory overhead | 1,55,000 | 77,500 | 2,32,500 |
| Variable selling costs (2.75% of selling price) | 16,500 | – | 16,500 |
| Total variable costs | 3,71,500 | 1,77,500 | 5,49,000 |
| *Less:* Fixed costs: | | | |
| Fixed factory overhead | 1,25,000 | – | 1,25,000 |
| Fixed selling and administrative cost | 72,500 | – | 72,500 |
| Total fixed costs | 1,97,500 | – | 1,97,500 |
| Total costs | 5,69,000 | 1,77,500 | 7,46,500 |
| Net income before taxes | 31,000 | 10,000 | 41,000 |

From the above analysis it is clear that the acceptance of the special order will increase the profit by Rs 10,000. Also the bid price (Rs 18.75) is significantly less than the normal price of Rs 30. However, before arriving at a proper decision, management should consider some qualitative factors other than just the immediate impact on income. An important point is the effect on regular customers. If regular customers are paying more for the products, they may demand price reduction or quit buying from the firm and seek another source of supply. Another consideration is the possibility of special order customers being the regular customers.

### Replace or Retain

The decision to replace or retain plant and equipment is also an important decision and should be taken very carefully. The differential costs which are important in retain or replace decisions are the following: change in fixed overhead costs, loss on sale of old equipment, capital investment and related costs such as rate of return and interest. Management should also consider differential benefits likely to be derived such as higher production and increased sales, realisable value of old machine, savings in operating costs, tax advantages, if any. Suppose a company has purchased a plant for Rs 1,00,000 five years ago which has a life of 10 years with no salvage value. The present book value is Rs 50,000. Management is considering the replacement of this plant with a new plant costing Rs 80,000 having a life of five years with no scrap value at the end of its life. The costs of operating present plant and the proposed palnt are as follows:

| | *Present plant* (Rs) | *Proposed plant* (Rs) |
|---|---|---|
| Variable costs: | | |
| Labour, supplies, power, etc. | 80,000 | 48,000 |
| Fixed costs: | 10,000 | 12,000 |
| Insurance, taxes, etc. | 10,000 | 16,000 |
| Depreciation | 1,00,000 | 76,000 |

It appears that the proposed plant would result into cost savings of Rs 24,000 (Rs 1,00,000 – 76,000). However, the book value of the present equipment is a sunk cost and not relevant in the decision. The following table helps in making a better analysis of the data:

| | *Present plant* Rs | *Proposed plant* Rs |
|---|---|---|
| Variable costs: | | |
| Labour, supplies, power, etc. | 80,000 | 48,000 |
| Fixed costs: | | |
| Insurance, taxes, etc. | 10,000 | 12,000 |
| Depreciation | 0 | 16,000 |
| | 90,000 | 76,000 |

The purchase of the new plant results in a saving of Rs 14,000 (Rs 90,000 – 76,000). Management has to consider whether this benefit is enough to justify the investment of Rs 80,000 in new machinery.

## LIMITATIONS OF DIFFERENTIAL COST ANALYSIS

Differential cost analysis helps in evaluating decision alternatives. Relevant costs are the cost factors that differ between alternatives. The primary objective is to select the least costly alternative. However,

cost computations and profit estimates are one means of tackling such problems. Many projects and proposals are rejected simply because the costs involved are too high or relative income potential was lower than that of an alternative. Yet, the project may have been beneficial to the company in that it would have allowed the company to balance its risk, or to offer a complete product line which would have attracted new customers to all the company's products. Perhaps this is the very reason why the cost accountant needs to be extremely careful in the translation of the data with which he works.

Managers must study carefully the data to be used in decision-making. Other qualitative factors besides cost should be given proper attention. The pressure of competition, the maintenance of sources of supply and of certain marketing outlets, and the maintenance of the existing personnel organisation and morale may often be the real determinants of business decisions. The quantitative information alone does not provide a solution to all business problems. Sometimes, other factors are more important than cost factors.

### *Example 17.1 (Differential Cost Analysis)*

P Ltd., is at present operating at 80% capacity level, the production being 15,000 units per annum. The company operates a flexible budgetary control system. The following relevant cost data are obtained from the company's budget at different capacity utilisation levels:

| | Capacity utilisation level | |
|---|---|---|
| | *80%* | *100%* |
| Sales | Rs 20,00,000 | Rs 25,00,000 |
| Variable overheads | Rs 2,25,000 | Rs 2,50,000 |
| Semi-variable Overheads | Rs 1,05,000 | Rs 1,11,000 |
| Fixed overheads | Rs 4,00,000 | Rs 4,70,000 |
| Output (in Units) | 15,000 | 18,750 |

Material and labour cost per unit are constant under present conditions. The management expects a profit margin of 10% on sales.

You are required to compute the differential cost of producing the additional 3,750 units by increasing the capacity utilization level to 100 per cent and the minimum price per unit at 10% profit on cost.

*(B. Com. Hons. Delhi 2001)*

*Solution*

| | | Rs |
|---|---|---|
| Sales at 80% capacity | | 20,00,000 |
| *Less:* Profit 10% $\left(\frac{20,00,000 \times 10}{100}\right)$ | | 2,00,000 |
| Cost of goods sold: | | 18,00,000 |
| *Less:* Expenses | Rs | |
| Variable overheads | 2,25,000 | |
| Semi-variable overheads | 1,05,000 | |
| Fixed overheads | 4,00,000 | 7,30,000 |
| Cost of material and labour at 80% capacity | | 10,70,000 |

Therefore, material and labour cost at 100% capacity

$$\frac{10,70,000 \times 100}{80} = \text{Rs } 13,37,500$$

Differential cost analysis is as follows:

| | *80% Capacity 15,000 units* | *100% Capacity 18,750 units* | *Differential cost* |
|---|---|---|---|
| | Rs | Rs | Rs |
| Material and Labour | 10,70,000 | 13,37,500 | 2,67,500 |
| Variable Expenses | 2,25,000 | 2,50,000 | 25,000 |
| Semi-variable Exp. | 1,05,000 | 1,11,000 | 6,000 |
| Fixed Expenses | 4,00,000 | 4,70,000 | 70,000 |
| Total Cost | 18,00,000 | 21,68,500 | 3,68,500 |

(a) Differential Cost for 3750 Units = Rs 3,68,500

(b) Minimum Price = $\frac{\text{Rs } 3,68,500}{3750 \text{ units}}$ Rs 98.266

*Add:* 10% Profit on cost 9.826

108.092

### *Example 17.2 (Deciding Mode of Conveyance)*

A company is considering three alternative proposals for conveyance facilities for its sales personnel who have to do considerable travelling, approximately 20,000 kilometres every year.

The proposals are as follows:

(i) Purchase and maintain its own fleet of cars. The average cost of car is Rs 1,00,000.

(ii) Allow the Executive use his own car and reimburse expenses at the rate of Rs 1.60 paise per kilometre and also bear insurance costs.

(iii) Hire cars from an agency at Rs 20,000 per year per car. The company will have to bear costs of petrol , taxes and tyres.

The following further details are available:

Petrol Re. 0.60 per kilometre
Repairs and maintenance Re 0.20 per kilometre
Tyre Re 0.12 per kilometre
Insurance Rs 1,200 per car per annum
Taxes Rs 800 per car per annum
Life of the car : 5 years with annual milage of 20,000 kilometres.
Resale value : Rs 20,000 at the end of the fifth year.
You are required to work out the relative costs of the three proposals and rank them.

*(B. Com. Hons. Delhi, 2001)*

*Solution*

| | Alternatives (Cost per km Rs) | | |
|---|---|---|---|
| | (i) (Rs) | (ii) (Rs) | (iii) (Rs) |
| Petrol | 0.60 | – | 0.60 |
| Repairs and Maintenance | 0.20 | – | – |
| Tyres | 0.12 | – | 0.12 |
| Insurance (1200 ÷ 20,000 km) | 0.06 | 0.06 | – |
| Taxes (800 ÷ 20,000 km) | 0.04 | – | 0.04 |

| | | | |
|---|---|---|---|
| Depreciation: $\frac{1,00,000 - 20,000}{5 \times 20,000}$ | 0.80 | – | – |
| Reimbursement of Expenses | – | 1.60 | – |
| Hire Charges (20,000 ÷ 20,000) | – | – | 1.00 |
| | 1.82 | 1.66 | 1.76 |
| Cost of 20,000 kms | 36,400 | 33,200 | 35,200 |

∴ The Proposal should be selected in order of (ii), (iii) and (i)

***Example 17.3 (Differential Cost Computation)***

A company has an installed production capacity of 1,00,000 units and presently it is working at 70% capacity utilisation. As production capacity utilisation increases, cost per unit decreases as follows:

| *Capacity utilisation* | *Cost per unit* |
|---|---|
| 70% | Rs 97 |
| 80% | Rs 92 |
| 90% | Rs 87 |
| 100% | Rs 82 |

The company has received three export orders from different sources as under:
Source A–5,000 units at Rs 55 per unit
Source B–10,000 units at Rs 52 per unit
Source C–10,000 units at Rs 51 per unit

Advise the company whether any or all the export orders should be accepted or not.

*(B. Com. Hons. Delhi 2000)*

*Solution*

**Statement showing Differential Costs at Different Capacity Utilisation Levels (Installed Capacity 1,00,000 units)**

| *Capacity Utilisation* | *Production at different levels capacity utilisation* | *Unit cost Rs* | *Total cost Rs* | *Differe-ntial cost Rs* | *Differential cost per unit Rs* |
|---|---|---|---|---|---|
| *Percent* | *Units* | | | | |
| 70 | $70,000\left(1,00,000 \times \frac{70}{100}\right)$ | 97 | 67,90,000 | – | – |
| 80 | $80,000\left(1,00,000 \times \frac{80}{100}\right)$ | 92 | 73,60,000 | 5,70,000 | $57\left[\frac{5,70,000}{10,000}\right]$ |
| 90 | $90,000\left(1,00,000 \times \frac{90}{100}\right)$ | 87 | 78,30,000 | 4,70,000 | $47\left[\frac{4,70,000}{10,000}\right]$ |
| 100 | 1,00,000 | 82 | 82,00,000 | 3,70,000 | $37\left[\frac{3,70,000}{10,000}\right]$ |

**Statement showing Profit or Loss Accepting the Various Export Orders**

| *Export order source* | *Export order* | *Capacity utilisation* | *Differential costs* | | *Price per unit* | *Sales revenue from the export order* | *Profit or (loss)* |
|---|---|---|---|---|---|---|---|
| | | | *Per unit* | *Total* | | | |
| | *Unit* | *Percent* | *Rs* | *Rs* | *Rs* | *Rs* | *Rs* |
| A | 5,000 | 75 | 57 | 2,85,000 | 55 | 2,75,000 | (10,000) |
| B | 10,000 | 85 | First 5,000 units being upto 80% @ Rs 57 Next 5,000 units Rs @ Rs 47 | 5,20,000 | 52 | 5,20,000 | Nil |
| C | 10,000 | 95 | First 5,000 units being upto 90% @ Rs 47 Next 5,000 units @ Rs 7 | 4,20,000 | 51 | 5,10,000 | 90,000 |
| Total | 25,000 | 95% | | 12,25,000 | | 13,05,000 | 80,000 |

It is clear from the above statement that it is advantageous for the company only when it accepts all the export orders. If the company accepts export orders only for one or two of three sources, it will suffer a loss. Therefore, the company should accept export orders from all the three sources to earn additional profits.

### *Example 17.4 (Material Procurement Decision)*

A Company has the option to procure a particular material from two sources:

Source I assures that defectives will not be more than 2% of supplied quantity.

Source II does not give any assurance, but on the basis of past experience of supplies received from it, it is observed that defective percentage is 2.8%.

The material is supplied in lots of 1,000 units. Source II supplies the lot at a price, which is lower by Rs 100 as compared to Source I. The defective units of material can be rectified for use at a cost of Rs 5 per unit.

You are required to find out which of the two sources is more economical.

*(CA Inter May 2001)*

*Solution*

**Comparative Statement of Procuring Material from Two Sources**

| | *Material source I* | *Material source II* |
|---|---|---|
| Defectives (in%) | 2 *(Future estimate)* | 2.8 *(Past experience)* |
| Units supplied *(in one lot)* | 1,000 | 1,000 |
| Total defective units in a lot | 20 *(1,000 units × 2%)* | 28 *(1,000 units × 2.8%)* |
| Additional price paid per lot (Rs): (A) | 100 | - |
| Rectification cost of defect (Rs) (B) | 100 *(20 units × Rs 5)* | 140 *(28 units × Rs 5)* |
| Total additional cost per (Rs): {(A) + (B)} | 200 | 140 |

*Decision:* On comparing the total additional cost incurred per lot of 1,000 units, we observe that it is more economical, if the required material units are procured from material Source II.

***Example 17.5 (Selling Price Decision)***

The accounts of a company are expected to reveal a profit of Rs 14,00,000 after charging fixed costs of Rs 10,00,000 for the year ended 31st March, 2000. The selling price of the product is Rs 50 per unit and variable cost per unit is Rs 20.

Market investigations suggest the following responses to the price changes:

| *Alternatives* | *Selling Price reduced by* | *Quantity Sold increased by* |
|---|---|---|
| I | 5% | 10% |
| II | 7% | 20% |
| III | 10% | 25% |

Evaluate these alternatives and state which of the alternatives, on profitability consideration, should be adopted for the forthcoming year.

*(CA Inter Nov. 2000; B. Com. (Hons) Delhi 2001)*

*Solution*

**Statement for evaluating three alternatives on profitability consideration**

| | *Alternatives* | | |
|---|---|---|---|
| | *I* | *II* | *III* |
| Selling price per unit (Rs) | 47.50 (Rs 50 – 5% of Rs 50) | 46.50 (Rs 50 – 7% of Rs 50) | 45.00 (Rs 50 – 10% of Rs 50) |
| *Less:* Variable cost per unit (Rs) | 20.00 | 20.00 | 20.00 |
| Contribution per unit (Rs) | 27.50 | 26.50 | 25.00 |
| Revised quantity of units to be sold *(Refer to Working Note 3)* | 88,000 | 96,000 | 1,00,000 |
| Total contribution (Rs) | 24,20,000 (88,000 units × Rs 27.50) | 25,44,000 (96,000 units × Rs 26.50) | 25,00,000 (1,00,000 units × Rs 25) |

*Recommendation:* An evaluation of the above three alternatives on profitability consideration clearly shows that alternative II is the best as it gives maximum contribution and hence profitability. Therefore this alternative should be adopted.

**Working Notes:**

1. *Contribution per unit*

   = Rs Selling price per unit – Variable cost per unit

   = Rs 50 – Rs 20 = Rs 30

2. *Expected quantity of units to be sold*

| | (Rs) |
|---|---|
| Profit | 14,00,000 |
| *Add:* Fixed costs | 10,00,000 |
| Total contribution | 24,00,000 |

$$\text{Quantity of units sold} = \frac{\text{Total contribution}}{\text{Contribution per unit}} = \frac{\text{Rs } 24,00,000}{\text{Rs } 30} = 80,000 \text{ units}$$

*(Refer to working note 1)*

3. *Revised quantity of units to be sold*

| *Alternatives* | *Units to be sold* |
|---|---|
| I | 80,000 units + 10% of 80,000 units = 88,000 units |
| II | 80,000 units + 20% of 80,000 units = 96,000 units |
| III | 80,000 units + 25% of 80,000 units = 1,00,000 units |

### *Example 17.6 (Dropping a Product)*

The costs per unit of three products *X*, *Y* and *Z* are given below:

| *Products* | X | Y | Z |
|---|---|---|---|
| Direct Material (Rs) | 20 | 16 | 18 |
| Direct Labour (Rs) | 12 | 14 | 12 |
| Variable Overheads (Rs) | 8 | 10 | 6 |
| Fixed Expenses (Rs) | 6 | 6 | 4 |
| | Rs 46 | 46 | 40 |
| Profit | 18 | 14 | 12 |
| Selling Price (Rs) | 64 | 60 | 52 |
| No. of units produced | 10,000 | 5,000 | 8,000 |

Production arrangements are such that if one product is given up the production of the others can be raised by 50%. The directors propose that product Z should be given up because the contribution from the product is the lowest. Present suitable analysis of the data indicating whether the proposal should be accepted. *(B. Com Hons Delhi 1998)*

*Solution*

1. *Computation of present Profit*

| | Rs |
|---|---|
| Product *X* (10,000 × 18) | 1,80,000 |
| Product *Y* (5,000 × 14) | 70,000 |
| Product *Z* (8,000 × 12) | 96,000 |
| | 3,46,000 |

2. *Computation of Fixed Cost*

| | Rs |
|---|---|
| Product X (10,000 × 6) | 60,000 |
| Product Y (5,000 × 6) | 30,000 |
| Product Z (8,000 × 4) | 32,000 |
| | 1,22,000 |

3. Computation of Profit Under Proposed Situation (*Product Z discontinued*)

| | |
|---|---|
| Product X (15,000 × 40) | Rs 6,00,000 |
| Product Y (7,500 × 40) | 3,00,000 |
| | 9,00,000 |
| *Add:* Total Fixed Cost [as per calculation above] | 1,22,000 |
| Total Cost (1) | 10,22,000 |
| Sales: | |
| Product X (15,000 × 64) | 9,60,000 |
| Product Y (7,500 × 60) | 4,50,000 |
| Total Sales (2) | 14,10,000 |
| Profit = (2) – (1) = (3) | = 3,88,000 |

Thus, the profit under the proposed situation will increase by Rs 42,000 (i.e. 3,88,000 – 3,46,000). Hence, the proposal for discontinuance of Product Z should be accepted.

*Note:* It has been assumed that fixed costs of Rs 1,22,000 are for the business as a whole. They have been simply apportioned to Product X, Y, and Z and they will continue to be same even after the Product Z is discontinued.

### *Example 17.7 (Decision to Increase Sales)*

Quality Product Limited has drawn up the following budget for the year 1998–99:

| | Rs |
|---|---|
| Raw Materials | 20,00,000 |
| Labour, stores, power and other variable costs | 6,00,000 |
| Fixed Manufacturing Overheads | 7,00,000 |
| Packing and variable distribution cost | 4,00,000 |
| Fixed general overheads including selling | 3,00,000 |
| | 40,00,000 |
| Sales Revenue @ Rs 50 per unit | 50,00,000 |
| Budgeted Profit | Rs 10,00,000 |

The General Manager suggests to reduce selling prices by 5% and expects to achieve an additional volume of 5%. The more intensive manufacturing programme will involve additional costs of Rs 15,000 for production planning. It will also be necessary to open an additional sales office at the cost of Rs 1,00,000 per annum.

The Sales Manager, on the other hand, suggests to increase selling price by 10% which it is estimated will reduce sales volume by 10%. At the same time a saving in manufacturing overheads and general overheads of Rs 50,000 and Rs 1,00,000 per annum respectively is expected on this reduced volume.

Which of these two proposals would you accept and why? Show complete working.

*(B. Com. (Hons) Delhi 1998)*

*Solution*

**Computation of Profit as per Proposal of General Manager**

| | | |
|---|---|---|
| 1. New Sales Volume (Units 1,00,000 + 5%) | | 1,05,000 |
| | | Rs |
| 2. Sales Value (1,05,000 × 4.750) | | 49,87,500 |
| 3. Cost of Sales: | | |
| Variable Costs = $\frac{30,00,000}{1,00,000} \times 1,05,000$ | | 31,50,000 |
| Fixed Cost: | | |
| Present = 7,00,000 + 3,00,000 | | 10,00,000 |
| Additional Fixed Cost | | 1,15,000 |
| Total Costs | | 42,65,000 |
| Profit (2) – (3) = (4) | | 7,22,500 |

**Computation of Profit as per Proposal of Sales Manager**

| | | |
|---|---|---|
| 1. Sales Volume (1,00,000 – 1,000) | | 9,00,000 |
| | | Rs |
| 2. Sales Value (90,000 × 55) | | 49,50,000 |
| 3. Cost of Sales | | |
| Variable Cost = $\frac{30,00,000}{1,00,000} \times 90,000$ | | 27,00,000 |
| Fixed Cost: | | |
| Present | 10,00,000 | |
| *Less:* Saving in Fixed Cost | 1,50,000 | 8,50,000 |
| Total Cost | | 35,50,000 |
| Profit = (2) – (3) | | 14,00,000 |

The profit as per the proposal of Sales Manager is much higher as compared to the proposal of the General Manager. Hence, the proposal of the Sales Manager should be accepted.

### *Example 17.8 (Minimum Price Decision)*

An umbrella manufacturer makes an average profit of Rs 2.50 per unit on a selling price of Rs 14.30 by producing and selling 60,000 units at 60 per cent of potential capacity.

His cost of sales per unit is as follows:

| | |
|---|---|
| Direct Materials | Rs 3.50 |
| Direct Wages | Rs 1.25 |
| Factory Overhead | Rs 6.25 (50% fixed) |
| Sales Overhead | Re 0.80 (25% variable) |

During the current year, he intends to produce the same number but estimates that his fixed costs would go up by 10 per cent while the rates of direct wages and direct materials will increase by 8% and 6% respectively. However, the selling price cannot be changed.

Under this situation, he obtains an offer for a future 20% of his potential capacity.

What minimum price would you recommend for acceptance of the offer to ensure the manufacturer an overall profit of Rs 1,67,300?

*(B. Com. Hons Delhi 1996)*

*Solution*

**Statement of Marginal Cost for Current Year**

| | | *Per units* |
|---|---|---|
| Direct Material | Rs 3.50 +.21 | 3.71 |
| Direct Wages | Rs 1.25 + .10 | 1.35 |
| Variable Overheads | | |
| Factory Overheads | | 3.125 |
| Selling Overheads | | 0.20 |
| Total Marginal Cost | | 8.385 |
| Contribution per unit | | 5.915 |
| Selling Price | | 14.300 |

**Statement of Profit**

| | | | *Output 60,000 units* |
|---|---|---|---|
| Sales (60,000 × 14.30) | | | Rs 8,58,000 |
| *Less:* Variable Costs (60,000 × 3.385) | | | 5,03,100 |
| Contribution | | | 3,54,900 |
| *Less:* Fixed Costs: | | | |
| Factory Overheads 60,000 × 3.125 = | | 1,87,500 | |
| *Add:* 10% Increase | | 18,750 | |
| | | 2,06,250 | |
| Sales Overheads | 36,000 | | |
| *Add:* 10% Increase | 3,600 | 39,600 | 2,45,850 |
| Profit | | | 1,09,050 |
| Desired Profit | | | 1,67,300 |
| Profit on 60,000 units | | | 1,09,050 |
| Profit to be earned on 20,000 units | | | 58,250 |

**Statement of Minimum Selling Price for 20,000 Units**

| | Rs |
|---|---|
| Variable Cost (20,000 × 8.385) | 1,67,700 |
| Desired Profit | 58,250 |
| Total Sales | 2,25,950 |

Selling Price per unit $\frac{2,25,950}{20,000}$ = Rs 11.30

### *Example 17.9 (Product profitability)*

The following particulars are taken from the records of a company engaged in manufacturing two products, A and B, from a certain material:

| *Particulars* | *Product A (per unit) Rs* | *Product B (per unit) Rs* |
|---|---|---|
| Sales | 2,500 | 5,000 |
| Material cost (Rs 50 per kg) | 500 | 1,250 |
| Direct labour ( 30 per hour) | 750 | 1,500 |
| Variable overhead | 250 | 500 |
| Total fixed overheads: Rs 10,00,000 | | |

Comment on the profitability of each product when:

(i) Total sales in value is limited.
(ii) Raw materials is in short supply.
(iii) Production capacity is the limiting factor.
(iv) Total availability of raw materials is 20,000 kg and maximum sales potential of each product is 1,000 units, find the product mix to yield maximum profits.

*(CA Inter Nov 1998)*

*Solution*

*Basic Calculations*

**Statement of Evaluation of Products A and B**

| *Particulars* | *Product A* | | *Product B* | |
|---|---|---|---|---|
| | *Rs* | *Rs* | *Rs* | *Rs* |
| Sales | | 2,500 | | 5,000 |
| *Less:* Variable Costs: | | | | |
| Material Cost | 500 | | 1,250 | |
| Direct Labour | 750 | | 1,500 | |
| Variable Overhead | 250 | | 500 | |
| | | 1,500 | | 3,250 |
| 1. Contribution per unit | | 1,000 | | 1,750 |
| 2. P/V Ratio | $\frac{1,000}{2,500} \times 100$ | | $\frac{1,750}{5,000} \times 100$ | |
| | = 40% | | 35% | |
| 3. Material in kg per unit | $= \frac{\text{Rs } 500}{\text{Rs } 50}$ | | $\frac{\text{Rs } 1,250}{\text{Rs } 50}$ | |
| | = 10 kg | | 25 kg | |
| 4. Contribution per kg of Material | = Rs 100 | | Rs 70 | |
| 5. Labour hour per unit | $= \frac{\text{Rs } 750}{30}$ | | $\frac{1,500}{30}$ | |
| | = 25 hours | | = 50 hours | |
| 6. Contribution per Labour Hour | = Rs 40 | | Rs 35 | |

(i) *Comment on the Profitability of each product when total sales in value is limited*
Product A has a higher P/V ratio than Product B and hence Product A is more profitable.

(ii) *Comment on the Profitability of each product when raw materials is in short supply*
Product A has a higher contribution per kg of raw material than Product B. Hence, Product A is more profitable.

(iii) *Comment on the Profitability of each product when production capacity is the limiting factor*
Product A has a higher contribution per labour hour than Product B. Hence, Product A is more profitable.

(iv) *When raw material and sales quantity both are limiting factors*

**Statement of Product Mix to Yield Maximum Profits**
***(When total availability of raw material is 20,000 kg)***

| *Products* | *Units to be made* | *Raw material consumed (kg)* | *Contribution per unit (Rs)* | *Total Contribution (Rs)* | *Fixed Cost (Rs)* | *Cost (Rs)* | *Profit (Rs)* |
|---|---|---|---|---|---|---|---|
| *(I)* | *(II)* | *(III)* | *(IV)* | *(V)* | *= (II) × (IV)* | *(VI)* | *(VII) = (V) – (VI)* |
| A | 1,000 | 10,000 (1,000 units × 10 kg.) | 1,000 | | 10,00,000 | | |
| B | 400 | 10.000 (400 units × 25 kg.) | 1,750 | 7,00,000 | | | |
| | 20,000 | | | 17,00,000 | 10,00,000 | 7,00,000 | |

### *Example 17.10 (Replacement of a Product)*

A multi product company has the following costs and output data for the last year.

| | *Product* | | |
|---|---|---|---|
| | *X* | *Y* | *Z* |
| Sales mix | 40% | 35% | 25% |
| | Rs | Rs | Rs |
| Selling price | 20 | 25 | 30 |
| Variable cost per unit | 10 | 15 | 18 |
| Total fixed cost | | | 1,50,000 |
| Total sales | | | 5,00,000 |

The company proposes to replace product Z by product S. Estimated cost and output data are:

| | | | |
|---|---|---|---|
| Sales mix | 50% | 30% | 20% |
| Selling price | 20 | 25 | 28 |
| Variable cost per unit | 10 | 15 | 14 |
| Total fixed costs | | | 1,50,000 |
| Total sales | | | 5,00,000 |

Analyse the proposed change and suggest what decision the company should take.

*(ICWA, Inter)*

*Solution*

**(I) Computation of Present Profit and BEP**

| Particula | *Products* | | | |
|---|---|---|---|---|
| | *X* | *Y* | *Z* | |
| | Rs | Rs | Rs | |
| Selling price | 20 | 25 | 30 | |
| Variable cost | 10 | 15 | 18 | |
| Contribution | 10 | 10 | 12 | |
| P/V ratio | 50% | 40% | 40% | |
| Sales mix | 40% | 35% | 25% | 100% |
| Contribution per rupee of sales: (P/V ratio × Sales mix) | 20% | 14% | 10% | 44% |
| Sales | | | | Rs 5,00,000 |
| Total contribution Rs (5,00,000 × 44/100) | | | | 2,20,000 |
| Fixed costs | | | | 1,50,000 |
| Profit | | | | Rs 70,000 |
| Break-even point (Rs 1,50,000 × 100/44) | | | | Rs 3,40,909 |

**(2) Computation of Proposed Profit and BEP**

| Particula | *Products* | | | *Total* |
|---|---|---|---|---|
| | *X* | *Y* | *Z* | |
| | Rs | Rs | Rs | |
| Selling price | 20 | 25 | 28 | |
| Variable cost | 10 | 15 | 14 | |
| Contribution | 10 | 10 | 14 | |
| P/V Ratio | 50% | 40% | 50% | |
| Sales mix | 50% | 30% | 20% | 100% |
| Contribution per rupee of sales (P/V ratio × Sales mix) | 25% | 12% | 10% | 47% |
| Sales | | | | Rs 5,00,000 |
| Total contribution 5,00,000 × 47/100 | | | | 2,35,000 |
| Fixed cost | | | | 1,50,000 |
| Profit | | | | Rs 85,000 |
| Break-even point ( 1,50,000 × 100/47) | | | | 3,19,149 |

A comparison of the present situation and the proposed situation shows that if product Z is replaced by product S, profit would increase by Rs 15,000 and break-even point will reduce by Rs 21,760. The change is beneficial and, therefore, product Z may be dropped, provided all other relevant factors remain constant.

### *Example 17.11 (Decision about New Market)*

A company annually manufactures 10,000 units of a product at a cost of 4 per unit and there is home market for consuming the entire volume of production at the sale price of 4.25 per unit. In the year 2002, there is a fall in the demand for home market which can consume 10,000 units only at a sale price of Rs 3.72 per unit. The analysis of cost per Rs 10,000 units is:

| | |
|---|---|
| Materials | Rs 15,000 |
| Wages | 11,000 |
| Fixed overheads | 8,000 |
| Variable overheads | 6,000 |

The foreign market is explored and it is found that this market can consume 20,000 units of the product if offered at sale price of 3.55 per unit. It is also discovered that for additional 10,000 units of the product (over initial 10,000 units) the fixed overheads will increase by 10 per cent. Is it worthwhile to try to capture the foreign market?

*Solution*

**Statement showing the Advisability of Selling Goods in Foreign Market**

| | *Year 2001* | *Year 2002* | | |
|---|---|---|---|---|
| | *Home market 10,000 (1) Rs* | *Home market 10,000 (2) Rs* | *Foreign market 20,000 (3) Rs* | *Total 30,000 units (4) Rs* |
| Materials | 15,000 | 15,000 | 30,000 | 45,000 |
| Wages | 11,000 | 11,000 | 22,000 | 33,000 |
| Overheads: | | | | |
| Fixed | 8,000 | 8,000 | 1,600 | 9,600 |
| Variable | 6,000 | 6,000 | 12,000 | 18,000 |
| Total cost | 40,000 | 40,000 | 65,600 | 1,05,600 |
| Profit (loss) | 2,500 | (2,800) | 5,400 | 2,600 |
| Sales | 42,500 | 37,200 | 71,000 | 1,08,200 |

From the above it is clear that it is advisable to sell goods in the foregin market. It will compensate not only for the loss on account of sale in the domestic market but will also result in an overall profit of Rs 2,600.

### *Example 17.12 (Export Offer)*

Due to industrial depression, a plant is running, at present, at 50% of its capacity. The following details are available.

| | *Cost of production per unit* |
|---|---|
| Direct material | Rs 2 |
| Direct labour | 1 |
| Variable overhead | 3 |
| Fixed overhead | 2 |
| | 8 |

| | |
|---|---|
| Production per month | 20,000 units |
| Total cost of production | Rs 1,60,000 |
| Sale price | 1,40,000 |
| Loss | 20,000 |

An exporter offers to buy 5,000 units per month at the rate of Rs 6.50 per unit and the company hesitates to accept the offer for fear of increasing its already large operating losses.

Advise whether the company should accept or decline this offer.

*Solution*

**Statement of Profit**

| | *Existing situation* | *Proposed situation* | | |
|---|---|---|---|---|
| | 20,000 Units | 20,000 Units | 5,000 Units | Total 25,000 Units |
| A. Sales Rs | 1,40,000 | 1,40,000 | 32,500 | 1,72,500 |
| B. Variable costs: (Rs) | | | | |
| Direct material | 40,000 | 40,000 | 10,000 | 50,000 |
| Direct labour | 20,000 | 20,000 | 5,000 | 25,000 |
| Variable overheads | 60,000 | 60,000 | 15,000 | 75,000 |
| Total variable cost | 1,20,000 | 1,20,000 | 30,000 | 1,50,000 |
| C. Contribution (A) – (B) (Rs) | 20,000 | 20,000 | 2,500 | 22,500 |
| D. Fixed costs (Rs) | 40,000 | 40,000 | – | 40,000 |
| Profit (loss) Rs | (20,000) | (20,000) | 2,500 | (17,500) |

The company should accept the offer since the amount of loss will stand reduced from 20,000 to Rs 17,500.

### *Example 17.13 (Decision about Mechanisation)*

Management of a manufacturing unit is considering extensive modernisation of the factory through progressive mechanisation which would result in improved productivity and reduced strength. Through negotiations with the union, it was agreed that for every 1% increase in productivity, workers would be paid 0.5% incentive wages. It was also agreed that through voluntary retirement the staff strength would be reduced to 300 from the present level of 400. The following further comparative data are available before and after the proposed mechanisation:

| | *Before mechanisation* | *After mechanisation* |
|---|---|---|
| No. of articles produced per month | 50,000 | 48,000 |
| Fringe benefits | 50% of wages | |
| Wages paid per month | Rs 4,00,000 | |
| Sales per month (value) | Rs 24,00,000 | |
| P/V ratio | 25% | |

Based on the above data, you are required to work out the annual financial implication of the proposal. *(ICWA Inter)*

*Solution*

Improvement in productivity after mechinisation:

Proportionate output of 300 workers on the basis of existing productivity level—

$$\frac{50,000}{400} \times 300 = 37,500 \text{ units}$$

Actual output of 300 workers envisaged after mechanisation = 48,000 units

$$\text{Improvement in productivity} = \frac{48,000 - 37,500}{37,500} \times 100\% = 28\%$$

Incentive wages payable:

Incentive wages for 28% improvement in productivity (@ 1/2% for every 1% improvement) = 28% × 0.5% = 14%

Annual wages payable to 300 workers before incentive

$$= \frac{\text{Rs } 4,00,000}{4000} \times 300 \times 12$$

$$= \text{Rs } 36,00,000$$

Selling price per unit = Rs 24,00,000 ÷ 50,000 = Rs 48.00 per unit

Computation of savings (loss) after mechanisation

| *Particulars* | *Before mechanisation* Rs | *After mechanisation* Rs |
|---|---|---|
| Wages payable per annum | 48,00,000 | 36,00,000 |
| Fringe benefits @ 50% of wages | 24,00,000 | 18,00,000 |
| Incentives wages @ 14% of wages | – | 5,04,000 |
| | 72,00,000 | 59,04,000 |
| Savings per annum | | 13,96,000 |
| *Less:* Loss of contribution due to lower sales: | | |
| (50,000 units – 48,000 units) × 12 × 25/100 of Rs 48 | | 2,88,000 |
| Increase in annual contribution due to mechanisation | | Rs 11,08,000 |

### *Example 17.14 (Make or Buy)*

Auto Parts Ltd. has an annual production of 90,000 units for a motor component. The component's cost structure is as below:

| | Rs | |
|---|---|---|
| Materials | 270 | per unit |
| Labour (25% fixed) | 180 | per unit |
| Expenses: | | |
| Variable | 90 | per unit |
| Fixed | 135 | per unit |
| Total | 675 | per unit |

(a) The purchase manager has an offer from a supplier who is willing to supply the component at Rs 5.40. Should the component be purchased and production stopped?

(b) Assume the resources now used for this component's manufacture are to be used to produce another new product for which the selling price is 485.

In the latter case the material price will be Rs 200 per unit. 90,000 units of this product can be produced on the same cost basis as above for labouir and expenses. Discuss whether it would be advisable to divert the resources to manufacture the new products, on the footing that the component presently being produced would, instead of being produced, be purchased from the market.

*(CA Inter)*

*Solution*

**(a) Statement showing the Variable Cost and Purchase Cost of Component... Used by Auto Parts Ltd.**

| *Variable cost* | *Per unit* | *Total for 90,000 units* |
|---|---|---|
| | *Rs* | *Rs* |
| Materials | 270 | 2,43,00,000 |
| Labour | 135 | 1,21,50,000 |
| Expenses | 90 | 81,00,000 |
| Total variable cost (when component is produced) | 495 | 4,45,50,000 |
| Cost of purchase (when component is purchased) | 540 | 4,86,00,000 |
| Difference, excess of purchase price over variable cost | 45 | 40,50,000 |

Fixed expenses not being affected, it is evident from the above statement that if the component is purchased from the outside supplier, the company will have to spend Rs 45 per unit more and on 90,000 units the company will have to spend Rs 40,50,000 more. Therefore, the company should not stop the production of the component.

(b) The following statement shows the cost implications of the proposal to divert the available facilities for a new product.

**Statement showing the Contribution per Unit if the Existing Resources are Used for the Production of Another New Product**

| | | Rs | Rs |
|---|---|---|---|
| Selling price of the new product per unit | | | 485 |
| *Less:* | Materials cost | 200 | |
| | Labour (variable) | 135 | |
| | Expenses (variable) | 90 | 425 |
| Contribution per unit | | | 60 |
| Loss per unit if the present component is purchased: | | | |
| Purchase price of the existing product | | | 540 |
| *Less:* Total variable cost of producing the existing component | | | 495 |
| Excess cost | | | 45 |

Thus, if the company diverts its resources for the production of another new product, it will benefit by Rs 15, i.e. Rs 60 – 45 per unit. On 90,000 units the company will save Rs 13,50,000. Therefore, it is advisable to divert the resources to manufacture the new product and the component presently being produced should be purchased from the market. This is also brought out by the following figures:

| | Rs |
|---|---|
| Total cost producing the component (90,000 × 675) (A) | 6,07,50,000 |
| Cost of purchasing the component (90,000 × 540) | 4,86,00,000 |
| Fixed expenses, not having been saved | 1,62,00,000 |
| (90,000 × 180, i.e. 675 – 495) | 6,48,00,000 |
| *Less:* Contribution from the new product (90,000 × 60) | 54,00,000 |
| Total cost if component is purchased and new product is made (B) | 5,94,00,000 |
| Savings (A – B) | 13,50,000 |

***Example 17.15 (Export Proposals)***

Vinak Ltd. operating at 75% level of activity produces and sells two products A and B. The cost sheets of the two products are as under:

| | *Product A* | *Product B* |
|---|---|---|
| Units produced and sold | 600 | 400 |
| Direct materials | Rs 2.00 | Rs 4.00 |
| Direct labour | 4.00 | 4.00 |
| Factory overheads (40% fixed) | 5.00 | 3.00 |
| Selling and administration overheads (60% fixed) | 8.00 | 5.00 |
| Total cost per unit | 19.00 | 16.00 |
| Selling price per unit | 23.00 | 19.00 |

Factory overheads are absorbed on the basis of machine hour which is the limiting (key) factor. The machine hour rate is Rs 2 per hour.

The company receives an offer from Canada for the purchase of product A at a price of Rs 17.50 per unit.

Alternatively, the company has another offer from the Middle East for the purchase of product B at a price of Rs 15.50 per unit.

In both the cases, a special packing charge of 50 p. per unit has to be borne by the company.

The company can accept either of the two export orders and in either case the company can supply such quantities as may be possible to be produced by utilising the balance of 25% of its capacity.

You are required to prepare:

(i) A statement showing the economics of the two export proposals giving your recommendations as to which proposals should be accepted.

(ii) A statement showing the overall profitability of the company after incorporating the export proposal recommended by you. *(CA Inter)*

*Solution*

**(i) Economics of the two Export Proposals**

| | *Order from Canada for Product A* | *Order from the Middle East for Product B* |
|---|---|---|
| Marginal cost per unit: | Rs | Rs |
| Materials | 2.00 | 4.00 |
| Labour | 4.00 | 4.00 |
| Variable factory overheads | 3.00 | 1.80 |
| Variable selling and admn. overheads | 3.20 | 2.00 |
| Special packing charges | 0.50 | 0.50 |
| Total variable cost | 12.70 | 12.30 |
| Export price per unit | 17.50 | 15.50 |
| Contribution per unit | 4.80 | 3.20 |

Since machine hour is the limiting (key) factor, the contribution should be linked with the machine hours. This has been worked out as follows:

| | | |
|---|---|---|
| Machine hour per unit | 2.5 hours | 1.5 hours |
| Contribution per machine hour | Rs 1.92 | Rs 2.13 |

Product B yields a better contribution per machine hour.

The order from the Middle East should therefore be accepted as compared to the Canadian offer.

**Working Notes:**

| | A | B | Total |
|---|---|---|---|
| Factory overheads per unit | Rs 5 | Rs 3 | |
| Machine hour rate per hour | Rs 2 | Rs 2 | |
| Machine hour per unit | 2.5 | 1.5 | |
| Units produced | 600 | 400 | |
| Machine hours utilised | 1,500 | 600 | 2,100 |
| Level of activity | | 75% | |

Maximum hours at 100% activity: $\frac{2,100}{75} \times 100 = 2,800$ hours

Capacity hours available for export 2,800 – 2,100 = 700 hours

**(ii) Statement of Overall Profitability**

| | *Product A* | *Product B* | *Total* |
|---|---|---|---|
| Units | 600 | 867 | |
| | (Rs) | (Rs) | (Rs) |
| Materials | 1,200 | 3,468 | 4,668 |
| Labour | 2,400 | 3,468 | 5,868 |
| Factory overhead: Variable | 1,800 | 1,561 | 3,361 |
| Fixed | 1,200 | 480 | 1,680 |

*(Contd.)*

| | | | |
|---|---|---|---|
| Selling & Admn. Overheads: | | | |
| Variable | 1,920 | 1,734 | 3,654 |
| Fixed | 2,880 | 1,200 | 4,080 |
| Special packing | – | 234 | 234 |
| Total costs | 11,400 | 12,145 | 23,545 |
| Sales | 13,800 | 14,839 | 28,639 |
| Profit | 2,400 | 2,694 | 5,094 |

**Working Notes:**

1. Number of units of B:

| | |
|---|---|
| Sales in the home market | 400 |
| Export market 700 hr/1.5 | 467 |
| Total | 867 |

2. Sales value of B:

| | |
|---|---|
| 400 units in the home market @ Rs 19 | Rs 7,600 |
| 467 units for export @ Rs 15.50 | Rs 7,239 |
| Total | Rs 14,839 |

***Example 17.16 (Special Order)***

Nubo Manufacturing Company is presently operating at 50% of practical capacity producing about 50,000 units annually of a patented electronic component. Nubo recently received an offer from an overseas market to sell 30,000 components at Rs 6.00 per unit FOB Nubo's Plant. Nubo has not previously sold components in the market. Budgeted production costs for 50,000 and 80,000 units of output are as follows:

| Units | 50,000 | 80,000 |
|---|---|---|
| Costs: | Rs | Rs |
| Direct material | 75,000 | 1,20,000 |
| Direct labour | 75,000 | 1,20,000 |
| Factory overheads | 2,00,000 | 2,60,000 |
| | 3,50,000 | 5,00,000 |
| Cost per unit | Rs 7.00 | Rs 6.25 |

The sales manager thinks the order should be accepted, even if it results in a loss of Re 1.00 per unit, because he feels the sales may build up future markets. The production manager does not wish to have the order accepted primarily because the order would show a loss of Re 0.25 per unit when computed on the new average unit cost. The cost accountant has made a quick computation indicating that accepting the order will actually increase profit.

You are required to:

(a) Explain what apparently caused the drop in cost from Rs 7.00 per unit to Rs 6.25 per unit when budgeted production increased from 50,000 to 80,000 units. Show supporting computations.

(b) Should the order be accepted?

*(ICWA Inter)*

*Solution*

From the given data at two levels of production, the costs per unit at 50,000 and 80,000 units are ascertained as under:

| *Units of production* | *Total cost (Rs)* | *50,000 C.P.U. (Rs)* | *Total cost (Rs)* | *80,000 C.P.U. (Rs)* |
|---|---|---|---|---|
| Direct material | 75,000 | 1.50 | 1,20,000 | 1.50 |
| Direct labour | 75,000 | 1.50 | 1,20,000 | 1.50 |
| Factory overhead | 2,00,000 | 4.25 | 2,60,000 | 3.25 |
| | 3,50,000 | 7.25 | 5,00,000 | 6.25 |

(a) The reason for the difference in average units cost of factory overhead was caused by some of the overheads being fixed within the total overhead under different levels of output. The fixed portion may be ascertained first as follows:

Change in cost (overhead) at two levels = Rs 60,000

Change in output at two levels = 30,000 units

Thus, variable cost P.U. $= \frac{\text{Rs } 60,000}{30,000} = \text{Rs } 2$

Therefore, amount of variable cost at 50,000 units = 50,000 × 2 = Rs 1,00,000 variable cost

Fixed overhead (Rs 2,00,000 – Rs 1,00,000) = Rs 1,00,000 fixed cost.

So at 50,000 units, the cost P.U. of fixed portion of overhead = Rs 2 (Rs 1,00,000 ÷ 50,000) and at 80,000 units the cost P.U. of fixed portion of overhead = Rs 1.25 = (Rs 100,000 ÷ 80,000). Thus, there is a decrease in unit cost to the tune of Re 0.75. Hence there is a drop in cost from Rs 7 to Rs 6.25 due to the incidence of fixed overhead being spread over to increased number of production.

(b) So when the variable cost P.U. remains constant, the total variable cost will vary in direct proportion with the volume of production: but since the total amount of fixed overhead is the same at different levels of production; the impact of fixed overhead on the cost of production of more number of units is favourable, as C.P.U. comes down with the increase in production volume. Hence, the order for the overseas market is acceptable.

### *Example 17.17 (Capacity Decision)*

A Ltd. Co. has capacity to produce 1,00,000 units of a product every month. It works cost at varying levels of production is as under:

| *Level* | *Works cost per unit* Rs |
|---|---|
| 10% | 400 |
| 20% | 390 |
| 30% | 380 |
| 40% | 370 |
| 50% | 360 |
| 60% | 350 |
| 70% | 340 |
| 80% | 330 |
| 90% | 320 |
| 100% | 310 |

Its fixed administration expenses amount to Rs 1,50,000 and fixed marketing expenses amount to Rs 2,50,000 per month respectively. The variable distribution cost amount to Rs 30 per unit.

It can market 100% of its output at Rs 500 per unit provided it incurs the following further expenditure:

(a) it gives gift items costing Rs 30 per unit of sale;
(b) it has lucky draws every month giving the first prize of Rs 50,000; 2nd prize of Rs 25,000, 3rd prize of Rs 10,000 and three consolation prizes of Rs 5,000 each to customers buying the product.
(c) it spends Rs 1,00,000 on refreshments served every month to its customers;
(d) it sponsors a television programme every week at a cost of Rs 20,00,000 per month.

It can market 30% of its output at Rs 550 per unit without incurring any of the expense referred to in (a) to (d) above.

Advise the company on its course of action. Show the supporting cost sheets.

*(CA Inter Nov 1998)*

*Solution*

**Statement of Cost**

| *Capacity Level* | *30%* | | *100%* | |
|---|---|---|---|---|
| *Output Level (Units)* | *30,000* | | *1,00,000* | |
| | *Per unit* Rs | *Total* Rs | *Per unit* Rs | *Total* Rs |
| Works cost | 380.00 | 1,14,00,000 | 310.00 | 3,10,00,000 |
| *Add:* Fixed Administration Expenses | 5.00 | 1,50,000 | 1.50 | 1,50,000 |
| Cost of Production | 385.00 | 1,15,50,000 | 311.50 | 3,11,50,000 |
| *Add:* Fixed Marketing Expenses | 8.33 | 2,50,000 | 2.50 | 2,50,000 |
| *Add:* Variable Distribution Cost | 30.00 | 9,00,000 | 30.00 | 30,00,000 |
| *Add:* Special cost: | | | | |
| Gift items cost | — | — | 30.00 | 30,00,000 |
| Customer's prizes | — | — | 1.00 | 1,00,000 |
| Refreshments | — | — | 1.00 | 1,00,000 |
| Television programme Sponsorship cost | — | — | 20.00 | 20,00,000 |
| Cost of Sales | 423.33 | 1,27,00,000 | 396.00 | 3,96,00,000 |
| Profit | 126.67 | 23,00,000 | 104.00 | 1,04,00,000 |
| Sales | 550.000 | 1,50,00,000 | 500.00 | 5,00,00,000 |

*Advice*

A Ltd. makes an extra profit of Rs 81 lacs (Rs 104 lacs – Rs 23 lacs) if it works at 100% capacity to produce 1,00,000 units of a product per month. Hence, the company is advised to produce 1,00,000 units and incur the special costs required for marketing its 100% output.

***Example 17.18 (Decision about Mechanisation)***

The present output details of a manufacturing department are as follows:

| | |
|---|---|
| Average output per week | 48,000 units from 160 employees |
| Saleable value of output | Rs 6,00,000 |
| Contribution made by output towards fixed expenses and profit | Rs 2,40,000 |

The Board of Directors plans to introduce more mechanisation into the department at a capital cost of Rs 1,60,000. The effect of this will be to reduce the number of employees to 120, and increasing the output per individual employee by 60%. To provide the necessary incentive to achieve the increased output, the Board intends to offer a 1% increase on the piece work rate of Re. 1 per unit for every 2% increase in average individual output achieved.

To sell the increased output, it will be necessary to decrease the selling price by 4%.

Calculate the extra weekly contribution resulting from the proposed change and evaluate for the Board's information, the desirability of introducing the change.

*(CA Inter Nov. 2000)*

*Solution*

**Working Notes**

1. *Present average output per employee and total future expected output per week*

$$\text{Present average output per employee per week} = \frac{\text{Total present output}}{\text{Total number of present employees}}$$

$$= \frac{48{,}000 \text{ units}}{160 \text{ employees}}$$

$$= 300 \text{ unit}$$

$$\text{Total future expected output per week} = \text{Total number of future employees} \left( \text{Present output} + \text{60\% of present output per employee} \right)$$

$$= 120 \text{ employees } (300 \text{ units} + 60\% \times 300 \text{ units})$$

$$= 57{,}600 \text{ units}$$

2. *Present and proposed piece work rate*

Present piece work rate = Re 1.00 per unit

Proposed piece work rate = Present piece work rate + 30% × Re. 1

= Re 1.00 + 0.30P

= Rs 1.30 per unit

3. *Present and proposed sale price per unit*

Present sale price per unit (Rs 6,00,000/48,000 units) = Rs 12.50

Proposed sale price per unit = Rs 12

(Rs 12.50 – 4% × Rs 12.50)

4. *Present marginal cost (excluding wages) per unit:*

$$= \frac{\text{Present sales value} - \text{Fixed expenses and profit} - \text{Contribution towards present wages}}{\text{Present output (units)}}$$

$$= \frac{\text{Rs } 6{,}00{,}000 - \text{Rs } 2{,}40{,}000 - \text{Rs } 48{,}000}{48{,}000 \text{ units}} = \text{Rs } 6.50 \text{ per unit}$$

**Statement of extra weekly contribution (Information resulting from the proposed change of mechanisation meant for Board's evaluation)**

| | | |
|---|---|---|
| Expected sales units (*Refer to Working Note 1*) | | 57,600 |
| | Rs | Rs |
| Sales value: (A) (57,600 units × Rs 12) (*Refer to Working Note 3*) | | 6,91,200 |
| Marginal costs (excluding wages): (B) (57,600 units × Rs 6.50) (*Refer to Working Note 4*) | 3,74,400 | |
| Wages: (C) (57,600 units × Rs 1.30) (*Refer to Working Note 2*) | 74,880 | |
| Total marginal cost: (D) = {(B) + (C)} | | 4,49,280 |
| Marginal contribution: {(A) – (D)} | | 2,41,920 |
| *Less:* Present contribution | | 2,40,000 |
| Increase in contribution (per week) | | 1,920 |

*Evaluation:* Since the mechanisation has resulted in the increase of contribution to the extent of Rs 1,920 per week, therefore the proposed change should be accepted.

### *Example 17.19 (Product Decision)*

The Chief Cost Accountant of a company running an orchard with an orchard with an adequate supply of labour, presents the following data and requests you to advise about the area to be allotted for the cultivation of various types of fruits, which would result in maximization of profits. The company contemplates growing Apples. Lemons, Oranges and Peaches:

| *Particulars* | *Apples* | *Lemons* | *Oranges* | *Peaches* |
|---|---|---|---|---|
| Selling Price per box (Rs) | 15 | 15 | 30 | 45 |
| Season's yield in boxes per acre | 500 | 150 | 100 | 200 |
| Costs: | Rs | Rs | Rs | Rs |
| Material per acre | 270 | 105 | 90 | 150 |
| Labour: Growing per acre | 300 | 225 | 150 | 195 |
| Picking and Packing per box | 1.50 | 1.50 | 3 | 4.50 |
| Transport per box | 3 | 3 | 1.50 | 4.50 |

The total fixed costs in each season would be Rs 2,10,000. The following limitations are also placed before you:

(a) The area available is 450 acres, but out of this, 300 acres are suitable for growing only oranges and lemons. The balance of 150 acres is suitable for growing any of the four fruits.

(b) As the produce may be hypothecated to banks, area allotted for any fruit should be demarcated in complete acres and not in fractions of an acre.

(c) The marketing strategy of the company requires the compulsory production of all the four types of fruits in a season and the minimum quantity of any one type to be 18,000 boxes.

Calculate the total profit that would accrue if your advice is followed.

*(B. Com. Hons Delhi 1997)*

*Solution*

**Statement showing Contribution per Acre**

| *Particulars* | *Apples* | *Lemons* | *Oranges* | *Peaches* |
|---|---|---|---|---|
| Selling Price per box Rs | 15 | 15 | 30 | 45 |
| Season's yield in boxes per acre | 500 | 150 | 100 | 200 |
| Sales Value per acre (A) Rs | 7,500 | 2,250 | 3,000 | 9,000 |
| Material Cost per acre Rs | 270 | 105 | 90 | 150 |
| Labour: Growing per acre Rs | 300 | 225 | 150 | 195 |
| Picking, Packing and Transport, per acre | | | | |
| 500 × 4.50 Rs | 2,250 | | | |
| 150 × 4.50 | | 675 | | |
| 100 × 4.50 | | | 450 | |
| 200 × 9 | | | | 1800 |
| Variable Cost per acre Rs (B) | 2,820 | 1,005 | 690 | 2,145 |
| Contribution per acre (A) – (B) Rs | 4,680 | 1,245 | 2,310 | 6,855 |
| Preference according to Contribution per acre | II | IV | III | I |

Since the minimum quantity of production of each type is 18,000 boxes and all the four types of fruits have to be produced, the minimum acreage to be allocated to each fruit would be as follows:

| | | | |
|---|---|---|---|
| Apples | = 18,000/500 | = | 36 acres |
| Lemons | = 18,000/150 | = | 120 acres |
| Oranges | = 18,000/100 | = | 180 acres |
| Peaches | = 18,000/200 | = | 90 acres |
| | Total | | 426 acres |

Lemons and oranges require 300 acres in total to produce. Moreover, 300 acres of land is suitable only for these two products, hence 300 acres would be used to produce only these products. The balance of 24 acres (i.e., 450 – 426) is available for production of any of the fruits. Since the peaches give the highest contribution per acre and hence they should be preferred for allocation of 24 acres. The total acreage for peaches would therefore be 90 + 24 = 114 acres.

**Statement of Profit**

| *Particulars* | *Apples* | *Lemons* | *Oranges* | *Peaches* | *Total* |
|---|---|---|---|---|---|
| Area (acres) | 36 | 120 | 180 | 114 | 450 |
| Contribution per acre Rs | 4,680 | 1,245 | 2,310 | 6,855 | |
| Total Contribution Rs | 1,68,480 | 1,49,400 | 4,15,800 | 7,81,479 | 15,15,150 |
| Less Fixed Costs | | | | | 2,10,000 |
| Net Profit | | | | | 13,05,150 |

***Example 17.20 (Product Mix Decision)***

A company produces three products. The cost data are as under:

| | | A | B | C |
|---|---|---|---|---|
| Direct Materials | Rs | 64 | 152 | 117 |
| Direct Labour: | | | | |
| Deptt. | Rate per hour Rs | Hrs. | Hrs. | Hrs. |
| 1 | 5 | 18 | 10 | 20 |
| 2 | 6 | 5 | 4 | 7 |
| 3 | 4 | 10 | 5 | 20 |
| Variable Overheads | | Rs 16 | 9 | 21 |
| Fixed Overheads | | Rs 4,00,000 per annum | | |

The budget was prepared at a time, when the market was sluggish. The budgeted quantities and selling prices are as under:

| *Product* | *Budgeted Qty.* | *Selling Price (Rs)/Unit* |
|---|---|---|
| A | 9,750 | 270 |
| B | 7,800 | 280 |
| C | 7,800 | 400 |

Later the market improved and the sales quantities could be increased by 20% for product A and 25% each for products B and C. The sales manager confirmed that the increased quantities could be acheived at the prices originally budgeted. The production manager stated that the output cannot be increased beyond the budgeted level due to limitation of direct labour hours in Department 2.

*Required:*

(i) Present a statement of budgeted profitability.

(ii) Set optimal product mix and calculate the optimal profit.

*(CA Inter May 1998)*

*Solution*

**Statement of Budgeted Profitability**

| *Products* | | *A* | *B* | *C* | *Total* |
|---|---|---|---|---|---|
| Budgeted Quantity (Units) | (1) | 9,750 | 7,800 | 7,800 | |
| | (2) | Rs | Rs | Rs | |
| Selling Price per unit | | 270 | 280 | 400 | |
| Variable Cost per unit: | | | | | |
| Direct Materials | | 64 | 152 | 117 | |
| Direct Labour | | 160 | 94 | 222 | |
| Variable Overheads | | 16 | 9 | 21 | |
| Total Variable Cost per unit | (3) | 240 | 255 | 360 | |
| Contribution per unit | (4) = ((2) – (3)) | 30 | 25 | 40 | |
| Total Contribution | (1) × (4) | 2,92,500 | 1,95,000 | 3,12,000 | 7,99,500 |
| *Less:* Fixed Cost | | | | | 4,00,000 |
| Profit | | | | | 3,99,500 |

**(2) Statement of Optimal Product Mix and Profit**

| *Products* | | *A* | *B* | *C* | *Total* |
|---|---|---|---|---|---|
| Contribution per unit | (1) | 30 | 25 | 40 | |
| Direct Labour hours in Department 2 | (2) | 5 | 4 | 7 | |
| Contribution per direct labour hour (1)/(2) | (Rs) | 6 | 6.25 | 5.71 | |
| Ranking | | II | I | III | |
| Optimal Product Mix Units | (3) | 11,700 (58,500 hrs.) | 9,750 (39,000 hrs.) | 5,292 (37,044 hrs.) | |
| Total Contribution (Rs) (1) × (3) | | 3,51,000 | 2,43,750 | 2,11,680 | 8,06,430 |
| *Less:* Fixed Cost (Rs) | | | | | 4,00,000 |
| Optimal Profit | | | | | 4,06,430 |

**Working Notes:**

1. Total hours available in Department 2

| *Products (a)* | *Units (b)* | *Hrs per unit (c)* | *Total Hrs. (d) = (b) × (c)* |
|---|---|---|---|
| A | 9,750 | 5 | 48,750 |
| B | 7,800 | 4 | 31,200 |
| C | 7,800 | 7 | 54,600 |
| Total | | | 1,34,550 |

2. Maximum Sales Quantities of Products (under improved market conditions)

| *Products* | *Units* | *Increase in percentage* | *Total number of units* |
|---|---|---|---|
| A | 9,750 | 20 | 11,700 |
| B | 7,800 | 25 | 9,750 |
| C | 7,800 | 25 | 9,750 |

***Example 17.21 (Product Mix Decision)***

M/s. Mars Ltd. are manufacturing three products. The cost details are as follows:

| *Particulars* | *Products* | | | | | |
|---|---|---|---|---|---|---|
| | *A* | | *B* | | *C* | |
| | *Units* | *Rs* | *Units* | *Rs* | *Units* | *Rs* |
| Direct Materials | 4 | 12 | 5 | 15 | 6 | 18 |
| Direct Labour | | 5 | | 6 | | 6 |
| Direct Expenses | | 8 | | 9 | | 11 |
| | | 25 | | 30 | | 35 |
| Selling Price | | 35 | | 40 | | 50 |
| | | 10 | | 10 | | 15 |

*(Contd.)*

| *Particulars* | *Products* | | | | | |
|---|---|---|---|---|---|---|
| | *A* | | *B* | | *C* | |
| | *Units* | *Rs* | *Units* | *Rs.* | *Units* | *Rs.* |
| No. of Units sold | 20,000 | | 40,000 | | 20,000 | |
| Total Contribution | | 2,00,000 | | 4,00,000 | | 3,00,000 |
| Total | | | | Rs 9,00,000 | | |
| *Less:* Fixed Costs | | | | Rs 7,50,000 | | |
| | | | | Rs 2,50,000 | | |

The direct materials were all imported. Due to foreign exchange restrictions, henceforth, the company can import only 3,00,000 units of raw materials. The company can produce in all 1,00,000 units maximum (all products). However, they can market only 20,000 units of product A & C each. There is a local substitute material which is available at a price of Rs 3,75 per unit. Besides, the company has to spend Rs 50,000 on intermediaries and consumables, if local substitute material is used in the production process. There was also a thrid party who was willing to take a part of the plant on lease upto 50,000 units capacity of B and willing to pay lease charges of Rs 2,75,000.

You are required to advise the management:

(i) What should be the quantum of production/sales mix of products with existing import restrictions?
(ii) Whether the company can optimise production of 1,00,000 units with local substitute materials?
(iii) Whether the company can enhance profits by leasing out a part of the plant to the thrid party and restricting its own production?

*(CA Inter May 1999)*

*Solution*

**(i) Statement of Quantum of Productions/Sales Mix of Products**
***(with existing import restrictions)***

| *Products* | *A* | *B* | *C* | *Total* |
|---|---|---|---|---|
| Selling price per unit (Rs) | 35 | 40 | 50 | |
| *Less:* Variable Cost per unit | 25 | 30 | 35 | |
| Contribution per unit of product (Rs) (1) | 10 | 10 | 15 | |
| Units of Materials (2) | 4 | 5 | 6 | |
| Contribution per unit of material (Rs) (3) = (1)/(2) | 2.50 | 2 | 2.50 | |
| Ranking | I | II | I | |
| Units made (4) | 20,000 | 20,000 | 20,000 | |
| (Materials consumed) | (80,000 units) | 1,00,000 units) | 1,20,000 units) | |
| Total Contribution (Rs) (5) = (1) × (4) | 2,00,000 | 2,00,000 | 3,00,000 | Rs 7,00,000 |
| *Less:* Fixed Costs (Rs) | | | | Rs 7,50,000 |
| Profit (Loss) | | | | Rs (50,000) |

(ii) *Use of Local substitute of Material*

| | | (Output 1,00,000 units) |
|---|---|---|
| | Rs | Rs |
| Contribution per unit of product B on using local substitute material (Rs 10 – Rs 3.75) | 6.25 | |
| Total Contribution on 40,000 units of product B (40,000 units × Rs 6.25) | | 2,50,000 |
| *Less:* Intermediaries Expenses | | 50,000 |
| Net additional Contribution | | 2,00,000 |
| Loss on Present Output of 60,000 units (as per (1)) | | 50,000 |
| Net Profit | | 1,50,000 |

Thus, the company can have optimum production of 1,00,000 units by using local substitute of material.

(iii) *Evaluation of Leasing Out a part of the Plant*

| | |
|---|---|
| Total contribution on sale of 20,000 units of Products A and C and 10,000 units of Product B by using imported material (20,000 units × Rs 10 + 10,000 units × Rs 10 + 20,000 units × Rs 15) | 6,00,000 |
| *Less:* Fixed Assets | 7,50,000 |
| Profit (Loss) | (1,50,000) |
| *Add:* Lease Rent received | 2,75,000 |
| Net Profit | 1,25,000 |

*Conclusion:* The net profit is Rs 1,50,000 in case the company uses local substitute of material and the plant capacity fully for producing 1,00,000 units, whereas by leasing out the plant capacity upto 50,000 of Product B for a rent of Rs 2,75,000, the company makes a profit of Rs 1,25,000/-. A comparative study of the two alternatives suggests that it will be better for the company to have optimum production of 1,00,000 units by using local substitute of material.

### *Example 17.22 (Profitable Product Mix)*

A manufacturing company produces and sells three products P, Q and R. It has an available machine hour capacity of one lakh hours, interchangeable among the three products. Presently, the company produces and sells 20,000 units of P and 15,000 units each of Q and R. The unit selling price of the three products are Rs 25, Rs 32 and Rs 42 for P, Q and R respectively. With this price structure and the aforesaid sales-mix the company is incurring loss. The total expenditure, exclusive of fixed charges (presently Rs 5 per unit), is Rs 13.75 Lakhs. The unit cost ratio among the products P, Q and R is 4: 6:7. Since the company desires to improve its profitablity without changing its cost and price structures, it has been considering the following three mixes so as to be within its total available capacity.

| *Products* | *Mix I (in units)* | *Mix II (in units)* | *Mix III (in units)* |
|---|---|---|---|
| P | 25,000 | 20,000 | 30,000 |
| Q | 15,000 | 12,000 | 5,000 |
| R | 10,000 | 18,000 | 15,000 |

You are required to compute the quantum of loss now incurred and advise the most profitable mix which could be considered by the company. *(I.C.W.A. Inter Dec. 1995)*

*Solution Basic Calculations*

**1. Computation of Equivalent Production**

| *Products* | *Present Production* | *Cost Ratio* | *Equivalent Units* |
|---|---|---|---|
| P | 20,000 | 4 | 80,000 |
| Q | 15,000 | 6 | 90,000 |
| R | 15,000 | 7 | 1,05,000 |
| | 50,000 | | 2,75,000 |

**2. Computation of Variable Cost Per Unit**

Total Variable Cost: Rs 13,75,000
Hence, Variable Cost per equivalent unit Rs 5 (i.e., Rs 13,75,000/2,75,000)
Variable Cost of product P is Rs 20 per unit
Variable Cost of product Q is Rs 30 per unit
Variable Cost of product R is Rs 35 per unit

**3. Computation of Present Profit (Loss)**

| | *Contribution from Products:* | | *Rs* |
|---|---|---|---|
| P | 20,000 × (25 – 20) | = | 1,00,000 |
| Q | 15,000 × (32 – 30) | = | 30,000 |
| R | 15,000 × (42 – 35) | = | 1,05,000 |
| Total Contribution | | | 2,35,000 |
| *Less:* Fixed Cost @ Rs 5 per unit for 50,000 units | | | 2,50,000 |
| Loss | | | (15,000) |

**Statement of Comparative Contribution for Different Mixes**

| *Products* | *Contribution* *Mix I* *Rs* | *Mix II* *Rs* | *Mix III* *Rs* |
|---|---|---|---|
| P | 1,25,000 | 1,00,000 | 1,50,000 |
| Q | 30,000 | 24,000 | 10,000 |
| R | 70,000 | 1,26,000 | 1,05,000 |
| Total | 2,25,000 | 2,50,000 | 2,65,000 |

Fixed cost of Rs 2,50,000 is constant at all levels of activity. Mix III is giving the highest contribution of the three and hence is the best and, therefore, recommended.

*Note:* It has been stated that the machine capacity is interchangeable and the company has selected the three mixes "so as to be within its total available capacity". No capacity constraint has been considered.

### *Example 17.23 (Profitability Decision)*

A company produces a single product which is sold by it presently in the domestic market at Rs 75 per unit. The present production and sale is 40,000 units per month representing 50% of the capacity available. The cost data of the product are as under:

Variable costs per unit Rs 50
Fixed costs per unit month Rs 10 lakhs.
To improve the profitability, the management has 3 proposals on hand as under:

(a) to accept an export supply order for 30,000 units per month at a reduced price of Rs 60 per unit, incurring addition variable costs of Rs 5 per unit towards export packing, duties, etc.;
(b) to increase the domestic market sales by selling to a domestic chain stores 30,000 units at Rs 55 per unit, retaining the existing sales at the existing price;
(c) to reduce the selling price for the increased domestic sales as advised by the sales department as under:

| *Reduce selling price per unit by Rs* | *Increased in sales expected (in units)* |
|---|---|
| 5 | 10,000 |
| 8 | 30,000 |
| 11 | 35,000 |

Prepare a table to present the results of the above proposals and give your comments and advice on the proposals. *(I.C.W.A. Inter June 1996)*

*Solution*

The three proposals can be studied by differential cost analysis. The present capacity utilisation is only 50% and as such there is a scope to increase the sales up to another 4,000 units. The comparison of proposals will depend on contribution generated since the fixed cost is not affected upto full utilisation and as such not relevant for decision-making.

**Statement showing Contribution at Various Price Levels**

| *Particulars* | *Proposal (a)* | | *Proposal (b)* | *Proposal (c)* | | |
|---|---|---|---|---|---|---|
| | *Present Level* | *Export Order* | *Domestic Order* | *Price* | *Reduction* | |
| Selling Price per unit Rs | 75 | 60 | 55 | 70 | 67 | 64 |
| Variable Cost per unit Rs | 50 | 55 | 50 | 50 | 50 | 50 |
| Contribution per unit Rs | 25 | 05 | 05 | 20 | 17 | 14 |
| Quantities in units | 40,000 | 30,000 (addl.) | 30,000 (addl.) | 50,000 (total) | 70,000 (total) | 75,000 (total) |
| Existing Contribution (Rs in lakh) | 10 | – | – | – | – | – |
| Additional Contribution (Rs in lakh) | | 1.5 | 1.5 | | | |
| Total Contribution for revised quantity (Rs in lakhs) | | | | 10.0 | 11.9 | 10.5 |
| Total Contribution Rs in lakhs | 10.00 | 11.5 | 11.5 | 10.0 | 11.9 | 10.5 |
| Proposal | | (a) | (b) | c(i) | c(ii) | c(iii) |

*Comments and Advice:*

(1) In case only cost considerations are considered, proposal to reduce selling price by Rs 8 to get a gross sales of 7,000 units is most profitable since it yields a total contribution of Rs 11.9 lakhs.

(2) In between export order as per proposal (a) and increased domestic order as per proposal (b) there is no change in additional profitability since both yield same results.
(3) However keeping in mind the impact on other domestic sale, if a part of production alone is sold at a drastically reduced price of Rs 55 per unit, it is desirable to go for export order. This will also enable gaining valuable foreign exchange. Besides with exchange rate fluctuations it may result in higher profits, in case the selling price is quoted in foreign currency.
(4) Reduction in selling price against possible increased sales is full of doubt and has only a marginal effect of Rs 40,000 as additional profit.

Thus, on the whole it is better to go for export order.

### *Example 17.24 (Product Priority Decision)*

Sum Toys (P) Ltd. manufactures and sells children's toys of high quality over an extensive market, utilising the services of skilled artists who are paid at an average rate of Rs 15 per hour. The total no. of skilled labour hours available in a year is only 14,000. The details of planned production for 1996–97, estimated cost and unit selling prices are given below:

| *Toy* | *Production Planned (unit)* | *Cost of Production per Unit* | | | *Selling Price per unit* |
|---|---|---|---|---|---|
| | | *Direct Materials* | *Direct Labour* | *Fixed Overheads* | |
| | | *Rs* | *Rs* | *Rs* | *Rs* |
| A | 3,000 | 20 | 10 | 15 | 70 |
| B | 4,000 | 24 | 12 | 18 | 92 |
| C | 4,000 | 32 | 12 | 18 | 95 |
| D | 3,000 | 40 | 16 | 24 | 110 |
| E | 2,400 | 60 | 20 | 30 | 180 |

Variable overhead costs amount to 50% of the direct labour cost.

The company has estimated the following maximum and minimum demands for each product:

| | A | B | C | D | E |
|---|---|---|---|---|---|
| Maximum (units) | 5,000 | 6,000 | 6,000 | 4,000 | 4,000 |
| Minimum (units) | 1,000 | 1,000 | 1,000 | 500 | 500 |

*(ICWA Inter June 1996)*

*Solution Basic Calculations*

**Statement of Priority of Production Taking Labour Time as key Factor**

| *Product* | *Selling Price per unit* | *Total Variable Cost* | | | | *Contribution* | | |
|---|---|---|---|---|---|---|---|---|
| | | *Direct materials* | *Direct labour* | *Variable overheads* | *Total* | *Per unit* | *Per Labour hour* | *Production priority* |
| | Rs | Rs | Rs | Rs | Rs | Rs | Rs | |
| A | 70 | 20 | 10 | 5 | 35 | 35 | 52.50 | IV |
| B | 92 | 24 | 12 | 6 | 42 | 50 | 62.50 | II |
| C | 95 | 32 | 12 | 6 | 50 | 45 | 56.25 | III |
| D | 110 | 40 | 16 | 8 | 64 | 46 | 43.13 | V |
| E | 180 | 60 | 20 | 10 | 90 | 90 | 67.50 | I |

Contribution per labour hour has been derived as follows:

$$\frac{\text{Product per unit contribution} \times \text{Rs 15 average labour rate}}{\text{Product direct labour cost}}$$

Product $A = \dfrac{\text{Rs } 35 \times 15}{10} = 52.5$

$B = \dfrac{50 \times 15}{12} = 62.5$

$C = \dfrac{45 \times 15}{12} = 56.25$

$D = \dfrac{46 \times 15}{16} = 43.13$

$E = \dfrac{90 \times 15}{20} = 67.50$

**(a) Statement of Estimated Profit for 1996-97**
***(As per Company's Production Plan)***

| *Product* | *Vol. of Sales (units)* | *Contribution per unit (Rs)* | *Total Contribution (Rs)* | *Total Fixed Cost (Rs)* | *Profit (Rs)* |
|---|---|---|---|---|---|
| A | 3,000 | 35 | 1,05,000 | 45,000 | 60,000 |
| B | 4,000 | 50 | 2,00,000 | 72,000 | 1,28,000 |
| C | 4,000 | 45 | 1,80,000 | 72,000 | 1,08,000 |
| D | 3,000 | 46 | 1,38,000 | 72,000 | 66,000 |
| E | 2,400 | 90 | 2,16,000 | 72,000 | 1,44,000 |
| | | | 8,39,000 | 3,33,000 | 5,06,000 |

**(b) Production Plan for Maximum Profits**

| *Product* | *Volume of Sales (units)* | *Hours required* | *Contribution per unit (Rs)* | *Total Contribution (Rs)* | *Priority* |
|---|---|---|---|---|---|
| E | 4,000 (Max.) | 5,334 | 90 | 3,60,000 | I |
| B | 6,000 (Max.) | 4,800 | 50 | 3,00,000 | II |
| C | 3,331 (Balance) | 2,665 (Bal. hrs.) | 45 | 1,49,895 | III |
| A | 1,000 (Minimum) | 667 | 35 | 35,000 | IV |
| D | 500 (Minimum) | 534 | 46 | 23,000 | V |
| | | 14,000 | | 8,67,895 | |

(c) The maximum profit under plan (b) suggested would amount to Rs 8,67,895 – Rs 3,33,000 = Rs 5,34,895.

### *Example 17.25 (Limiting Factor Decision)*

A company producing products 'PIE' and 'SIGMA' using a single production process, has the following cost data:

| | PIE | SIGMA |
|---|---|---|
| Selling price per unit (Rs) | 20 | 30 |
| Variable cost per unit (Rs) | 11 | 16 |
| Machine hours required per unit production (hrs.) | 1 | 2 |
| Market limitation (units) | 1 lakh | 2.5 lakhs |

Total machine hours available – 4 lakhs
Fixed cost per annum – Rs 26 lakhs
Considering the limiting factors of machine hours and market limitations, you are required to

(a) indicate the best combination of products to give optimum contribution;
(b) show the additional machinery requirement to be augmented on rental basis at an annual rent of Rs 1.5 lakhs per machine to provide additional capacity of 30,000 hours per machine;
(c) change in number of machines to be rented if the annual rental charges reduce to Rs 1,25,000 per machine.

*(ICWA Inter June 1997)*

*Solution*

**Evaluation Parameters for Optimum Product Mix**

| *Particulars* | | *Products* | | *Total* |
|---|---|---|---|---|
| | | *PIE* | *SIGMA* | |
| Total Machine hours available | | | | 4 lakhs |
| Market Limitation (units) | | 1 lakh | 2.5 lakhs | |
| Machine hours required per unit of production | | 1 | 2 | |
| Fixed cost per annum | (Rs in lakhs) | | | 4.00 |
| Selling price per unit | (Rs) | 20 | 30 | |
| Variable cost per unit | (Rs) | 11 | 16 | |
| Contribution per unit | (Rs) | 9 | 14 | |
| Contribution per machine hour | (Rs) | 9 | 7 | |
| Ranking | | 1 | 2 | |

**(a) Statement showing Best Combination of Product Mix Towards Optimum Contribution**

| | | | |
|---|---|---|---|
| Production for market demand (units) | 1,00,000 | 1,50,000 | 2,50,000 |
| Total Hours required | 1,00,000 | 3,00,000 | 4,00,000 |
| Total Contribution (Rs) | 9,00,000 | 21,00,000 | 30,00,000 |
| (Total Production × Contribution Per unit) | | | |

**(b) Computation of Requirement of Additional Machines on Rental Basis**

| *Particulars* | | |
|---|---|---|
| Annual rent per machine having capacity of 30,000 hours | | Rs 1,50,000 |
| No. of additional units of SIGMA to be produced to meet the market demand (additional) | | 1,00,000 units |
| Requirement of machine hours for production (1,00,000 × 2) | | 2,00,000 hrs |
| Number of Machines required (2,00,000 ÷ 30,000) = 6.67 (i.e., 6 + 1) | | 7 machines |
| 1. In case 6 machines are hired: | | |
| Total Net Contribution from 6 rented machines with full capacity utilisation (Rs) | 3,60,000 | |
| 2. In case 7 machines are hired: | | |
| (i) Net Contribution from 6 machines on full utilisation = (30,000 hrs × Rs 7 – Rent Rs 1,50,000) × 6 = 2,10,000 – 1,50,000 = 60,000 × 6 = | | 3,60,000 |
| (ii) Net Contribution from 7th machine = 20,000 hrs × Rs 7 – Rs 1,50,000 = (10,000) | | 3,50,000 |

Thus, the net contribution will stand reduced by Rs 10,000 in case seven machines are hired. It is, therefore, better to hire only six machines.

(c) In case the annual rental charges are reduced to Rs 1,25,000, the position will be as under:

Net Contribution from 7th Machine: 20,000 hrs × Rs 7 – Rs 1,25,000

= Rs 15,000

Thus, the seventh machine will also give additional contribution of Rs 15,000.

Hence, in all seven machines may be taken on rent.

### *Example 17.26 (Buy Decision)*

Stirling Industries Ltd. manufactures a product Z by making and assembling three components A, B and C. The components are made in a machine shop using three identical machines each of which can make any of the three components. However, the total capacity of the three machines is only 12,000 machine-hours per month and is just sufficient to meet the current demand. Labour for assembling is available according to requirements. Further details are given below:

| *Components* | *Machine-hours required per unit* | *Variable cost per unit* | *Market price at which the component can be purchased if required* |
|---|---|---|---|
| A | 4 | Rs 48 | Rs 64 |
| B | 5 | 60 | 75 |
| C | 6 | 80 | 110 |
| Assembling (per unit of Z) | – | 30 | – |

Fixed costs per month amount to Rs 50,000. Product Z is sold at Rs 300 per unit. From next month onwards the company expects the demand for Z to rise by 25%. As the machine capacity is limited, the

company wants to meet the increase in demand by buying such numbers of A, B or C which is most profitable.

You are asked to find out the following:

(a) Current demand and profit made by the company.
(b) Which component and how many units of the same should be bought from the market to meet the increase in demand?
(c) Profit made by the company if suggestion in (b) is accepted. *(ICWA Inter Dec. 1998)*

*Solution*

(a) Total Machine Hours required per unit of Z = 15 hrs.
Hence, with 12,000 hours available 800 units of Z can be produced.

**Statement of Current Profit**
**(*Output and Sales 800 Units*)**

| *Particulars* | | *Rs* |
|---|---|---|
| | Selling Price per unit | 300 |
| *Less:* | Variable Cost including assembling | 218 |
| | Contribution per unit | 82 |
| | Total Contribution from 800 units @ Rs 82 | 65,600 |
| *Less:* | Fixed Costs | 50,000 |
| | Current Net Profit | 15,600 |

**(b) Statement of Additional Cost per Hour if Components are Purchased from the Market**

| | A | B | C |
|---|---|---|---|
| Market Price per unit | Rs 64 | Rs 75 | Rs 110 |
| *Less:* Variable Cost of making per unit | Rs 48 | Rs 60 | Rs 80 |
| Additional Cost of purchasing per unit | Rs 16 | Rs 15 | Rs 30 |
| Hours saved by purchasing | 4 | 5 | 6 |
| Additional Cost per hour-saved | Rs 4 | Rs 3 | Rs 5 |

Thus, to save machine hours it is best to purchase B which has the least additional cost per hour. In the next month demand will be 25% more i.e., (800 units + 25%) or 1,000 units. This can be met as follows:

| | Hrs required | |
|---|---|---|
| Make 1,000 units of C | 6,000 | |
| Make 1,000 units of A | 4,000 | |
| Make 400 units of B | 2,000 | (Balance) |
| | 12,000 | hours |

The balance of 600 units (1,000 – 400) of B can be purchased from the market.

**(c) Statement of Profit**
*as per plan given in (b)*

| | | Rs | Rs |
|---|---|---|---|
| Sale Value of 1,000 units of Z | @ Rs 300 | | 3,00,000 |
| Cost of making 1,000 units of C | @ Rs 80 | Rs 80,000 | |
| Cost of making 1,000 units of A | @ Rs 48 | Rs 48,000 | |
| Cost of making 400 units of B | @ Rs 60 | Rs 24,000 | |
| Cost of buying 600 units of B | @ Rs 75 | Rs 45,000 | |
| Assembling 1,000 units Z | @ Rs 30 | Rs 30,000 | 2,27,000 |
| Contribution | | | 73,000 |
| Fixed Costs | | | 50,000 |
| Net Profit | | | 23,000 |

***Example 17.27 (Diversification Decision)***

A company produces 30,000 units of product A and 20,000 units of product B per annum. The sales value and costs of the two products are as follows:

| | Rs |
|---|---|
| Sales value | 7,60,000 |
| Direct Material | 1,40,000 |
| Direct Labour | 1,90,000 |
| Factory Overheads | 1,90,000 |
| Administrative and Selling Overheads | 1,20,000 |

50% of factory overheads are variable and 50% of administrative and selling overheads are fixed. The selling price of A is Rs 12 per unit and B is Rs 20 per unit.

The direct material and labour ratio for product A is 2 : 3 and for B is 4 : 5. For both the products the selling price is 400% of direct labour. The factory overheads are charged in the ratio of direct labour and administrative and selling overheads are recovered at a flat of Rs 2 per unit of A and Rs 3 per unit of B.

Due to fall in demand of the above products the company has a plan to diversify and make product C using 40% capacity. It has been estimated that for C direct material and direct labour will be Rs 2.50 and Rs 3 per unit respectively. Other variable costs will be same as applicable to product A. The selling price of product C is Rs 14 per unit and production will be 30,000 units.

Assuming 60% capacity is used for manufacture of A and B calculate

(a) present cost and profit,
(b) cost and profit after diversification, and
(c) give your recommendation as to whether to diversify or not.

*(ICWA Inter June 1999)*

*Solution*

**Computation of Unit Variable Cost of Products A and B**

| *Particulars* | *A* | *B* | *Total* |
|---|---|---|---|
| | Rs | Rs | Rs |
| (i) Selling Price per unit | 12.00 | 20.00 | 32.00 |
| (ii) Variable Cost per unit: | | | |
| Direct Material | 2.00 | 4.00 | 6.00 |
| Direct Labour (1/4th of Selling Price) | 3.00 | 5.00 | 8.00 |
| Factory Overhead (50%) | 1.50 | 2.50 | 4.00 |
| Administrative and Selling Overhead (50%) | 1.00 | 1.50 | 2.50 |
| Total Variable Cost | 7.50 | 13.00 | 20.50 |
| (iii) Contribution (i) – (ii) | 4.50 | 7.00 | 11.50 |

**(a) Computation of Cost and Profit before Diversification**

| *Particulars* | | *A* | *B* | *Total* |
|---|---|---|---|---|
| 1. Production and Sales (in units) | | 30,000 | 20,000 | 50,000 |
| | | Rs | Rs | Rs |
| 2. Sales Value (Rs) | | 3,60,000 | 4,00,000 | 7,60,000 |
| 3. Variable Costs: | | | | |
| Direct Material | | 60,000 | 80,000 | 1,40,000 |
| Direct Labour | | 90,000 | 1,00,000 | 1,90,000 |
| Factory Overheads | | 45,000 | 50,000 | 95,000 |
| Administrative & Selling Overhead | | 30,000 | 30,000 | 60,000 |
| Total Variable Costs | | 2,25,000 | 2,60,000 | 4,85,000 |
| 4. Contribution (2) – (3) | | 1,35,000 | 1,40,000 | 2,75,000 |
| 5. Fixed Costs: | | | | |
| Factory Overhead | 95,000 | | | |
| Administrative & Selling Overhead | 60,000 | | | 1,55,000 |
| 6. Net Profit | | | | 1,20,000 |

**(b) Cost and Profit after Diversification**

| *Particulars* | *Capacity Levels* | | |
|---|---|---|---|
| | *60%* | | *40%* |
| Products | A | B | C |
| 1. Production and Sales (in units) | 18,000 | 12,000 | 30,000 |
| | Rs | Rs | Rs |
| 2. Sales Value (Rs) | 2,16,000 | 2,40,000 | 4,20,000 |
| 3. Variable Costs: | Rs | Rs | Rs |
| Direct Material | 36,000 | 48,000 | 75,000 |
| Direct Labour | 54,000 | 60,000 | 90,000 |
| Factory Overhead | 27,000 | 30,000 | 45,000 |
| Administrative & Selling Overheads | 18,000 | 18,000 | 30,000 |
| Total Variable Costs | 1,35,000 | 1,56,000 | 2,40,000 |
| 4. Contribution (2) – (3) (Rs) | 81,000 | 84,000 | 1,80,000 |

| Particulars | Capacity Levels | | |
|---|---|---|---|
| | 60% | | 40% |
| | A | B | C |
| Products | | | |
| 5. Total Contribution (Rs) | | (Rs) | |
| | Product | A 81,000 | |
| | | B 84,000 | |
| | | C 1,80,000 | |
| | | | 3,45,000 |
| 6. Fixed Overheads: | | | |
| Factory Overheads | | 95,000 | |
| Administrative & Selling Overheads | | 60,000 | |
| | | | 1,55,000 |
| 7. Net Profit | | | 1,90,000 |

**Recommendation:** The company should immediately implement the proposed diversification. This is because this has increased the net profit from Rs 1,20,000 to Rs 1,90,000 and improve the overall P/V Ratio from 36.18% to 39.38%.

### *Example 17.28 (Production Plan Decision)*

XY Ltd. is manufacturing three household products A, B and C and selling them in a competitive market. Details of current demand, selling price and cost structure are given below:

| Particulars | A | B | C |
|---|---|---|---|
| Expected Demand (units) | 10,000 | 12,000 | 20,000 |
| Selling Price per unit (Rs) | 20 | 16 | 10 |
| Variable Cost per unit (Rs): | | | |
| Direct Materials (Rs 10/kg) | 6 | 4 | 2 |
| Direct Labour (Rs 15/hr.) | 3 | 3 | 1.50 |
| Variable Overheads | 2 | 1 | 1 |
| Fixed Overhead per unit (Rs) | 5 | 4 | 2 |

The company is frequently affected by acute scarcity of raw material and high labour turnover. During the next period, it is expected to have one of the following situations:

(a) Raw materials available will be only 12,100 kg.
(b) Direct labour hours available will be only 5,000 hrs.
(c) It may be possible to increase sales of any one product by 25% without any additional fixed costs but by spending Rs 20,000 on advertisement. There will be no shortage of materials or labour.

Suggest the best production plan in each case and the resultant profit that the company would earn according to your suggestion.

*(ICWA Inter June 1998)*

*Solution*

**Statement of Cost and Profit**

| *Particulars* | *Products* | | |
|---|---|---|---|
| | *A* | *B* | *C* |
| Selling Price/unit (Rs) | Rs 20 | Rs 16 | Rs 10 |
| Variable Cost/unit (Rs): | | | |
| Direct Material | 6 | 4 | 2.00 |
| Direct Labour | 3 | 3 | 1.50 |
| Variable Overheads | 2 | 1 | 1.00 |
| Total Variable Cost/Unit | 11 | 8 | 4.50 |
| Contribution/Unit | 9 | 8 | 5.50 |
| P/V Ratio or Contribution/Sales | 45% | 50% | 55% |

*Ranking*

| | | | |
|---|---|---|---|
| (i) As per profitability | | | |
| With no limiting factor | | | |
| (On the basis of profitability) | III | II | I |
| (ii) With raw material as limiting factor | | | |
| Raw Material required per unit | | | |
| $\left(\frac{\text{Raw Material Cost}}{\text{Price per kg}}\right)$ | 0.6 kg | 0.4 kg | 0.2 kg |
| Contribution per kg. of Raw Material | Rs 15 | Rs 20 | Rs 27.50 |
| Ranking | III | II | I |
| (iii) With labour as limiting factor: | | | |
| Labour hours required per unit | | | |
| $\left(\frac{\text{Labour cost}}{\text{Wages per hour}}\right)$ | 1/5 hr. | 1/5 hr. | 1/10 hr. |
| Contribution per labour hour | Rs 45 | Rs 40 | Rs 55 |
| Ranking | II | III | I |

**Evaluation of Alternatives**

(a) Raw material available is 12,100 kg. In such a case, the Production Plan will be as follows:

| *Product* | *No. of Units* | *Raw Material required* | *Contribution per unit* | *Total Contribution* |
|---|---|---|---|---|
| C | 20,000 | 4,000 kg | Rs 5.50 | Rs 1,10,000 |
| B | 12,000 | 4,800 kg | Rs 8.00 | Rs 96,000 |
| A | 5,500 | 3,300 kg | Rs 9.00 | Rs 49,500 |
| Total: | | 12,100 kg | | Rs 2,55,500 |
| *Less:* Total Fixed Costs | | | | Rs 1,38,000* |
| Net Profit | | | | Rs 1,17,500 |

*Total Fixed Cost

| | | |
|---|---|---|
| A: | 10,000 × Rs 5 = Rs | 50,000 |
| B: | 12,000 × Rs 4 = Rs | 48,000 |
| C: | 20,000 × Rs 2 = Rs | 40,000 |
| | | Rs 1,38,000 |

(b) When Labour Hours available are 5,000 hours. In such a case the Production Plan will be as follows:

| *Product* | *No. of Units* | *Labour Hours required* | *Contribution per unit* | *Total Contribution* |
|---|---|---|---|---|
| C | 20,000 | 2,000 | Rs 5.50 | Rs 1,10,000 |
| A | 10,000 | 2,000 | Rs 9,00 | Rs 90,000 |
| B | 5,000 | 1,000 | Rs 8.00 | Rs 40,000 |
| Total: | 5,000 | | | Rs 2,40,000 |
| *Less:* Fixed Cost | | | | Rs 1,38,000 |
| Net Profit | | | | Rs 1,02,000 |

(c) No shortage of Material and Labour: The most profitable product is C and hence its 25% more production will be raised by 25% i.e. 5,000 units. The total production of C will be 25,000 units i.e. 25% of 20,000 or 5,000 units.

The extra production of 5,000 units of C will fetch an additional contribution of Rs (5,000 × Rs 5.50) or Rs 27,500. The solution will now be as under than additional expenditure on advertisement of Rs 20,000.

| *Product* | *No. of units* | *Contribution per unit* | *Total Contribution* |
|---|---|---|---|
| A | 10,000 | Rs 9.00 | Rs 90,000 |
| B | 12,000 | Rs 8.00 | Rs 96,000 |
| C | 25,000 | Rs 5.50 | Rs 1,37,500 |
| | | | Rs 3,23,500 |
| *Less:* Fixed Costs | | 1,38,000 | |
| Advertisement Expenses | | 20,000 | Rs 1,58,000 |
| Net Profit: | | | Rs 1,65,500 |

### *Example 17.29 (Product Profitability Decision)*

Zenith Enterprises Ltd. is engaged in manufacturing and selling two products A and B. The following information are available from the records of the company:

| Budgeted Data (Monthly) | | | | |
|---|---|---|---|---|
| Products | | A | | B |
| Capacity | | 40% | | 30% |
| Production in units | | 4,000 | | 6,00 |
| Cost per unit: | Rs | Rs | Rs | Rs |
| Direct Material | 150 | | 80 | |
| Conversion Cost: | | | | |
| Variable | 360 | | 300 | |
| Fixed | 90 | 600 | 120 | 500 |
| Selling Price per unit | | 750 | | 425 |
| Profit/Loss per unit | | 150 | | (75) |

(2) In the subsequent period, the following changes are envisaged:
   (a) Direct Material Cost of Products A and B to increase by 20%;
   (b) Selling Price of Product A to increase by 10%;
   (c) Selling Price of Product B to increase by 30%.

(3) The management is contemplating to utilise 30% capacity presently lying idle and for this the following alternative proposals are to be considered:
   (a) Further sale of Product A is possible, but the additional out put can be sold at Rs 600 per unit. Efficiency for this additional production, will decrease by 10%;
   (b) Product B is expected to have a ready market at a price of Rs 510 per unit. The additional output is possible at the same efficiency level as budgeted;
   (c) A new product C may be introduced for which the following data are available:

| | |
|---|---|
| Direct Material Cost per unit | Rs 480 |
| Selling Price per unit | Rs 1,200 |

Conversion Cost of Product C is same as that of Product B. However, an additional amount of Rs 50,000 is to be incurred for advertisement. Production rate of C is also same as that of Product B.

(4) The following additional information also needs to be considered:
   (a) Present allocation of capacity of 40% to Product A and 30% to Product B cannot be altered. However, the idle capacity of 30% can be utilised for any of the Products A, B and C.
   (b) Fixed expenses are not to increase on account of utilisation of additional 30% capacity (except for the advertisement expenses as stated above).

You are required to prepare a comparative statement for providing information to the management giving your comments on the profitability of the three proposals as stated above.

*(ICWA Inter Dec. 1997)*

*Solution*

**Statement of Comparative Profitability Proposals**

| *Proposals* | *(a)* | | | *(b)* | | | *(c)* | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Products* | *A* | *B* | *Total* | *A* | *B* | *Total* | *A* | *B* | *C* | *Total* |
| *Capacity (%)* | *70* | *30* | *100* | *40* | *60* | *100* | *40* | *30* | *30* | *100* |
| 1. Production (Units) | 7,000 | 6,000 | 13,000 | 4,000 | 12,000 | 16,000 | 4,000 | 6,000 | 6,000 | 16,000 |
| 2. Selling Price per unit (Rs) | | | | | | | | | | |
| (a) For Current Production | 825.0 | 552.5 | – | 825.0 | 552.5 | – | 825.0 | 552.5 | 1,200.00 | – |
| (b) For Additional Production | 600.00 | – | – | – | 510.00 | – | – | – | – | – |
| | | | | (Rs in lakhs) | | | | | | |
| 3. Sales (WN 1) | 51.00 | 33.15 | 84.15 | 33.00 | 63.75 | 96.75 | 33.00 | 33.15 | 72.00 | 138.15 |
| 4. direct Material (WN 2) | 12.60 | 5.76 | 18.36 | 7.20 | 11.52 | 18.72 | 7.20 | 5.76 | 28.80 | 41.76 |
| 5. Conversion Cost (variable) (WN 3) | | | | | | | | | | |
| (a) For Current Production | 14.40 | 18.00 | 32.40 | 14.40 | 18.00 | 32.40 | 14.40 | 18.00 | 18.00 | 50.40 |
| (b) For Additional Production | 12.00 | – | 12.00 | – | 18.00 | 18.00 | – | – | – | – |
| 6. Total Variable Cost (4) & (7) | 39.00 | 23.76 | 62.76 | 21.60 | 47.52 | 69.12 | 21.60 | 23.76 | 46.80 | 92.16 |
| 7. Contribution (3) – (6) | 12.00 | 9.39 | 21.39 | 11.40 | 16.23 | 27.63 | 11.40 | 9.39 | 25.20 | 45.99 |
| 8. Fixed Cost (WN 4) | 3.60 | 7.20 | 10.80 | 3.60 | 7.20 | 10.80 | 3.60 | 7.20 | 0.50 | 11.40 |
| 9. Profit/Loss (7) – (8) | 8.40 | 2.19 | 10.59 | 7.80 | 9.03 | 16.83 | 7.80 | 2.19 | 24.70 | 34.69 |

*Comment:*
In view of above comparative statement, Proposal C may be considered for acceptance as the most profitable proposal. The acceptance of this proposal will result in highest increase in contribution and profit, as compared to any other proposal.

**Working Notes:**

1. Sales Proceeds

| | Rs |
|---|---|
| *Product-A* | |
| Current Production of 4,000 units @ Rs, 825 (750 + 10% of Rs 750) | 33,00,000 |
| Additional Production of 3,000 units @ Rs 600 | 18,00,000 |
| | 51,00,000 |
| | Rs |
| *Product-B* | |
| Current Production of 6000 units @ Rs 552.50 i.e. (450 + 30% of 450) | 33,15,000 |
| Additional Production of 600 units @ Rs 510 | 30,60,0000 |
| | 63,75,000 |

2. Direct Material Cost per unit
   *Product A:* 150 + 20% of 150) = Rs 180
   *Product B:* (80 + 20% of 80) = Rs 96
3. Variable Conversion Cost for Additional Production of 3000 units for product A:

| | |
|---|---|
| Conversion Cost per unit | Rs 360 |
| *Add:* 1/9 of 360 (decreased efficiency level by 10%) | 40 |
| | 400 |

   Total Conversion Cost for 3,000 units = (3,000 × 400) = Rs 12,00,000
4. Fixed conversion cost for product C has been taken as Rs 50,000 being the additional expenditure for advertisement.

***Example 17.30 (Production´ Subcontracting Decision)***

New Bharat Industries is manufacturing several consumer durables which have good demand in the market. The firm has been established only very recently and currently it is in the final stage of production. It has ambitious plans to expand production after earning income in the market. However, the company is having problems to get adequate power supply. Moreover, most of its labourers are casual workers and labour-absenteeism is also affecting production. In view of these unstable conditions the firm has adopted the practice of preparing quarterly flexible budgets.

For the quarter ending 31st December, 1996 flexible budgets for three possible levels of production were prepared as follows. The company wanted to achieve 90% capacity utilisation as its products had good demand.

| *Particulars* | *Flexible Budgets* | | |
|---|---|---|---|
| | *60%* | *80%* | *90%* |
| | *(in lakhs of rupees)* | | |
| Budgeted Sales | 50.00 | 66.00 | 75.00 |
| Budgeted Costs: | | | |
| Direct Materials | 12.00 | 16.00 | 18.00 |
| Direct Labour | 15.00 | 20.00 | 22.50 |
| Production Overheads | 11.80 | 14.00 | 15.10 |
| Administration Overheads | 2.00 | 2.00 | 2.00 |
| Selling Overheads | 7.80 | 9.80 | 10.20 |

Soon after the decision to attain 90% capacity utilisation, available power was reduced by the State Electricity Board and the reduced supply was sufficient to meet 50% capacity production.

The position has been immediately reviewed and the firm is considering the following possible options to meet the situation.

(a) Stop production for the quarter. As regular employees are only very few, lay-off compensation payable will be only Rs 1.20 lakhs. Further, overheads can be reduced by as much as 60%.
(b) Continue production at 50% level. Estimated sales income at this level will be Rs 40 lakhs.
(c) A private agency in the area has offered surplus captive power available with it. With this additional supply production can be maintained at 90% level. However, the overall variable production overhead will increase by 40%.
(d) Sub-contract the balance 40% which cannot be made by the firm to two small industrial units in the area, which have the necessary facilities, equally at a cost of Rs 15 lakhs each.

Evaluate each of the above options and recommend the best plan. Indicate the other important points, if any, to be considered.

*(ICWA Inter Dec. 1996)*

*Solution*

**Flexible Budget**

*(In Rs lakhs)*

| *Capacity Levels:* | *50%* | | *90%* | |
|---|---|---|---|---|
| *Costs:* | *Variable* | *Fixed* | *Variable* | *Fixed* |
| Direct Materials | 10.00 | — | 18.00 | — |
| Direct Labour | 12.50 | — | 22.50 | |
| Production Overheads | 5.50 | 5.20 | 9.90 | 5.20 |
| Administration Overheads | — | 2.00 | — | 2.00 |
| Selling & distribution Overheads | 4.00 | 3.00 | 7.20 | 3.00 |
| Total | 32.00 | 10.20 | 57.60 | 10.20 |
| Total Cost | | 42.20 | | 67.80 |
| Sales | | 40.00 | | 75.00 |
| Estimated Profit (Loss) | | (2.20) | | 7.20 |

*Results under different options*

(a) *Stop Production*

| | |
|---|---|
| Lay-off compensation | Rs 1.20 lakhs |
| Fixed Overheads at 40% of Rs 10.20 lakhs | 4.08 lakhs |
| Loss | 5.28 lakhs |

(b) *Continue Production at 50% capacity:*
Loss incurred will be Rs 2.20 lakhs
(as shown in Flexible Budget above)

(c) *Purchase Power from external source:*
Production is now at 90% level

| | | |
|---|---|---|
| Profit at 90% level Rs 7.20 lakhs | Rs 7.20 lakhs | (as shown in the Flexible Budget above) |
| *Less:* Additional Cost: Variable Production Overheads @ 40% of Rs 9.90 lakhs | 3.96 lakhs | |
| Net Profit | 3.24 lakhs | |

(d) *Sub-contract Part of Production:*

| | |
|---|---|
| Cost of Production at 50% level | Rs 42.20 lakhs |
| Payment to Sub-contract Firms towards Production | Rs 30.00 lakhs |
| Cost: Variable Selling and Distribution Overheads for balance 40% goods supplied by outsiders (Rs 7.20 lakhs – Rs 4 lakhs) | Rs 3.20 lakhs |
| | Rs 75.40 lakhs |
| Sales | Rs 75.00 lakhs |
| Net Loss | Rs 0.40 lakhs |

*Comments:* The firm is a growing firm which is trying to expand its production and sales. At present it is affected mainly by shortage of power which is working as a limiting factor. As its long term objective is to expand its activities, options (a) and (b) are not acceptable. Option (d), apart from the loss, entrusting production to another unit, may result in parting with technology and method of manufacture and creating a potential competitor. Hence, this is also not acceptable, even if it has been more profitable. The best course for the firm at present, therefore, is to follow option (c) and build up its own captive power supply so that future production would in no way be affected.

### *Example 17.31 (Buy Decision)*

Household Equipments Ltd. is producing a kitchen equipment from five components three of which are made using general purpose machines and two by manual labour. The data for the manufacture of the equipment is as follows:

| *Components* | *A* | *B* | *C* | *D* | *E* | *Total* |
|---|---|---|---|---|---|---|
| Machines Hours reqd. per Unit | 10 | 14 | 12 | — | — | 36 |
| Labour Hours reqd. per Unit | — | — | — | 2 | 1 | 3 |
| Variable Cost per Unit (in Rs) | 32 | 54 | 58 | 12 | 4 | 160 |
| Fixed Cost per Unit (apportioned) | 48 | 102 | 116 | 24 | 36 | 316 |
| Total Component Cost | 80 | 156 | 174 | 36 | 30 | 476 |
| Assembly Cost per Unit (all variable) | | | | | | Rs 40 |
| Selling Price per Unit | | | | | | Rs 600 |

The marketing department of the company anticipates 50% increase in demand during the next period. General purpose machinery used to manufacture A, B and C is already working to the maximum capacity of 4,752 hours and there is no possibility of increasing this capacity during the next period. But labour is available for making components D and E and also for assembly according to demand. The management is considering the purchase of one of the components A, B or C from the market to meet the increase in demand. These components are available in the market at the following prices:

Component A : Rs 80
Component B : Rs 160
Component C : Rs 125

*Required:*

(a) Profit made by the company from current operations.
(b) If the company buys any one of the components A, B or C, what is the extent of additional capacity that can be created?
(c) Assuming 50% increase in demand during the next period, which component should the company buy from the market

(d) The increase in profit, if any, if the component suggested in (c) is purchased from the market.
*(ICWA Inter Dec 1995)*

*Solution*

1. (a) Available Machine Hours: 4,752
Machine Hours required for one unit of equipment: 36
Number of Equipments that can be produced in a period: 4,752/36 = 132 units
Estimated Demand for the next period (50% increase): 132 + 66 = 198 units

| | | | |
|---|---|---|---|
| Selling Price per Unit | | | Rs 600 |
| *Less:* Variable Cost: | | Rs | |
| Component | A | 32 | |
| Component | B | 54 | |
| Component | C | 58 | |
| Component | D | 12 | |
| Component | E | 4 | |
| Assembly | | 40 | 200 |
| Contribution per unit | | | 400 |
| Total Contribution for 132 units | | | Rs 52,800 |
| *Less:* Fixed Cost | | | 41,712 |
| Net Profit | | | 11,088 |

(b) The company may buy any one of the components. The number of units that can be produced under the three options available are as follows:

| *Buy Component 'A'* | | *Buy Component 'B'* | | *Buy Component 'C'* | |
|---|---|---|---|---|---|
| *Component* | *Machine hours reqd.* | *Component* | *Machine hours reqd.* | *Component* | *Machine hours reqd.* |
| A | — | A | 10 | A | 10 |
| B | 14 | B | — | B | 14 |
| C | 12 | C | 12 | C | — |
| Total Machine Hrs per unit | 26 | | 22 | | 24 |

Total Machine Hours available under all options are 4,752

Number of units that can be manufactured, if A is bought = 4,752/26 = 182.77 units

Number of units that can be manufactured, if B is bought = 4,752/22 = 216 units

Number of units that can be manufactured, if C is bought = 4,752/24 = 198 units.

Additional Capacity that can be created

$$\frac{(182.77 - 132) \times 100}{132} = 38.5\%$$

$$\frac{(216 - 132) \times 100}{132} = 63.6\%$$

$$\frac{(198 - 132) \times 100}{132} = 50\%$$

(c) In case the increase in demand during the next period is 50%, it is not possible to meet it by buying component A as additional capacity created is only 38.5%. Of the remaining two options the cheaper one has to be accepted.

| *Particulars* | *Buy B* Rs | *Buy C* Rs |
|---|---|---|
| Market Price | 160 | 125 |
| *Less:* Variable Cost if made by the company | 54 | 58 |
| *Add:* Cost to be incurred | 106 | 67 |
| Machine Hours saved | 14 | 12 |
| Cost per hour saved | Rs 7.57 | Rs 5.58 |

The above analysis shows that it is cheaper to increase capacity by Buying C hence this option has to be exercised.

(d) *Profitability Statement*

| | | | |
|---|---|---|---|
| Selling Price per unit of equipment | | | Rs 600 |
| *Less:* Variable Cost: | | | |
| Making A | | Rs 32 | |
| Making B | | 54 | |
| Buying C | | 125 | |
| Making D | | 12 | |
| Making E | | 4 | |
| Assembly | | 40 | 267 |
| Contribution per unit | | | 333 |
| Total Contribution for 198 units | | | 65,934 |
| *Less:* Fixed Cost per period | | | 41,712 |
| Net Profit | | | 24,222 |
| Net Increase over profit for current period (24,222 – 11,088) | | | Rs 13,134 |

## THEORY QUESTIONS

1. What is meant by the term "differential costing"? Does differential cost mean the same thing as variable cost?
2. What is incremental cost? Does incremental cost mean the same thing as variable cost?
3. Give examples of how incremental costs are used in decision-making.
4. A departmental store is thinking of eliminating one of its departments because the accountant using the total cost basis to profitability analysis, says the department is operating at a loss. What should be investigated before the final decision is made?
5. Explain the meaning and features of relevant costs. Give suitable examples to support your explanation. *(B. Com (Hons) Delhi 1997)*
6. Ventilators Ltd. wants to stabilise its production through the year. The approaches recommended are:
   (a) Maintan production at an even pace throughout the year, and get the off-season production stored on the premises.
   (b) Maintain production at an even pace but offer dealers a special discount for off-season purchases.
   (c) Extend special terms to dealers, but maintain prices at a level that will enable regular movement of goods throughout the year.

   Discuss the relative merits and disadvantages of the above proposals. *(CA Inter)*

7. Cost-benefit analysis is needed for resolving many managerial problems. List the various items of cost and benefits that you will quantify in respect of managerial decisions:
   (a) change versus status quo;
   (b) retain or replace;.
   (c) shutdaun or continue
8. Explain the basic characteristics of costs involved in decision-making.
   *(B Com (Hons), Delhi)*
9. State the costing data required for (i) determining the priority of products, and (ii) make or buy decisions.
   *(B Com (Hons), Delhi)*
10. How would you go about determining the point at which a manufacturing company that is facing a period of operating losses should shut assuming that profitability of operations is the only point to be considered?
11. Why is the contribution that a product makes towards the recovery of non-escapable costs a bettr measure of its profitability than the profit or loss reported on its sale after it has been charged with its fair share of all costs?

## SELF-EVALUATION QUESTIONS

Choose the correct answer for the following multiple-choice questions:

(i) The type of costs presented to management for a non-routine decision should be limited to
   (a) Relevant costs
   (b) Standard costs
   (c) Controllable costs
   (d) Conversion costs

(ii) Other things remaining the same, ideal product mix is determined in terms of
   (a) Sales
   (b) Variable costs
   (c) Total costs
   (d) Contribution margin

(iii) In a make or buy decision
   (a) Only variable costs are relevant
   (b) Fixed costs that can be avoided in the future are relevant
   (c) Fixed costs that will continue regardless of the decision are relevant
   (d) a and b

(iv) Relevant costs are
   (a) Future costs
   (b) Standard costs
   (c) Controllable costs
   (d) Historical costs

(v) The decision marker should consider in case of limiting factor(s) to maximise the profit
   (a) Sales
   (b) Contribution margin
   (c) Variable costs
   (d) Fixed costs

(vi) The measurable value of an alternative use of resources is referred to as a (an)
   (a) Opportunity cost
   (b) Imputed cost
   (c) Differential cost
   (d) Sunk cost

(vii) A manager of a company reported the total additional cost required for the proposed increased production level. The increase in total cost is known as
  (a) Controllable cost
  (b) Incremental cost
  (c) Opportunity cost
  (d) Out-of-pocket cost

(viii) Which of the following is usually an incremental cost.
  (a) Conversion cost
  (b) Period cost
  (c) Manufacturing overhead cost
  (d) Direct product cost

(ix) A cost incurred in the past and hence irrelevant for current decision making is a
  (a) Fixed cost
  (b) Discretionary cost
  (c) Sunk cost
  (d) Direct cost

(x) A cost that cannot be changed by any decision made now or in the future is a (an)
  (a) Indirect cost
  (b) Uncontrollable cost
  (c) Opportunity cost
  (d) Sunk cost

## PROBLEMS

1. Timeless products, a clock manufacturer, is operating at capacity. Constrained by machine time, the company has decided to drop the most unprofitable of its three product lines. The accounting department came up with the following data from last year's operations:

| | *Manual* | *Electric* | *Quartz* |
|---|---|---|---|
| Machine time per unit | 0.4 hour | 2.5 hours | 5.0 hours |
| Selling price per unit | Rs 20 | 30 | 50 |
| *Less:* Variable costs per unit (Rs) | (10) | (14) | (28) |
| Contribution margin (Rs) | 10 | 16 | 22 |

Which line should Timeless products drop?

*Ans:* Timeless products should drop the quartz line.

2. A factory is currently working at 50% capacity and produces 10,000 units of product P, the unit cost of which is Rs 180 comprised as follows:

| | Rs | |
|---|---|---|
| Direct materials | 100 | |
| Direct labour | 30 | |
| Factory overhead | 30 | (40% fixed) |
| Administration overhead | 20 | (50% fixed) |

The selling price per unit is Rs 200

If the capacity is increased to 60%, the raw material cost will increase by 2% and selling price falls by 2%. At 80% capacity, raw material cost increases by 5% and selling price falls by 5%.

You are required to work out the total costs and profit for the three capacity levels and prepare a brief note for the management on the profitability at these levels of performance with your recommendation.

*(CA Inter, ICWA Inter)*

*Ans:* Profit at 50% Rs 2,00,000, at 60%, Rs 2,12,000, at 80%, Rs 2,12,000. It is advisable to run the factory at 60% capacity level. The total amount of profit at 60% and 80% capacity is the same. In fact it will be preferable to use the surplus capacity over 60% for some other purpose.

3. A firm is selling X product, whose variable cost per unit is Rs 10 and fixed cost is Rs 6,000. It has sold 1,000 articles during one month at Rs 20 per unit. Market research shows that there is a great demand for the product if the price can be reduced. If the price can be reduced to Rs 12.50 per unit it is expected that 5,000 articles can be sold in the expanded market. The firm has to take a decision whether to produce and sell 1,000 units at the rate of Rs 20 or to produce and sell for the growing demand of 5,000 units at the rate of Rs 12.50. Give your advice to the management in taking a decision.

   *Ans:* Profit (a) 1000 units, Rs 4000
   (b) 5000 units, Rs 6500
   Proposal to manufacture and sell 5000 units is preferable.

4. A manufacturer of a certain product has been selling exclusively in the Indian market up to now. He has just received his first export enquiry and wants to quote as competitively as the circumstances will allow. His latest Indian cost sheet is:

| | Rs 34 per unit |
|---|---|
| Raw materials | 13 |
| Direct labour | 6 |
| Services | 7 |
| Works overhead | 2 |
| Office overhead | 62 |
| | 6 |
| Profit earned in India | 68 |
| Indian selling price | |

   Management is thinking of quoting a selling price somewhere between Rs 62 and Rs 68 per unit for this export order. One of the directors suggests quoting an even lower price based on the principles of marginal costing. As the firm's accountant, you are requested to compute the lowest price the management could quote on these principles. State clearly any assumptions that you may make on the above facts, and also on any other costs or facts.

*(CA Inter)*

   *Ans:* Marginal cost of product Rs 51. Any price above this amount can be quoted by the company.

5. On the basis of the following information in respect of an engineering company, what is the product-mix which will give the highest profit attainable? Do you recommend overtime working up to a maximum of 15,000 hours at twice the normal wages (overheads are ignored for the purpose of this question)?

| Products | *A* | *B* | *C* |
|---|---|---|---|
| Raw materials per unit (kg) | 10 | 6 | 15 |
| Labour hours per unit @ Re 1 per hour | 15 | 25 | 20 |
| Sales price per unit (Rs) | 125 | 100 | 200 |
| Maximum production possible (Units) | 6,000 | 4,000 | 3,000 |

   1,00,000 kg raw materials are available @ Rs 10 per kg. Maximum production hours are 1,84,000 with facility for a further 15,000 hours on overtime basis at twice the normal wage rate.

6. A company manufactures three products A, B and C. There are no common processes and the sale of one product does not affect price or volume of sales of any other.
   The company's budgeted profit/loss for 2002 has been abstracted as follows:

| | | *Total* | *A* | *B* | *C* |
|---|---|---|---|---|---|
| Sales | | Rs 3,00,000 | Rs 45,000 | Rs 2,25,000 | Rs 30,000 |
| Production cost: | Variable | 1,809,000 | 24,000 | 1,44,000 | 12,000 |
| | Fixed | 60,000 | 3,000 | 48,000 | 9,000 |
| Factory cost | | 2,40,000 | 27,000 | 1,92,000 | 21,000 |
| Selling and administration costs: | Variable | 24,000 | 8,100 | 8,100 | 7,800 |
| | Fixed | 6,000 | 2,100 | 1,800 | 2,100 |
| Total cost | | 2,70,000 | 37,200 | 2,01,900 | 30,900 |
| Profit | | 30,000 | 7,800 | 23,100 | (–) 900 |

On the basis of the above, the Board had almost decided to eliminate product C, on which a loss was budgeted. Meanwhile, they have sought your opinion. As the company's Cost Accountant what would you advice? Give reasons for your answer.

*(ICWA Inter)*

*Ans:* P/V ratio, A 28.7%, B 32.4%, C 34%

It is found that product C, though has the highest P/V Ratio, seems to be non-profitable because it has to bear a higher percentage of fixed cost as compared to its total cost. The percentage comes to about 36 $\left(\text{i.e. } \frac{11,100}{30,900} \times 100\right)$ which in case of other products is too less. Since the surplus capacity generated by one product canot be used for other products, there seems to be no justification for discontinuing product C till some new product is developed which will have a higher P/V ratio than product C. In the present circumstances, since C has a higher P/V ratio, and if the sales continue to rise, C may start giving profit too.

7. A factory produces 24,000 units. The cost sheet gives the following information:

| | |
|---|---|
| Direct material | Rs 1,20,000 |
| Direct wages | 84,000 |
| Variable overheads | 48,000 |
| Semi-variable overheads | 28,000 |
| Fixed overheads | 80,000 |
| Total Cost | 3,60,000 |

The product is sold at Rs 20 per unit. The management proposed to increase the production by 3000 units for sales in the foreign market. It is estimated that semi-variable overheads will increase by Rs 1,000. But the product will be sold at Rs 14 per unit in the foreign market. However, no additional capital expenditure will be incurred. The management seeks your advice as cost accountant. What will you advise them?

*(B. Com (Hons) Delhi 1997)*

*Ans:* Sales of additional units 3000 in the foreign market will give a profit of Rs 9500. Hence the proposal should be accepted.

8. A machine tool manufacturing company sells its lathes at Rs 36,500 each made up as follows:

| | | |
|---|---|---|
| Direct materials | Rs 16,000 | |
| Direct labour | 2,000 | |
| Variable factory overheads | 5,000 | |
| Fixed factory overheads | 3,000 | |
| Variable selling overheads | 500 | |
| Royalty | 1,000 | |
| Profit | 5,000 | 32,500 |
| Central excise duty | | 1,000 |
| Sales tax | | 3,000 |
| | | 36,500 |

There is enough idle capacity.

(a) A firm in Arabia has offered to buy 10 company's lathes at Rs 28,500 each. Should the company be interested in the business?

(b) It has been decided to sell 5 such lathes to an engineering company under the same management at bare cost. What price should you charge?

*Ans:*

(a)

| | |
|---|---|
| Contribution | Rs 4,000 |
| *Less:* Sales tax | 2,340 |
| Savings | Rs 1,660 |

Company may accept the export order.

(b) The company may charge Rs 31000 (Rs 36000 - Rs 5500) (profit and selling overheads)

9. The budgeted results for X Co. include the following:

| | | *Rs in lakhs* | *Variable cost as % of sales value* |
|---|---|---|---|
| *Sales:* | Product A | 60 | 50% |
| | Product B | 50 | 60% |
| | Product C | 80 | 65% |
| | Product D | 40 | 80% |
| | Product E | 30 | 70% |
| | | 260 | |

Fixed overheads for the period Rs 100.00 lakhs.

You are required to (a) Prepare a statement showing the amount of loss expected, (b) assuming that the sale of only one product can be increased at a time, you are asked to recommend a change in the sales volume of each product which will eliminate the expected loss.

*Ans:* (a) Total loss Rs 5,00,000.

(b) Additional sales required to break-even, assuming sales of only one product is increased at a time, to give the additional contribution of Rs 5,00,000, is calculated as follows:

$$\text{Sales required} = \frac{\text{Under-recovery of fixed overheads}}{\text{P/V ratio of the product}}$$

| Product | Rs | Rs |
|---|---|---|
| A | 5,00,000 / 50% | 10,00,000 |
| B | 5,00,000 / 40% | 12,50,000 |
| C | 5,00,000 / 45% | 14,28,571 |
| D | 5,00,000 / 20% | 25,00,000 |
| E | 5,00,000 / 30% | 16,66,667 |

The company should utilise the spare capacity available for Product 'A' to achieve maximum profitability as its P/V ratio is highest. Fixed costs remaining the same at every level of production, this combination will lead to maximum profitability.

10. Quality Products. Ltd. manufactures and markets a single product. The following data are available:

| | *Per unit* | *Per unit* | |
|---|---|---|---|
| Materials | Rs 16 | Dealer's margin | Rs 4 |
| Conversion costs (Variable) | 12 | Selling price | 40 |

Fixed cost: Rs 5 lakhs
Present sales: 90,000 units
Capacity utilisation: 60 per cent

There is acute competition. Extra efforts are necessary to sell. Suggestions have been made for increasing sales:

(a) By reducing sales price by 5 per cent.
(b) By increasing dealer's margin by 25 per cent over the existing rate.
Which of these two suggestions you would recommend, if the company desires to maintain the present profit? (Give reasons)

*Ans:* Present profit Rs 2.20,000
(a) Units required to maintain the same profit 1,16,111 units
(b) Units required to maintain the same profit 102,857 units. Second proposal is recommended.

11. From the cost records of a company, for a specific period for product X, the information given in the first column is extracted. The second column can be ignored since it is only one of the projections of an assistant accountant; but it may be useful to you:

| | *This period activity* | *One of the future projections* |
|---|---|---|
| Sales, in units | 10,000 | 20,000 |
| Profit (loss) (in Rs) | (10,000) | 10,000 |
| Fixed cost (in Rs) | 30,000 | 30,000 |
| Variable cost per unit (in Rs) | 8 | 8 |

On the basis of the first column, determine:
(a) What increased sales volume is required to cover an extra attractive packaging cost of Re 0.50 per unit, to increase the sales, at the existing sale price, to yield zero profit?
(b) What increased sales volume is required, at the present sale price to cover an additional publicity expense of Rs 5,000 for that period while yielding a profit of Rs 5,000?
(c) What increased sales volume is required to reach a profit of Rs 4,000 while reducing the seling price by 3% per unit?

*Ans:* (a) BEP if extra packaging cost is incurred 20,000 units. Additional Sales Rs 1,00,000.
(b) Additional sales required Rs 1,00,000.
(c) Additional sales required Rs 94,000.

12. A company follows the flexible budgeting system, and the position at 70% level of production, is as follows:

| | |
|---|---|
| Production | 40,000 units |
| Direct wages | Rs 60,000 |
| Direct materials | 80,000 |
| Overhead: | |
| Fixed | 84,000 |
| Variable | 42,000 |
| | 2,66,000 |

The selling price per unit is Rs 8.65
In the present market conditions there is hardly any chance for selling more locally. A special export order for 8,000 units @ Rs 6.50 per unit, is received. (a) Would it be prudent for the company to accept the order at this price? (b) What is the price beyond which it would be profitable to accept this order?

13. Yardley Corporation uses a joint process to produce products A, B and C. Each product may be sold at its split-off point or processed further. Additional processing costs are entirely variable and are traceable to the respective products produced. Joint production costs for 2002 were Rs 50,000.
Relevant data are as follows:
Sales value and additional costs if processed further

| *Product* | *Units produced* | *Sales value at split-off* | *Sales value* | *Additional costs* |
|---|---|---|---|---|
| *A* | 20,000 | Rs 45,000 | Rs 60,000 | Rs 20,000 |
| *B* | 15,000 | 75,000 | 98,000 | 20,000 |
| *C* | 15,000 | 30,000 | 62,000 | 18,000 |
| | | Rs 1,50,000 | | |

*Required:*
To maximise profits, which products should Yardley subject to further processing? Why?

14. Alpha Company has the following budgeted figures for its various products for next year:

| | *Products* | | |
|---|---|---|---|
| | *A* | *B* | *C* |
| | (Rs '000) | (Rs '000) | (Rs '000) |
| Sales value | 480 | 480 | 160 |
| Variable costs | 432 | 384 | 120 |
| Fixed costs (allocated) | 24 | 36 | 50 |

The company is concerned about product C and several alternatives are being considered:
Alternative: 1
Cut C's selling price by 10%. It is estimated that this will increase C's unit sales by 40%.
Alternative: 2
Substitute a new product D for C. Estimated sales are Rs 1,40,000 in the first year. Variable costs are estimated at 55% of sales. Fixed cost directly attributable to C of Rs 10,000 will be eliminated but Rs 16,000 additional fixed costs directly attributable to D will be incurred.
Alternative: 3
Eliminate C entirely. This will reduce the fixed costs attributable to C by Rs 10,000.
Alternative: 4
Convert C into special finish by adding additional treatments, which will secure a price increase of 20%. The additional costs incurred will be 10% of the new increased price.
Management wants to know the effect of each alternative on the profit of the company and their ranking in order of preference.
*Ans:* The four alternatives have no relationship with products A and B. It can be assumed that these products will continue to make contribution whatever they are currently making. Therefore, there is no need to examine products A and B profitability.
For product C, the following ranking of alternatives is applicable:
Rank 1 – Alternative 2 — Increases profit by Rs 17,000
Rank 2 – Alternative 4 — Increase profit by Rs 12,800
Rank 3 – Alternative 1 — Increase profit by Rs 9,600
Rank 4 – Alternative 3 — Reduces profit by Rs 30,000

15. At present the operations of Aravalli Forge products are mainly manual. Under the present method of production, the business shows a net income of Rs 1,000 per month at maximum production capacity as thus:

| | |
|---|---|
| Sales revenue | Rs 10,000 |
| Variable costs to make and sell | Rs 8,000 |
| Contribution | Rs 2,000 |
| Fixed costs to make and sell | Rs 1,000 |
| | Rs 1,000 |

Sale volume can be increased by at least 50 per cent if production capacity permitted.

Under consideration is a plan to double the production capacity by substituting machinery for manual labour. In case the plan is adopted, fixed costs would be increased by Rs 6,000 per month and variable costs would be reduced by 75 per cent.

You are required to give—

(i) Calculations of all costs involved in and the profitability of the proposed change in manufacturing operations; and

(ii) Arguments for and against the proposed change based on the calculations made.

*(B Com (Hons), Delhi)*

16. A company is at present working at 90 per cent of its capacity and producing 13,500 units per annum. It operates a Flexible Budgetary Control System. The following figures are obtained from its budget:

| | 90% | 100% |
|---|---|---|
| | Rs | Rs |
| Sales | 15,00,000 | 16,00,000 |
| Fixed expenses | 3,00,500 | 3,00,600 |
| Semi-fixed expenses | 97,300 | 1,00,500 |
| Variable overhead expenses | 1,45,000 | 1,49,500 |
| Units made | 13,500 | 15,000 |

Labour and material cost per unit are constant under present conditions. Profit margin is 10 per cent.

(a) You are required to determine the differential cost of producing 1,500 units by increasing capacity to 100 per cent.

(b) What would you recommend for an export price for these1,500 units taking into account that overseas prices are much lower than indigenous prices?

*(B Com (Hons), Delhi, ICWA Inter)*

17. A toy manufacturer earns an average net profit of Rs 3 per piece in a selling price of Rs 15 by producing and selling 60,000 pieces at 60% of the potential capacity. Composition of his cost of sales is:

| | | |
|---|---|---|
| Direct material | : | Rs 4 |
| Direct wages | : | Re 1 |
| Works overhead | : | Rs 6 (50% fixed) |
| Sales | : | Re 1 (25% variable) |

During the current year, he intends to produce the same number but anticipates that:

(a) his fixed charges will go up by 10%

(b) rates of direct labour will increase by 20%

(c) rates of direct material will increase by 5%

(d) selling price cannot be increased.

Under these circumstances, he obtains an order for a further 20% of his capacity. What minimum price will you recommend for accepting the order to ensure the manufacturer an overall profit of Rs 1,80,000?

18

# Standard Costing

Control of cost is one of the most important objectives of cost accounting and cannot be achieved without some standard against which actual can be compared. This chapter introduces the concepts and basic procedures of standard costing and also explains the techniques used in standard cost variance analysis. However, before discussing standard costing it will be appropriate to evaluate briefly historical cost accounting and its limitations.

## HISTORICAL COSTING AND ITS LIMITATIONS

Historical cost systems are principally associated with recording of historical, or as they are commonly called, actual cost. Historical costing is the ascertainment of costs after they have been incurred. Historical costs have the following limitations:

1. Historical costs are collected after they have been incurred and therefore are ineffective in cost control. The costs have been incurred, they cannot be undone and no steps can be taken to correct inefficiencies.
2. Historical costs are not helpful in cost reduction since they contain no standards or goals towards which employees can work.
3. Historical costs do not provide reliable guides to management in the tasks of budgeting, planning, and decision-making because they reflect a situation in a previous period. But the company, in fact, may be working under conditions different from those prevailing during that previous period.

## DEFINITION OF STANDARD COST, STANDARD COSTING

A standard cost is a planned cost for a unit of product or service rendered. Standard costs represent excellent target costs that should be obtained. The Institute of Cost and Management Accountants (UK) defines standard cost as "a predetermined cost which is calculated from management's standards of efficient operation and the relevant necessary expenditure. It may be used as a basis for price fixing and for cost control through variance analysis." Standard cost expresses what costs should be under attainable good performance.

Standard costing is the setting of predetermined cost estimates in order to provide a basis for comparison with actual costs. The Institute of Cost and Management Accountants (UK) defines standard costing as "the preparation and use of standard costs, their comparison with actual costs, and the analysis of variances to their causes and points of incidence."

## STANDARD COSTS AND ESTIMATED COSTS

The term "standard costs" should not be confused with "estimated costs". Standard cost and estimated costs differ in the following respects:

First estimated costs are frequently less accurately determined. Estimated costs are developed from projections using averages of past data regarding performance. Standard costs are predetermined realistically and much more scientifically through the use of time and motion studies, engineering estimates and specifications, selected measures of plant capacity, cost behaviour patterns.

Second, estimated costs are not helpful to management in accomplishing managerial functions as they are not scientifically predetermined costs. But standard costs involve more sophistication, operation analysis and evaluation and comprehensive review of internal and external factors and provide reliable measures for product costing, product pricing, planning, coordination and cost control purposes.

Third, estimated cost emphasises on actual cost with which it is compared at the end of the accounting period. If the estimated costs are found higher or lower than actual costs they are revised for use in the next accounting period. In standard costing, the emphasis is on standard costs, i.e., what costs of material, labour and overhead should be incurred if the factory is to be operated as a highly efficient unit with each manager, foreman, worker, plant and machine functioning as an efficient part of the production process. Under standard costing, actual costs are ascertained only to facilitate their comparison with standard costs.

## ADVANTAGES OF STANDARD COSTING

Among the many advantages generally attributed to standard costing, the most important may be listed as follows:

1. *Managerial planning* Planning is a process of using all resources in such a manner that maximises business profits. Standard costs are more convenient than actual costs for budget preparation because the standard costs at different production levels and for different product-mixes are readily built up into total costs as called for by the budget. On the other hand, using actual costs requires a great deal of analysis and adjustment when extensive changes in product volume or product-mixes take place.
2. *Coordination* The establishment of standards coordinates all functions—manufacturing, marketing engineering, research, and accounting towards the achievement of a common goal. Setting standards involves defining and communicating targets so that they can work towards the attainment of the goal.
3. *Cost control* Cost control and cost reduction are probably the most important aims of any costing system; and standard costing gives due recognition to this fact. Cost control has the objective of production of the required quality at the lowest cost attainable under existing conditions. Standards enable management to make periodic comparison of actual costs with

standard costs in order to measure performance and to take action to maintain control over costs.

4. *Economical means of costing and record-keeping* The use of standard costs can reduce clerical labour and expense by avoiding the detailed record-keeping which is necessary when actual costs alone are used.
5. *Formulating price and production policies* Standard costs as compared to actual costs can be used for estimating selling prices. When standard unit costs are available, expected costs and sales prices can be computed on the basis of standard costs. Standards already established can easily be modified to reflect current conditions and changes in material prices or labour rates and the price of the product can be determined on a realistic basis.

   Actual costs, on the other hand, may reflect excessive usage of material, abnormal labour times or an inequitable charge for overhead. Actual overhead cost per unit at any given time may be so influenced by temporary fluctuations in production levels as to make actual cost entirely unusable for pricing.
6. *Standards as incentives to employees* If standards are reasonable and attainable they act as incentives to employees to improve their performances and to maintain the quality of the product. Standards motivate workers, supervisors and foremen to work more efficiently in the accomplishment of their respective standards.

## DIFFERENT TYPES OF STANDARDS

The two principal consideration affecting the classification of standards are: (i) attainability of standards, that is, the ease with which it is possible to achieve the standards, and (ii) frequency with which the standards are revised. On the basis of these two factors, it is possible to classify standards as ideal, normal, basic, current or expected actual standards.

### Ideal, Perfect, Maximum Efficiency or Theoretic Standards

Ideal standards (costs) are the standards which can be attained under the most favourable conditions possible. The level of performance under ideal standards would be achieved through the best possible combination of factors—the most favourable prices for materials and labour, highest output with best equipment and layout, and maximum efficiency in the utilisation of the production resources—in other words, maximum output at minimum cost. Such standards reflect only goals or targets without any hope of performance being currently achieved. These standards are extremely tight and do not provide for waste and inefficiency in any form; no material is wasted; no units are spoiled; there are no idle hours; operators work at predetermine speed; the available capacity is fully utilised.

### Normal Standards

Normal standards are the average standards which (it is anticipated) can be attained during a future period of time, preferably long enough to cover one business cycle. These standards are not revised until the cycle has run its full course. This generally results in an incorrect valuation of inventories and consequent errors in the profit disclosed, as the inventories are understated in periods of high prices, and over-stated when prices are low. Normal standards are mainly used as a device to solve the problem of absorbing fixed overhead rather than in connection with material cost and wages. Since these standards do not reflect the goals to be attained, they are not often used.

### Basic Standards

The Institute of Cost and Management Accountants (UK) defines a basic standard as the standard which is established for use unaltered for an indefinite period which may be a long period of time. Basic standards are seldom revised or updated to reflect current operating costs and price level changes.

### Currently Attainable or Expected Actual Standards

Current standards are standards which are established for use over a short period of time, and are related to current conditions. They represent current costs to be expected from efficient operations. Currently attainable standards are formulated after making allowance for the cost of normal spoilage, cost of idle time due to machine breakdowns, and the cost of other events which are unavoidable in normal efficient operations. They take the place of actual cost and are recorded in account books and financial statements. Any deviation from these standards reflect inefficiencies in the production activities, unless the variances have occurred due to uncontrollable factors. These standards are most accurate and very useful to management in product costing, inventory valuations; estimates, analyses, performance evaluation, planning, employee motivation, and for managerial decision making and external financial reporting.

## HOW TIGHT SHOULD STANDARD BE

It can be rightly said that a single standard may not be suitable for all purposes. For the purposes of cost control, tight standards need to be established. The attainable (good) performance standards are useful for purposes of inventory valuation, product costing and income determination.

### High Standards

A high standard helps in cost reduction and motivating employees to try to reach the targets established. High standards represent the best possible performance and, if achieved, raise the levels of performance and efficiency as compared to poor or loose standards. High standards being unattainable in practice may not be good for the employees. Employees may not seriously accept them because they know that they are unattainable and impossible to achieve. High standards are also not realistic and therefore cannot be used in product costing, inventory valuation, financial statement, planning, and capital investment decisions.

### Low (Loose) Standards

A standard which is low or loose can be attained by poor performance. However, it defeats the purpose of standard costing and fails to disclose inefficiencies. Such standards do not help management in cost control as they are not accurate measures to compare actual results.

In conclusion, it can be said that accountants generally seem to favour currently attainable standards which are most appropriate for performance appraisal, accounting purposes, cost control and decision-making. Such standards produce good performance, promote employee motivation and include unavoidable elements, such as spoilage, lost time, capacity not utilised in setting standards.

## DEVELOPING OR SETTING STANDARD

All factors related with standards-setting should be considered in the establishment of standards. Whatever method is used, standards must be established for a definite period of time so that they can be effective in performance evaluation, control and analysis of costs. Standards are usually set for a six- or twelve-month period. Sometimes a longer period is used but rarely a shorter period. Standards are developed for:

1. Materials.
2. Labour, and
3. Overhead.

### Materials Standards

Two standards must be developed for materials:

1. Materials quantity (usage) standard
2. Materials price standard

### Labour Standards

As in the case of direct materials, labour standards are also established for both cost and quantity (efficiency). For standard cost purposes, direct labour is treated separately from indirect labour, which is included in the factory overhead. Two standards are usually developed for labour costs;

1. Labour usage (or efficiency) standard
2. Labour cost (or rate) standard

### Factory Overhead Cost Standards

### Setting Overhead Standards

Setting standard overhead cost requires the determination of: (1) standard capacity and (2) standard overhead costs for this capacity. The standard overhead costs can be computed using normal capacity. The normal or expected actual capacity aims at a production level according to an existing set of conditions. This capacity does not require complete utilisation of all available facilities but is based on the efficient utilisation of resources and operations.

After standard capacity is determined, overhead—variable and fixed—to be incurred at that capacity is prepared. The standard overhead rate is found by dividing the standard or budgeted overhead at standard capacity by the volume selected to represent standard capacity. Volume may be measured in units of product, standard productive hour (labour or machine) or some standard cost, such as direct labour.

$$\text{Standard overhead rate} = \frac{\text{Standard overhead}}{\text{Standard production}}$$

## REVISION OF STANDARDS

Standard costs require continuous review and, at times, frequent change. Changing prices, technological advances, new personnel, new machinery, changing quality of materials and new labour negotiations,

all influence standards and make them obsolete resulting in unrealistic budgets, poor cost control, and unreasonable unit cost for inventory valuation and income determination.

A company should establish a programme to revise standards whenever required so that standards can be set at a currently attainable level. Labour rate standards should be revised for any change in labour rates; material quantity standards for any change in type, quality of material or method of production. If a new machine is purchased to replace an old machine, labour time standards and material quantity standards should be updated. In addition to these obvious revisions, in every business firm there should be a system for revising standards for adequacy and suitability at least once a year. A periodic review of standards is desirable to accomplish the objectives of standard costing.

## VARIANCE ANALYSIS

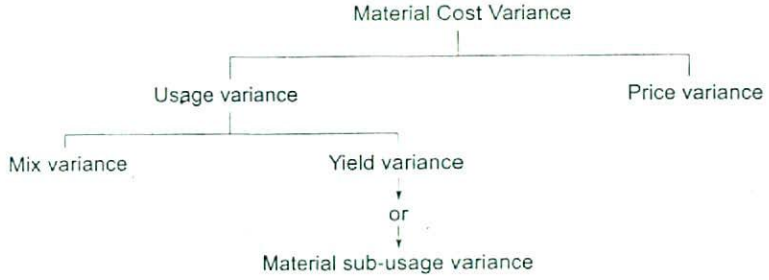
The function of standards in cost accounting is to indicate variances between standard costs which are allowed and actual costs which have been recorded. The Institute of Cost and Management Accountants (UK) defines variance as the difference between a standard cost and the comparable actual cost incurred during a period. Variance analysis can be defined as the process of computing the amount of, and isolating the cause of variances between actual costs and standard costs. Variance analysis involves two phases:

1. Computation of individual variances, and
2. Determination of the cause(s) of each variance

First, we concentrate on the computation of material, labour and factory overhead variances. Analysis of causes, reporting variances to managers, and accounting disposition of variances conclude the study of standard costing in this chapter.

### Materials Variance

The following variances constitute materials variances:




#### *Material Cost Variance*

Material cost variance is the difference between the actual cost of direct materials used and standard cost of direct materials specified for the output achieved. This variance results from differences between quantities consumed and quantities of materials allowed for production and from differences between prices paid and prices predetermined. This can be computed by using the following formula.

Material cost variance = $(AQ \times AP)$ $(SQ \times SP)$

where $AQ$ = Actual quantity

$AP$ = Actual price

$SQ$ = Standard quantity for the actual output

$SP$ = Standard price

### Materials Usage Variance

The material quantity or usage variance results when actual quantities of raw materials used in production differ from standard quantities that should have been used to produce the output achieved. It is that portion of the direct materials cost variance which is due to the difference between the actual quantity used and standard quantity specified. As a formula this variance is shown as:

Materials quantity variance = (Actual quantity – Standard quantity) × Standard price

A material usage variance is favourable when the total actual quantity of direct materials used is less than the total standard quantity allowed for the actual output.

### Example 18.1

Compute the materials usage variance from the following information:

| Standard material cost per unit | Materials issued |
|---|---|
| Material A 2 pieces @ Re 1.00 = 2.00 | Material A 2,050 pieces |
| Material B 3 Pieces @ Rs 2,00 = 6.00 | Material B 2,980 pieces. |
| Rs 8.00 | |
| Units completed 1,000 | |

*Solution*

Materials usage variance = (Actual quantity – Standard quantity) × Standard price

Material $A$ = (2,050 – 2,000) × Re 1.00 = Rs. 50 (Adverse or Unfavourable)

Material $B$ = (2,980 – 3,000) × Rs 2.00 = Rs 40 (Favourable)

Total = Rs 10 (Unfavourable)

It should be noted that the standard rather than the actual price is used in computing the usage variance. Use of actual price would have introduced a price factor into a quantity variance. Because different departments are responsible, these two factors must be kept separate.

As a general principle, actuals (cost, quantity, price, output, etc.) are compared with respective standard data to compute variances. Therefore, any formula to calculate, mathematically, any variance would be as follows:

*(Actual–Standard)*

However, one may use variance formula as Standard–Actual as it does not influence in any way the variance figure calculated by using the formula 'Actual–Standard'.

### Materials Price Variance

A materials price variance occurs when raw materials are purchased at a price different from standard price. It is that portion of the direct materials which is due to the difference between actual price paid and standard price specified and cost variance multiplied by the actual quantity. Expressed as a formula,

Materials price variance (Actual price – Standard price) × Actual quantity

Materals price variance is unfavourable when the actual price paid exceeds the predetermined standard price. It is advisable that materials price variance should be calculated at the time of materials purchase rather than when materials are used. Purchase of matrials is an earlier event than the use of materials. Therefore, a variance based on quantity purchased is basically an earlier report than a variance based on quantity actually used. This is quite beneficjal from the viewpoint of performance measurement and corrective action.

### *Example 18.2*

Assuming in Example 18.1 that material A was purchased at the rate of Re 1.00 and material B was purchased at the rate of Rs 2.10 the material price vriance will be as follows:

Materials price variance = (Actual price – Standard price) × Actual quantity

Material A = (1,00 – 1,00) × 2,050 = Zero

Material B = (2.10 – 2.00) × 2,980 = Rs 298 (Unfavourable)

The total of materials usage variance and price variance is equal to materials cost variance.

### *Materials Mix Variance*

The materials usage or quantity variance can be separated into mix variance and yield variance.

A mix variance will result when materials are not actually placed into production in the same ratio as the standard formula. For instance, if a product is produced by adding 100 kg of raw material A and 200 kg of raw material B, the standard material mix ratio is 1 : 2. Actual raw materials used must be in this 1 : 2 ratio, otherwise a materials mix variance will be found.

Materials mix variance is that portion of the materials quantity variance which is due to the difference between the actual composition of a mixture and the standard mixture. It can be computed by using the following formula:

Materials mix variance = (Standard cost of actual quantity of the actual mixture – Standard cost of actual quantity of the standard mixture)

or

Materials mix variance =(Actual mix – Revised standard mix of actual input) × Standard price

Revised standard proportion is calculated as a sfollows:

$$\frac{\text{Standard mix of a particular material}}{\text{Total standard quantity}} \times \text{Actual input}$$

### *Example 18.3*

A product is made from two raw materials, materials A and materials B. One unit of finished product requires 10 kg of material. The following is standard mix:

| | | | | |
|---|---|---|---|---|
| Material A | 20%– | 2 kg @ | Rs 2.00 = | Rs 4.00 |
| Material B | 80%– | 8 kg @ | Rs 1.00 = | Rs 8.00 |
| | 100% | 10 kg | Rs 1.20 | Rs 12.00 |

During a period one unit of product was produced at the following costs:

| | | | |
|---|---|---|---|
| Material A | 8 kg @ | Rs 2.00 | = Rs 16.00 |
| Material B | 4 kg @ | Rs 1.25 | = Rs 5.00 |
| | 12 kg | Rs 1.75 | Rs 21.00 |

Compute the materials mix variance.

*Solution*

Materials mix variance = (Actual proportion – Revised standard proportion of actual input) × Standard price

Revised standard proportion:

$$\frac{\text{Standard proportion of a particular mix}}{\text{Total standard quantity}} \times \text{Actual input}$$

Revised standard proportion:

$$\text{Material A} = \frac{2}{10} \times 12 = 2.40 \text{ kg}$$

$$\text{Material B} = \frac{8}{10} \times 12 = 9.60 \text{ kg}$$

Materials mix variance:

Material A = (8 kg – 2.40 kg) × 2.00
= 5.60 × 2.00 = Rs 11.20 (Unfavourable)
Material B = (4 kg – 9.60) × 1.00
= 5.60 × 1.00 = Rs 5.60 (Favourable)
Total mix variance = Rs 5.60 (Unfavourable)

### *Materials Yield Variance*

Materials yield variance explains the remaining portion of the total materials quantity variance. It is that portion of materials usage variance which is due to the difference between the actual yield obtained and standard yield specified (in terms of actual inputs). In other words, yield variance occurs when the output of the final product does not correspond with the output that could have been obtained by using the actual inputs.

The total of materials mix variance and materials yield variance equals materials quantity or usage variance. When there is no materials mix variance, the materials yield variance equals the total materials quantity variance.

The formula for computing yield variance is as follows:

Yield variance = (Actual yield – Standard yield specified) × Standard cost per unit

or

Yield variance = (Actual loss – Standard loss on actual input) × Standard cost per unit

### *Example 18.4*

Standard input = 100 tonnes, standard yield = 90 tonnes, standard cost per tonne of output = Rs 20. Actual input 200 tonnes, actual yield 182 tonnes. Compute the yield variance.

*Solution*

$$\text{Standard yield for the actual input} = \frac{90}{100} \times 200 = 180 \text{ tonne}$$

Yield variance = (Actual yield – Standard yield for the actual input) × Standard cost per unit.
= (182 – 180) × Rs 20
= 2 × 20 = 40 (Favourable)

The above yield variance can be computed by using another formula also, e.g.

Yield variance = (Actual loss – Standard loss on actual input) × Standard cost per unit

= (18 tonnes– 20 tonnes) × Rs 20

= Rs 40 (Favourable)

In this example there is no mix variance and therefore, the materials usage variance will be equal to the materials yield variance.

The above formula uses output or loss as the basis of computing the yield variance. Yield variance can also be computed on the basis of input factors only. The fact is that loss in inputs equals loss in output. A lower yield simply means that a higher quantity of inputs have been used and the anticipated or standard output (based on actual inputs) has not been achieved. Yield, in such a case, is known as sub-usage variance (or Revised usage variance) which can be computed by using the following formula:

Sub-usage or revised usage variance = (Revised standard proportion of actual input—Standard quantity) × Standard cost per unit of input

### *Example 18.5*

Standard material and standard price for manufacturing one unit of a product is given below:

| | *Standard Material* | *Standard price* |
|---|---|---|
| Material A | 5 kg | @ Rs 4 |
| Material B | 3 kg | @ Rs 6 |

The actual production of the product is 400 units.

The actual material A 2500 kg @ Rs 3.90

B 1000 kg @ Rs 6.25

Calculate the materials subusage variance.

*Solution*

Revised standard production of actual input:

$$\text{Material A} = \frac{5}{8} \times 3500 = 2187.5 \text{ kg}$$

$$\text{Material B} = \frac{5}{8} \times 3500\ 1312.5 \text{ kg}$$

Material sub-usage variance:

(Revised standard proportion of actual input–Standard quantity) × St. cost perunit of Material A

= (2, 187.5 – 2,000) × 4

= 187.5 × 4 = Rs 750 (Unfavourable)

Material B = (1,312.5 – 1,200) × 6

= 112.5 × 6 = Rs 675 (Unfavourable)

Total materials subusage variance = Rs 1,425 (Unfavourable)

or

$$(3{,}500 - 3{,}200) \times \text{Rs } \frac{15{,}200}{3{,}200}$$

$$= 300 \times \frac{15{,}200}{3{,}200} = \text{Rs } 1{,}425 \text{ (Unfavourable)}$$

Materials yield variance always equals subusage variance. The difference lies only in terms of calculation. The former considers the output or loss in output and the latter considers standard inputs and actual input used for the actual output.

### *Example 18.6*

From the following particulars compute: (a) materials cost variance; (b) materials price variance; (c) materials usage variance:

| | |
|---|---|
| Quantity of materials purchased | 3,000 units |
| Value of materials purchased | Rs 9,000 |
| Standard quantity of materials required per tonne of output | 30 units |
| Standard rate of material | Rs 2.50 per unit |
| Opening stock of materials | Nil |
| Closing stock of materials | 500 units |
| Output during the period | 80 tonnes |

*(B. Com. (Hons), Delhi)*

*Solution*

Materials consumed = 3,000 – 500 = 2,500 units

Actual rate of material = Rs $\frac{9,000}{3,000}$ = Rs 3 per unit

Standard quantity of actual output = 30 × 80 = 2,400 units

Materials cost variance = Actual cost – Standard cost
= (Actual price × Actual quantity) – (SP × Standard quantity)
= Rs 3 × 2,500 – Rs 2.50 × 2,400
= 7,500 – 6,000
= Rs 1,500 Adverse

Materials price variance = Actual quantity (Actual price – Standard price)
2500 × (Rs 3 – Rs 2.50) = Rs 1250 (Adverse)

Materials usage variance = Standard price × (Actual quantity – Standard quantity)
= Rs 2.50 (2,500 – 2,400)
= Rs 250 (Adverse)

### *Example 18.7*

The standard materials cost to produce a tonne of chemical X is:

300 kg of material A @ Rs 10 per kg
400 kg of material B @ Rs 5 per kg
500 kg of material C @ Rs 6 per kg

During a period, 100 tonnes of mixture X was prduced from the usage of:

35 tonnes of material A at a cost of Rs 9,000 per tonne
42 tonnes of material B at a cost of Rs 6,000 per tonne
53 tonnes of material C at a cost of Rs 7,000 per tonne

Calculate the price, usage and mix variances.

*(B. Com. (Hons) Delhi)*

*Solution*

| *Material* | *Standard* | | | *Actual* | | |
|---|---|---|---|---|---|---|
| | *Qty (Rs)* | *Rate (Rs)* | *Amount (Rs)* | *Qty (Rs)* | *Rate (Rs)* | *Amount (Rs)* |
| A | 30,000 | 10 | 3,00,000 | 35,000 | 9 | 3,15,000 |
| B | 40,000 | 5 | 2,00,000 | 42,000 | 6 | 2,52,000 |
| C | 50,000 | 6 | 3,00,000 | 53,000 | 7 | 3,71,000 |
| | 1,20,000 | | 8,00,000 | 1,30,000 | | 9,38,000 |

Materials cost variance = Actual cost – Standard cost for actual output
= Rs 9,38,000 – Rs 8,00,000
= Rs 1,38,000 (Adverse)

Materials price variance = Actual quantity × (Actual price – Standard price)

A = 35,000 × (9 – 10) = Rs 35,000 (F)
B = 42,000 × (6 – 5) = Rs 42,000 (A)
C = 53,000 × (7 – 6) = Rs 53,000 (A)
Total Rs 60,000 (A)

Materials usage variance = Standard price × (Actual quantity – Standard quantity for actual output)
A = 10 × (35,000 – 30,000) = Rs 50,000 (A)
B = 5 × (42,000 – 40,000) = Rs 10,000 (A)
C = 6 × (53,000 – 50,000) = Rs 18,000 (A)
Total Rs 78,000 (A)

Materials mix variance = Standard price × (Actual quantity – Revised standard quantity)
A = Rs 10 × (35,000 – 32,500)
= 10 × 2,500 = Rs 25,000 (A)

B $= 5 \times \left(42{,}000 - \frac{1{,}30{,}000}{3}\right)$

$= 5 \times \frac{4{,}000}{3}$ = Rs 6,667 (F)

C $= 6 \times \left(53{,}000 - \frac{1{,}62{,}500}{3}\right)$

$= 6 \times \frac{3{,}500}{3}$ = 7,000 (F)

Total = 11,333 (A)

**Working Notes:**

1. Revised standard quantity $= \frac{\text{Standard quantity of a mix} \times \text{Total actual quantity}}{\text{Total Standard quantity of mixture}}$

$$A = \frac{30{,}000}{1{,}20{,}000} \times 1{,}30{,}000 = 32{,}500 \text{ kg}$$

$$B = \frac{40,000}{1,20,000} \times 1,30,000 = \frac{1,30,000}{3}$$

$$C = \frac{50,000}{1,20,000} \times 1,30,000 = \frac{1,62,500}{3}$$

2. Standard cost per unit of output $= \dfrac{\text{Total standard cost}}{\text{Total standard output}}$

$$= \frac{\text{Rs } 8,00,000}{100} = \text{Rs } 8,000 \text{ per tonne}$$

3. Standard output for actual mix $= \dfrac{\text{Standard output}}{\text{Standard mix}} \times \text{Actual mix}$

$$= \frac{100}{1,20,000} \times 1,30,000$$

$$= \frac{1,300}{12} \text{ tonnes}$$

Materials yield variance (although not asked for in the question) would be calculated as follows:

Materials yield variance = (Actual output – Standard output for actual mixture) × Standard cost per unit of output

$$= \left(100 - \frac{1300}{12}\right) \times \text{Rs } 8,000$$

$$= \frac{100}{12} \times \text{Rs } 8,000$$

$$= \text{Rs } 66,667 \text{ (Adverse)}$$

***Example 18.8***

The standard cost card for product 'SIMCO' reveals:

| | Rs |
|---|---|
| Standard materials | |
| 2 kg of A Rs 2 per kg | 4.00 |
| 1 kg of B Rs 6 per kg | 6.00 |
| Direct labour (3 hours @ Rs 6 per hour) | 18.00 |
| Variable overheads (3 hours @ Rs 4 per direct labour hours) | 12.00 |
| Total standard cost per unit | 40.00 |

It is proposed to produce 10,000 units of SIMCO in the month of March and budgeted cost based on the information contained in the standard cost card are as follows:

| | |
|---|---|
| *Direct materials* | |
| A 20,000 kg @ Rs 2 per kg | 40,000 |
| B 10,000 kg @ Rs 6 per kg | 60,000 |
| Direct Labour (30,000 hours @ Rs 6 per hour) | 1,80,000 |
| Variable Overhead (30,000 hours @ Rs 4 per direct labour) | 1,20,000 |
| | 4,00,000 |

The actual results are:

| | Rs |
|---|---|
| *Direct materials* | |
| A 19,000 kg @ Rs 2.20 per kg | 41,800 |
| B 10000 kg @ Rs 5.60 per kg | 56,560 |
| Direct Labour (28,500 hours @ Rs 6.40 per hour) | 1,82,400 |
| Variable Overheads | 1,04,000 |
| Actual production was 9,000 units | 3,84,760 |

From the above, calculate the following variances:

(a) Materials: Price and usage
(b) Labour: Wages rate and labour efficiency
(c) Variable overehad total and overhead expenditure vai *(B. Com. (Hons), Delhi)*

*Solution*

Materials price variance = Actual quantity × (Actual rate – Standard rate)

| | |
|---|---|
| A = 19,000 × (2.20 – 2) | Rs 3,800 (A) |
| B = 10,100 × (5.60 – 6) | Rs 4,040 (F) |
| | Rs 240 (F) |

Materials usage variance = Standard rate × (Actual quantity – Standard quantity for actual output)

| | |
|---|---|
| A = 2 × (19,000 – 18,000) | Rs 2,000 (A) |
| B = 6 × (10,100 – 9,000) | Rs 6,600 (A) |
| | Rs 8,600 (A) |

Labour rate variance = Actual time × (Actual rate – Standard rate)
= 28,500 × (6.40 – 6) = Rs 11,400 (A)

Labour efficiency variance = Standard rate × (Actual time – Standard time for actual output)
= 6 × (28,500 – 27,000) = Rs 9,000 (A)

Total variable overhead variance = Actual variable overheads – Recorded variable overheads
= 1,04,000 – 9,000 × 12
= 1,04,000 – 1,08,000 = Rs 4,000 (F)

Overhead (Variable) expenditure variance
= Actual variable overheads – Standard variable overheads
= 1,04,000 – 28,500 × Rs 4
= 1,04,000 – 1,14,000 = Rs 10,000 (F)

### *Example 18.9*

A company manufacturing 'distempers' operates a costing system. The standard cost of one of the products of the company shows the following standards:

| *Materials* | *Quantity* | *Standard price per kg (Rs)* | *Total Rs* |
|---|---|---|---|
| A | 40 kg | 75 | 3,000 |
| B | 120 kg | 50 | 50 |
| C | 50 kg | 20 | 1,000 |
| Material cost per unit (Total) | | | 4,500 |

The standard input mix is 100 kg and the standard output of the finished product is 90 kg.
The actual results for period are:
Materials used

A = 2,40,000 kg @ Rs 80/kg
B = 40,000 kg @ Rs 52/kg
C = 2,20,000 kg @ Rs 21/kg

Actual output of the finished product = 4,20,000 kg
You are required to calculate the material price, mix and yield variances.

*(ICWA, Inter)*

*Solution*

| *Materials* | *Standard* | | | *Actual* | | |
|---|---|---|---|---|---|---|
| | *Qty (Rs)* | *Rate (Rs)* | *Amount (Rs)* | *Qty (Rs)* | *Rate (Rs)* | *Amount (Rs)* |
| A | 2,00,000 | 75 | 1,50,00,000 | 2,40,000 | 80 | 1,92,00,000 |
| B | 50,000 | 50 | 25,00,000 | 40,000 | 52 | 20,80,000 |
| C | 2,50,000 | 20 | 50,00,000 | 2,20,000 | 21 | 46,20,000 |
| | 5,00,000 | | 2,25,00,000 | 5,00,000 | | 2,59,00,000 |

Standard output 4,50,000 kg
Actual output 4,20,000 kg

Materials cost variance = (Actual cost – Standard cost of actual output)
= 2,59,00,000 – 4,20,000 × 50
= 2,59,00,000 – 2,10,00,000
= Rs 49,00,000 (A)

Materials price variance = Actual quantity × (Actual rate – Standard rate)

A = 2,40,000 × (80 – 75) = 12,00,000 (A)
B = 40,000 × (52 – 50) = 80,000 (A)
C = 2,20,000 × (21 – 20) = 2,20,000 (A)
Rs 15,00,000

Materials usage variance = Standard rate × (Actual quantity – Standard quantity for actual output)

A = 75 × (2,40,000 – 2,00,000 × 42/45) = 40,00,000 (A)
B = 50 × (40,000 – 50,000 × 42/45) = 3,33,333 (F)
C = 20 × (2,20,000 – 2,50,000 × 42/45) = 2,66,667 (F)
Rs 34,00,000 (A)

Material mix variance = Standard rate × (Actual quantity – Revised standard quantity)

A = 75 (2,40,000 – 2,00,000) = 30,00,000 (A)
B = 50 (40,000 – 50,000) = 5,00,000 (F)
C = 20 (2,20,000 – 2,50,000) = 6,00,000 (F)
Rs 19,00,000

Materials yield variance = Standard cost per unit × (Actual output – Standard output for actual mix)
= 50 (4,20,000 – 4,50,000)
= Rs 15,00,000 (A)

***Example 18.10***

S.V. Ltd. manufacturers a single product, the standard mix of which is:

Material A 60% at Rs 20 per kg

Material B 40 % at Rs 10 per kg

Normal loss in production is 20% of input. Due to shortage of Material A, the standard mix was changed. Actual results for March 2002 were;

| | |
|---|---|
| Material A | 105 kg at Rs 20 per kg |
| Material B | 95 kg at Rs 9 per kg |
| Input | 200 kg |
| Loss | 35 kg |
| Output | 165 kg |

*Calculate:*

(i) Material Price Variance (ii) Material Usage Variance

(iii) Material Mix Variance (iv) Material Yield Variance

*(B. Com. (Hons), Delhi)*

*Solution*

**Workings:**

1. Standard quantity for actual production —

$$\text{Material A} = \frac{60 \times 165}{80} = \frac{495}{4} \text{ kg}$$

$$\text{Material B} = \frac{40 \times 165}{80} = \frac{165}{2} \text{ kg}$$

2. Calculation of revised standard quantity —

$$\text{Material A} = 200 \times \frac{3}{5} = 120 \text{ kg}$$

$$\text{Matrial B} = 200 \times \frac{2}{5} = 80 \text{ kg}$$

3. Calculation of standard quantity—

$$\text{Material A} = \frac{120 \times 165}{160} = \frac{495}{4}$$

$$\text{Material B} = \frac{80}{160} \times 165 = \frac{165}{2}$$

4. Calculation of standard cost per unit of output—

$$\text{Material A} = 60 \times 20 = \text{Rs } 1{,}200$$

$$\text{Material B} = \frac{40}{100} \times 10 = \frac{\text{Rs } 400}{1{,}600}$$

*Less* loss 20% = 100 – 20 = 80

$$\text{Cost per unit} = \frac{\text{Rs } 1600}{80} = \text{Rs } 20$$

(i) Calculation of variances:

Material price variance = (AP – SP) × AQ

Material A = (Rs 20 – 20) × 105 = Nil

Material B = (Rs 9 – 10) × 95 = Rs 95 (F)

Total Rs 95 (F)

(ii) Material usage variance = (AQ – SQ) × SP

$$\text{Material A} = \left(105 - \frac{495}{4}\right) \times \text{Rs } 20 = \text{Rs } 375 \text{ (F)}$$

$$\text{Material B} = \left(95 - \frac{165}{2}\right) \times \text{Rs } 10 = \text{Rs } 125 \text{ (A)}$$

Total Rs 250 (F)

(iii) Material mix variances = (AQ – RSQ) × SP

Material A = (105 – 120) × Rs 20 = Rs 300 (F)

Material B = (95 – 80) × Rs 10 = Rs 150 (A)

Total Rs 150 (F)

(iv) Material yield variance = (Actual output – Std. output) × Std. cost per unit of outputs

= (165 – 160) × Rs 20 = Rs 100 (F)

### *Example 18.11*

The standard cost of a certain chemical mixture is:

35% Material A at Rs 25 per kg

65% Material B at Rs 36 per kg

A standard loss of 5% is expected in production

During a period there is used:

125 kg of Material A at Rs 27 per kg and

275 kg of Material B at Rs 34 per kg

The actual output was 365 kg

*Calculate:*

(a) Material Cost Variance

(b) Material Price Variance

(c) Material Mix Variance

(d) Material Yield Variance *(B Com (Hons), Delhi. 1996)*

*Solution*

| *Material* | *Standard* | | | *Actual* | | |
|---|---|---|---|---|---|---|
| | *kg* | *Rate* | *Amt* | *kg* | *Rate* | *Amt* |
| A | 140 | 25 | 3,500 | 125 | 27 | 3,375 |
| B | 260 | 36 | 9,360 | 275 | 34 | 9,350 |
| | 400 | | 12,860 | 400 | | 12,725 |

Standard output = 400 – 20 = 380 kg

Actual output = 365 kg

Standard cost per kg = 12,860/380 = Rs 33.84

The various variances can now be calculated as follows:

(a) Material cost variance = (Actual cost – Standard cost for actual output)

= 12,725 – 365 × 33.84

= 12,725 – 12,352 = Rs 373 (Adverse)

(b) Material price variance = Actual quantity × (AR – SR)

A = 125 × (27 – 25) = 250 (A)

B = 275 × (34 – 36) = 350 (F)

= Rs 300 (Favourable)

(c) Material mix variance = Standard rate × (AQ – Revised standard quanity)

Material A = 25 × (125 – 140) = 375 (F)

Material B = 30 × (275 × 260) = 540 (A)

165 (Adverse)

(d) Material yield variance = Standard cost × (Actual output for actual mix – Standard output)

= 33.84 × (365 – 380)

= Rs 508 (Adverse)

**Working Notes:**

1. Standard quantity for actual mix
   Material A : 400 × 35/100 = 140 kg
   Material B: 400 × 65/100 = 260 kg
2. Since Standard mix and Actual mix are the same, the Revised standard quantity and Standard quantity will also be the same.

***Example 18.12***

The standard material inputs required for 1,000 kgs of a finished product are given below:

| *Material (in kg)* | *Quantity (in Rs)* | *Standard Rate per kg (in Rs)* |
|---|---|---|
| P | 450 | 20 |
| Q | 400 | 40 |
| R | 250 | 60 |
| | 1,100 | |
| Standard Loss | 100 | |
| Standard Output | 1,000 | |

Actual production in a period was 20,000 kgs. of the finished product for which the actual quantities of material used and the prices paid thereof are as under:

| *Material* | *Quantity used (in kgs.)* | *Purchased price per kg (in Rs.)* |
|---|---|---|
| P | 10,000 | 19 |
| Q | 8,500 | 42 |
| R | 4,500 | 65 |

Calculate:

(i) Material Cost Variance (MCV)
(ii) Material Price Variance (MPV)
(iii) Material Usage Variance (MUV)
(iv) Material Mix Variance (MMV)
(v) Material Yield Variance (MYV)

Present a reconciliation among the variances. *(I.C.W. A Inter June 1996)*

*Solution*

| *Material* | *Standard* | | | *Actual* | | |
|---|---|---|---|---|---|---|
| | *Qty. (kg.)* | *Rate (Rs.)* | *Amt. (Rs.)* | *Qty. (kg.)* | *Rate (Rs.)* | *Amt. (Rs.)* |
| P | 9,000 | 20 | 1,80,000 | 10,000 | 19 | 1,90,000 |
| Q | 8,000 | 40 | 3,20,000 | 8,500 | 42 | 3,57,000 |
| R | 5,000 | 60 | 3,00,000 | 4,500 | 65 | 2,92,500 |
| Total | 22,000 | | 8,00,000 | 23,000 | | 8,39,500 |

**Variances**

(i) MCV = Standard Cost for Actual Output – Actual Cost
= 8,00,000 – 8,39,500 = Rs. 39,500 (A)

(ii) MPV = Actual Qty. × (SR – AR)
P = 10,000 × (20 – 19) = Rs. 10,000 (F)
Q = 8,500 × (40 – 42) = Rs. 17,000 (A)
R = 4,500 × (60 – 65) = Rs. 22,500 (A)
Rs. 29,500 (A)

(iii) MUV = SR × (Std. Qty. for Actual Output – Actual Qty.)
P = 20 × (9,000 – 10,000) = 20,000 (A)
Q = 40 × (8,000 – 8,500) = 20,000 (A)
R = 60 × (5,000 – 4,500) = 30,000 (F)
10,000 (A)

(iv) MMV = SR × (RSQ – AQ)

$$P = 20 \times \left(\frac{9,000}{22,000} \times 23,000\right) - 10,000$$

$$= 20 \times (9,409 - 10,000) = \text{Rs. } 11,820 \text{ (A)}$$

$$Q = 40 \times \left(\frac{8,000}{22,000} \times 23,000\right) - 8,500$$

$$= 40 \times (8,364 - 8,500) = 5,440 \text{ (A)}$$

$$R = 60 \times \left( \frac{5,000}{22,000} \times 23,000 \right) - 4,500$$

$$= 60 \times (5,227 - 4,500) = \underline{43,620 \text{ (F)}}$$

$$\underline{26,360 \text{ (F)}}$$

(v) MYV = Std. Cost per unit × (Std. Output for Actual Mix – Actual Output)

= 40 × (20,909 – 20,000)

= Rs. 36,360 (Adverse)

**Statement of Reconciliation of Variances**

| *Particulars* | *Rs.* | *Rs.* |
|---|---|---|
| (i) Material Price Variance | | 29,500 (A) |
| (ii) Material Usage Variance: | | |
| (a) Material Mix Variance | 26,363 (F) | |
| (b) Material Yield Variance | 36,363 (A) | 10,000 (A) |
| Material Cost Variance | | 39,500 (A) |

### *Example 18.13*

Pragati Company manufactures a product P by mixing three raw materials. For every 100 kg of output 125 kg of raw material input are used. In April 1997, there was an output of 5,600 kg. of P. The standard and actual particulars of April, 1997 are as follows:

| *Raw Material* | *Standard* | | *Actual* | |
|---|---|---|---|---|
| | *Mix* | *Price per kg* | *Mix* | *Price per kg* |
| I | 50% | Rs. 40 | 60% | Rs. 42 |
| II | 30% | Rs. 20 | 20% | Rs. 16 |
| III | 20% | Rs. 10 | 20% | Rs. 12 |

Calculate all material variances. The actual quantity of material used was 7,000 kg

*(B. Com. Hons. Delhi 1997)*

*Solution*

| *Raw Material* | *Standard for output of 5,600 kg.* | | | *Actual for output of 5600 kg.* | | |
|---|---|---|---|---|---|---|
| | *Qty kg.* | *Rate Rs.* | *Amt. Rs.* | *Qty kg.* | *Rate Rs.* | *Amt. Rs.* |
| I | 3,500 | 40 | 1,40,000 | 4,200 | 42 | 1,76,400 |
| II | 2,100 | 20 | 42,000 | 1,400 | 16 | 22,400 |
| III | 1,400 | 10 | 14,000 | 1,400 | 12 | 16,800 |
| Total | 7,000* | | 1,96,000 | 7,000 | | 2,15,600 |

$$\frac{*5,600}{100} \times 125$$

DMCV = Std. Cost for Actual Output – Actual Cost
= 1,96,000 – 2,15,600 = Rs. 19,600 (A)

DMPV = Actual Qty. × (SR – AR)
I = 4,200 × (40 – 42) = 8,400 (A)
II = 1,400 × (20 – 16) = 5,600 (F)
III = 1,400 × (10 – 12) = 2,800 (A)
5,600 (A)

DMUV = SR × (Std. qty. for actual output – Actual qty.)
I = 40 × (3,500 – 4,200) = 28,000 (A)
II = 20 × (2,100 – 1,400) = 14,000 (F)
III = 10 × (1,400 – 1,400 = NIL
14,000 (A)

DMMV = SR × (SRQ – AQ)

Since total Std. Mix and Actual Mix are the same, the RSQ will be the same as Std. qty.

I 40 × (3,500 – 4,200 = 28,000 (A)
II 20 × (2,100 – 1,400) = 14,000 (F)
III 10 × (1,400 – 1,400) = 0
14,000 (A)

The DMYV will be *Nil*.

***Example 18.14***

AB Ltd. has established the following standard mix for producing gallons of product A.

| | Rs. |
|---|---|
| 5 gallons of material X at Rs. 7 per gallon | = 35 |
| 3 gallons of material Y at Rs. 5 per gallon | = 15 |
| 2 gallons of material Z at Rs. 2 per gallon | = 4 |
| | Rs. 54 |

A standard loss of 10% of output is expected to occur. Actual input was as a under:

53,000 gallons of material X at Rs. 7 per gallon.
28,000 gallons of material Y at Rs. 5.30 per gallon.
19,000 gallons of material Z at Rs. 2.20 per gallon.

Actual output for a period was 92,700 gallons of product A.

*Compute:*

(i) Material Mix Variance
(ii) Material Yield Variance

*(B. Com. Hons. Delhi 1999)*

*Solution*

| Material | Standard | | | Actual | | |
|---|---|---|---|---|---|---|
| | Quantity | Rate Rs. | Amount Rs. | Quantity Rs. | Rate Rs. | Amount |
| X | 50,000 | 7 | 3,50,000 | 53,000 | 7.00 | 3,71,000 |
| Y | 30,000 | 5 | 1,50,000 | 28,000 | 5.30 | 1,48,400 |
| Z | 20,000 | 2 | 40,000 | 19,000 | 2.20 | 41,800 |
| | 1,00,000 | | 5,40,000 | 1,00,000 | | 5,61,200 |

(i) Material Mix Variance = SR × (Revised Std. Quantity* – Actual Quantity)

* Since Total Actual Mix & Total Std. Mix is the same, hence Standard Quantity is equal to Revised Standard Quantity

X = Rs. 7 × (50,000 – 53,000) = 21,000 (A)
Y = Rs. 5 × (30,000 – 28,000) = 10,000 (F)
Z = Rs. 2 × (20,000 – 19,000) = 2,000 (F)
9,000 (A)

(ii) Material Yield Variance = Standard Cost per unit × (Standard Output for Actual Mix – Actual output)

= 6 × (90,000 – 92,700)
= Rs. 16,200 (F)

**Verification:**

Direct Material Usage variance = Standard Rate × (Standard Quantity for Actual output – Actual Quantity)

X = 7 × (51,500 – 53,000) = 10,500 (A)
Y = 5 × (30,900 – 28,000) = 14,500 (F))
Z = 2 × (20,600 – 19,000) = 3,200 (F)
7,200 (F)

Direct Material Usage Variance = Direct Material Mix Variance + Direct Material Yield Variance
= 9,000 (A) + 16,200 (F)
= 7,200 (F)

***Example 18.15***

A company produces a finished product by using three basic raw materials. The following standards have been set-up for raw materials:

| *Material* | *Standard-Mix in percentages* | *Standard Price per kg in Rs.* |
|---|---|---|
| A | 25 | 4 |
| B | 35 | 3 |
| C | 40 | 2 |

The standard loss in process is 20% of input. During a particular month, the Company produced 2,400 kgs of finished product. The details of stock and purchases for the month are as under:

| *Material* | *Opening Stock (Kgs.)* | *Closing Stock (Kgs.)* | *Purchases during the month* | |
|---|---|---|---|---|
| | | | *Quantity in Kgs.* | *Cost in Rs.* |
| A | 200 | 350 | 800 | 3,600 |
| B | 150 | 200 | 1,000 | 3,500 |
| C | 300 | 200 | 1,100 | 1,980 |

The opening stock is valued at standard cost. Compute:

(i) Material price and Material cost variances, when:
  (a) Variance is calculated at the point of issue on 'First-in-First-out' basis
  (b) Variance is calculated at the point of issue on 'Last-in-First-out' basis

(ii) Material Usage variance,

(iii) Material Mix variance, and

(iv) Material Yield variance.

*(C.A. Inter Nov. 2000)*

*Solution*

**Statement showing standard cost and actual cost (on FIFO and LIFO basis) for 2,400 kgs of finished product and standard cost of actual mix quantity**

| | | *Standard cost* | | *Actual cost (FIFO basis)* | | | | *Actual Cost (LIFO Basis)* | | | | *Standard cost of actual quantity* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Mate. Srial* | *Qty. in Kgs.* | *Price Rs.* | *Amount Rs.* | *Qty. in Kgs.* | *Price Rs.* | *Amount Rs.* | | *Qty. in Kgs.* | *Price Rs.* | *Amount Rs.* | | *Qty. Kgs* | *Price Rs.* | *Amount Rs.* |
| A | 750 | 4 | 3,000 | 200 | 4.00 | 800 | + | 650 | 4.50 | | 2,925 | 650 | 4 | 2,600 |
| | | | | 450 | 4.50 | 2,025 | 2,825 | | | | | | | |
| B | 1,050 | 3 | 3,150 | 150 | 3.00 | 450 | + | 950 | 3.50 | | 3, 325 | 950 | 3 | 2,850 |
| | | | | 800 | 3.50 | 2,800 | 3,250 | | | | | | | |
| C | 1,200 | 2 | 2,400 | 300 | 2.00 | 600 | + | 1,100 | 1.8 | 1,980 | | 1, 200 | 2 | 2,400 |
| | | | | 900 | 1.80 | 1,620 | 2,220 | 100 | 2 | 200 + | 2,180 | | | |
| | 3,000 | | 8,550 | 2,800 | | | 8,295 | 2,800 | | | 8,430, | 2800 | | 7,850 |

**Computation of Variances:**

(i) *(a) Material price variance (Calculated at the point of issue on 'First-in-First-out' basis)*

= Actual quantity (Standard price – Actual price)

= 200 kgs. (Rs 4 – Rs 4) + 450 kgs (Rs 4 – Rs 4.50) + 150 kgs. (Rs 3 – Rs 3)
+ 800 kgs. (Rs 3 – Rs 3.50) + 300 kgs. (Rs 2 – Rs 2) + 900 kgs. (Rs 2 Rs 1.80)

= Rs 225 (Adv.) + Rs 400 (Adv.) + Rs 180 (Fav.) = Rs 445 (Adv.)

*Material cost variance (Calculated at the point of issue on 'First-in-First-out' basis):*

= Standard cost – Actual cost

= (Rs 8,550 – Rs 8,295) = Rs 255 (Fav.)

*(b) Material Price variance (Calculated at the point of issue on 'Last-in-First-out' basis)*

= Actual quantity (Standard price –Actual price)

= 650 kgs. (Rs. 4 – Rs. 4.50) + 950 kgs. (Rs. 3 – Rs. 3.50) + 1,100 kgs. (Rs. 2 – Rs. 1.8)
+ 100 kgs (Rs2 – Rs2)

= Rs. 325 (Adv.) + Rs. 475 (Adv.) + Rs. 220 (Fav.)

= Rs. 580 (Adv.)

*Material cost variance (Calculated at the point of issue on 'Last-in-First-out' basis)*

= (Standard Cost – Actual Cost)

= (Rs. 8,550 – Rs. 8,430)

= Rs. 120 (Fav.)

(ii) *Material Usage Variance*

Standard price (Standard quantity – Actual quantity)

= Rs 4 (750 kgs – 650 kgs) + Rs 3 (1,050 kgs – 950 kgs) + Rs 2 (1,200 kgs – 1,200 kgs)

= Rs 400 (Fav.) + Rs. 300 (Fav.) = Rs. 700 (Fav.)

(iii) *Material Mix Variance*

= Total actual quantity (Standard cost of Standard mix per kg. – Standard cost of Actual mix per kg.)

$$= 2{,}800 \text{ kgs} \left( \frac{\text{Rs. } 8{,}550}{3{,}000 \text{ kgs}} - \frac{\text{Rs. } 7{,}850}{2{,}800 \text{ kgs}} \right)$$

= Rs. 1.30 (Fav.)

(iv) *Material Yield Variance*

= Standard cost per unit of standard output (Actual output – Standard output*)

$$= \frac{\text{Rs. } 8{,}550}{2{,}400 \text{ kgs}} (2{,}400 \text{ kgs} - 2{,}240 \text{ kgs}^*)$$

= Rs. 570 (Fav.)

* Standard input of 100 kgs gives 80 kgs of standard output

Standard input of 1 kg gives 80/100 kgs of standard output

Standard input of 2,800 kgs gives (80/100) × 2,800 kgs = 2,240 kgs of standard output

### *Example 18.16*

Vinak Ltd. produces an article by blending two raw materials. It operates a standard costing system and the following standards have been set for raw materials:

| *Material* | *Standard mix* | *Standard price per kg* |
|---|---|---|
| A | 40% | Rs 4.00 |
| B | 60% | Rs 3.00 |

The standard loss in processing is 15%.

During April 2001 the company produced 1,700 kg of finished output. The position of stocks and purchases for the month of April 2001 is as under:

| *Material* | *Stock on 1.4.01 (kg)* | *Stock on 30.4.01 (kg)* | *Purchasing during April 2001* | |
|---|---|---|---|---|
| | | | *(kg)* | *Cost (Rs)* |
| A | 35 | 5 | 800 | 3,400 |
| B | 40 | 50 | 1,200 | 3,000 |

Calculate the following variances:

(i) Materials price variance
(ii) Materials usage variance
(iii) Materials yield variance
(iv) Materials mix variance
(v) Total materials cost variance.

*(CA Inter, B. Com. (Hons), Delhi)*

*Solution:*

Standard cost of standard mix:

| *Type of material* | *Standard quantity of material required Rs* | *Standard price per kg Rs* | *Standard quantity* |
|---|---|---|---|
| A | 800 | 4 | 3,200 |
| B | 1,200 | 3 | 3,600 |
| Total | 2,000 | | 6,800 |

**Note:** 1. The loss being 15% to produce 85 kg of an article, the standard quantity of material required is 100 kg. Therefore, to produce 1,700 kg of the article the standard quantity of material required is $\frac{100}{85} \times 1{,}700$ kg or 2,000 kg

2. Out of 2,000 kg of material used, 40% is type A and 60% is type B, i.e. 800 kg of A and 1,200 kg of B are the standard quantities.

*Actual costs*

| *Type of material* | *Actual quantity of material used kg* | *Actual price per kg Rs* | *Actual quantity X actual price Rs* |
|---|---|---|---|
| A | 830 | 4.25 | 3,518.75 |
| B | 1,190 | 2.50 | 2,995.00 |
| Total | 2,020 | | 6,513.75 |

*Actual quantity of material A is 830 kg out of this 35 kg is available at the standard price of Rs 4 per kg and remaining 795 kg at Rs 4.25 per kg.

Actual quantity of material B used is 1,190 kg; out of this 40 kg is available at the standard price Rs 3 per kg and the remaining 1,150 kg at Rs 2.50.

(i) Materials price variance = Actual quantity × (Actual price – Standard price)

| | | |
|---|---|---|
| A. Standard price of 830 units @ 4 | | 3,320.00 |
| Actual price of 35 units @ Rs 4 | 140.00 | |
| 795 units 2 Rs 4.25 | 3,378.75 | 3,518.75 |
| | | 198.75 (A) |
| B. Standard price of 1,190 units @ Rs. | | 3,570.00 |
| Actual price of 40 units @ Rs 3 | 120,00 | |
| 1,150 units @ Rs 2.50 | 2,875.00 | 2,995.00 |
| | | 575.00 (F) |
| Total | | 376.75 (F) |

(ii) Materials (total) usage variance = Standard price × (Actual quantity – Standard quantity)

| | Rs |
|---|---|
| A : 4 × (830 – 800) | 120.00 (A) |
| B: 3 × (1,190 – 1,200) | 30.00 (F) |
| | 90.00 (A) |

(iii) Materials yield variance = Standard rate × (Actual yield – Standard yield)

$$\text{Standard rate} = \frac{\text{Total standard cost}}{\text{Standard yield}} = \text{Rs}\ \frac{6,700}{1,700} = \text{Rs 4 per kg}$$

Yield variance = 4 (1,700 – 1,717*) or Rs 68 (A)

*By using 2,000 kg of material, standard yield is 1,700 kg. Therefore, the standard yield by using 2,020 kg of material will be (1,700/2,000 × 2,020 or 1.71 kg)

(iv) Material mix variance = Actual quantity × (Per unit standard cost of standard mix – per unit standard cost of actual mix)

$$= 2,020\left(\frac{6,800}{2,000} - \frac{6,890}{2,020}\right)$$

= 2,020 (3.4 – 3.410) or Rs 22 (A)

(v) Materials cost variance = (Actual cost – Standard cost)

= Rs 6,513.75 – 6,800

= Rs 286.25 (F)

***Example 18.17***

JS Limited used a full standard cost system with raw material inventory carried at standard. The following data were taken from the records of the company for the year ended 31.12. 2001:

| | Rs |
|---|---|
| Opening raw materials inventory | 300 |
| Closing raw material inventory | 250 |
| Net purchases | 410 |
| Material price variance | 10 A |
| Material usage variance | 20 A |
| Direct labour cost (Actuals) | 900 |
| Direct labour cost (Standard) | 840 |
| Actual overhead cost incurred | 875 |
| Overhead cost variance | 45 F |

| | |
|---|---|
| Opening work-in-progress inventory | 120 |
| Closing work-in-progress inventory | 140 |
| Opening finished goods inventory | 360 |
| Cost of goods sold reported | 2,240 |

**Note:** F denotes favourable and A denotes adverse.

You are required to compute;

1. Raw Material purchases at standard
2. Raw Materials consumed at actuals
3. Raw Materials consumed at standard
4. Labour cost variance
5. Standard overhead costs
6. Total manufacturing cost at standard cost
7. Cost of goods manufactured.
8. Cost of produces sold to customers
9. Closing finished goods inventory

*(CA Inter.)*

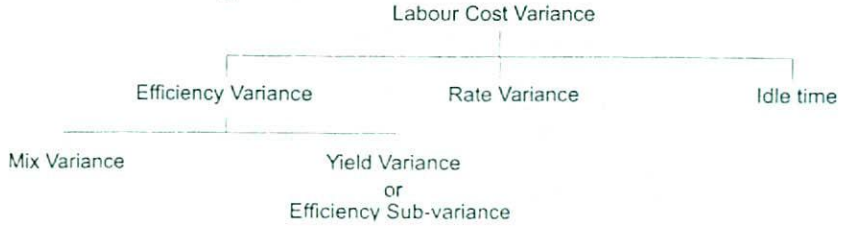
*Solution*

| | Rs | |
|---|---|---|
| 1. Raw material purchases at standard | 410 | |
| Net purchases at actual | 10 | |
| *Less:* Material price variance (A) | 400 | |
| 2. Raw materials consumed at Actual | 450 | |
| Raw materials consumed at Standard (as per 3 below) | 20 | |
| *Add:* Materials usage variance (A) | 470 | |
| 3. Raw materials consumed at standard | 300 | |
| Opening stock at standard | 400 | |
| *Add:* Purchase at standard (as per 1) | 700 | |
| 4. Labour cost variance | 840 | |
| Direct labour cost at standard | 900 | |
| *Less:* Actual direct labour cost | 60 | (A) |
| 5. Standard overhead cost: | 875 | |
| Actual overheads | 45 | (F) |
| *Add:* Overhead cost variance | 920 | |

| | | | |
|---|---|---|---|
| 6. | Total (or Gross) manufacturing Cost at standard | | |
| | Standard raw material cost | 450 | |
| | Standard direct labour cost | 840 | |
| | Standard overhead cost | 920 | |
| | | 2,210 | |
| 7. | Cost of goods manufactured (at standard) | | |
| | Opening WIP (at standard) | 120 | |
| | *Add:* Total or Gross cost of goods manufactured | 2,210 | |
| | | 2,330 | |
| | *Less:* Closing WIP (at standard) | 140 | |
| | | 2,190 | |
| 8. | Cost of products sold to customers | | |
| | Cost of goods sold reported | 2,240 | |
| | *Less:* Adverse Variance: | | |
| | Material cost variance – Price variance | 10 | (A) |
| | Usage variance | 20 | (A) |
| | | 30 | (A) |
| | Direct labour cost variance | 60 | (A) |
| | | 90 | (A) |
| | | 2,150 | |
| | *Add:* Overhead cost variance | 45 | (F) |
| | | 2,195 | |
| 9. | Closing stock of finished goods inventory at standard: | | |
| | Opening finished goods inventory at standard | 360 | |
| | *Add:* Cost of goods manufactured at standard | 2,190 | |
| | | 2,550 | |
| | *Less:* Cost of products sold to customers at standard | 2,195 | |
| | | 355 | |

## LABOUR VARIANCES

Direct labour variances arise when actual labour costs are different from standard labour costs. Labour variances constitute the following:



## Labour Cost Variance

Labour cost variance denotes the difference between the actual direct wages paid and the standard direct wages specified for the output achieved. This variance is calculated by using the following formula:

Labour cost variance = (AH × AR – SH × SR)

where AH = Actual hours
AR = Actual rate
SH = Standard hours
SR = Standard rate

## Labour Efficiency Variance

The calculation of labour efficiency or usage variance follows the same pattern as the computation of materials usage variance. If actual direct labour hours required to complete a job differ from the number of standard hours specified, a labour efficiency variance results; it is the difference between actual hours expended and standard labour hours specified multiplied by the standard labour rate per hour. The formula is:

Labour efficiency variance = (Actual hours – Standard hours for the actual output) × Std. rate per hour.

It may be noted that the standard labour hour rate and not the actual rate is used in computing labour efficiency variance. If quantity variances are calculated, changes in prices/rates are excluded, and when price variances are calculated, standard quantities are ignored.

## Labour Rate Variance

Labour rate variance is computed in the same manner as materials price variance. When actual direct labour hour rates differ from standard rates, the result is a labour rate variance. It is that portion of the direct wages variance which is due to the difference between the actual rate paid and standard rate of pay specified. The formula for its calculation is:

Labour rate variance = (Actual rate – Standard rate) × Actual hours

Favourable rate variance arise whenever actual rates are less than standard rates; unfavourable variances occur when actual rates exceed standard rates.

### *Labour Mix Variance*

Labour mix variance is computed in the same manner as materials mix variance. Manufacturing or completing a job requires different types or grades of workers and production will be completed if labour is mixed according to standard proportions. Standard labour mix may not be adhered to under some circumstances and substitution will have to be made. There may be changes in the wage rates of some workers; there may be a need to use more skilled or expensive types of labour, e.g. employment of men instead of women; sometimes workers and operators maybe absent. These lead to the emergence of a labour mix variance which is calculated by using the following formula:

Labour mix variance = (Actual labour mix—Revised standard labour mix in terms of actual total hours) × Standard rate per hour

To take an example, suppose the following were the standard labour cost data per unit in a factory:

| *Class* | *Proportion* | | | *Cost* |
|---|---|---|---|---|
| | % | | | Rs |
| A | 50 | 3 hours @ | Rs 4.00 | 12 |
| B | 50 | 3 hours @ | Rs 2.00 | 6 |
| | 100 | 6 hours | Rs 3.00 | 18 |

In a period, many class B workers were absent and it was necessary to substitute class B workers. Since the class A workers were less experienced with the job, more labour hours were used. The recorded costs of a unit were:

| *Class* | *Proportions* | | *Cost* | |
|---|---|---|---|---|
| | % | | Rs | |
| A | 75 | 6 hours @ | Rs 4.00 | 24.00 |
| B | 25 | 2 hours @ | Rs 2.00 | 4.00 |
| | 100 | 8 hours | Rs 3.50 | 28.00 |

Labour mix variance will be calculated as follows:

Labour mix variance = (Actual proportion – Revised standard proportion of actual total hours) × Standard rate per hour

Revised standard proportion:

$$\text{Class } A = \frac{3}{6} \times 8 = 4 \text{ hours}$$

$$\text{Class } B = \frac{3}{6} \times 8 = 4 \text{ hours}$$

Applying the formula:

Class $A = (6 - 4) \times$ Rs $4 = 8$ (Unfavourable)

Class $B = (2 - 4) \times$ Rs $2 = 4$ (Favourable)

Total labour mix variance = Rs 4 (Unfavourable)

### *Labour Yield Variance*

The final product cost contains not only material cost but also labour cost. Therefore, higher or lower output than the standard output should take into account labour yield variance also. A lower output simply means that final output does not correspond with the production units that should have been produced from the hours expended on the inputs. It can be computed by applying the following formula:

Labour yield variance = (Actual output – Standard output based on actual hours) × Average standard labour rate per unit of output

or

Labour yield variance = (Actual loss – Standard loss on actual hours) × Average standard labour rate per unit of output

Labour yield variance is also known as labour efficiency sub-variance which is computed in terms of inputs, i.e. standard labour hours and revised labour hours mix (in terms of actual hours). Labour efficiency sub-variance is computed by using the following formula:

Labour efficiency sub-variance = (Revised standard mix – Standard mix) × Standard labour rate

***Substitution Variance*** This type of variance arises in the case of labour, due to the substitution of labour, that is when one grade of labour is substituted by another. This variance in fact represent the difference between the actual hours at standard rate of standard worker and the actual hours at standard rate of actual worker.

The formula for computation is:

Substitution variance = (Standard hours × Standard rate for standard worker)
– (Standard hours × Standard rate of actual worker)

### *Idle Time Variance*

Idle time variance occurs when workers are not able to do the work due to some reason during the hours for which they are paid. Idle time can be divided according to causes responsible for creating idle time, e.g. idle time due to breakdown, lack of materials or power failures. Idle time variance will be equivalent to the standard labour cost of the hours during which no work has been done, but for which workers have been paid for unproductive time. Suppose, in a factory 2,000 workers were idle because of a power failure. As a result of this a loss of production of 4,000 units of product A and 8,000 units of product B occurred. Each employee was paid his normal wage (a rate of Rs 20 per hour). A single standard hour is needed to manufacture four units of product A and eight units of product B. Idle time variance will be computed in the following manner:

Standard hours lost:

$$\text{Product A} = \frac{4{,}000}{4} = 1{,}000 \text{ hr}$$

$$\text{Product B} = \frac{8{,}000}{8} = 1{,}000 \text{ hr}$$

Total hours lost = 2,000 hr

Idle time variance (power failure)

2,000 hours @ Rs 20 per hour = Rs 40,000 (Adverse)

### *Example 18.18*

Standard hours for manufacturing two products M and N are 15 hours per unit and 20 hours per unit respectively. Both products require identical kind of labour and the standard wages rates per hour is Rs 5. In the year 2001, 10,000 units of M and 15,000 units of N were manufactured. The total of labour hours actually worked were 4,50,000 and the actual wage bill came to Rs 23,00,000. This include 12,000 hours paid for @ Rs 7 per hour and 9,400 hours paid for @ Rs 7.50 per hour, the balance having been paid at Rs 5 per hour. You are required to compute the labour variances. *(ICWA Inter)*

*Solution*

Labour cost variance = (Actual labour cost – Standard labour cost for actual output)

Standard cost:

| | | |
|---|---|---|
| For Product M | = 10,000 × 15 × 5 = | 7,50,000 |
| For Product N | = 15,000 × 20 × 5 = | 15,00,000 |
| Total standard cost | | 22,50,000 |

Total actual labour cost = Rs 23,00,000

Labour cost variance = Rs 23,00,000 – 22,50,000
= Rs 50,000 (Adverse)

Labour rate variance = Actual hours × (Actual rate – Standard rate)

| | | |
|---|---|---|
| = 12,000 × (Rs 7 – Rs 5) | = | 24,000 (A) |
| = 9,400 × (Rs 7.50 – Rs 5) | = | 23,500 (A) |
| = 4,29,100 × (Rs 5 – Rs 5) | = | — |
| Total | | 47,500 (A) |

Labour efficiency variance = Standard rate × (Actual time – Standard time)
= Rs 5 × (4,50,500 – 4,50,000)
= Rs 2,500 (Adverse)

***Example 18.19***

The Standard cost card for a product shows:

| | |
|---|---|
| Material cost 2 kg @ Rs 2.50 each | Rs 5.00 per unit |
| Wages 2 hours @ Rs 10 each | Rs 20 per unit |

The actuals which have emerged from business operations are as follows:

| | |
|---|---|
| Production | 8,000 units |
| Material consumed 16,500 kg @ Rs 2.40 each | Rs 39,600 |
| Wages paid 18,000 hours @ Re 8 each | Rs 1,44,000 |

Calculate the appropriate material and labour variances. *(B. Com. (Hons), Delhi)*

*Solution*

Materials cost variance = (Actual cost – Standard cost)
= 16,500 × 2.40 – 16,000 × 2.50)
= Rs 39,600 – Rs 40,000
= 400 (Favourable)

Material price variance = Actual quantity × (Actual price – Standard price)
= 16,500 × (2.40 – 2.50)
= Rs 1,650 (Favourable)

Materials usage variance = Standard price × (Actual quantity – Standard quantity)
= 2.50 × (16,500 – 16,000)
– Rs 1,250 (Adverse)

Labour cost variance = (Actual labour cost – Standard labour cost)
= (Rs 1,44,000 – Rs 1,60,000)
= Rs 16,000 (Favourable)

Labour rate variance = Actual hours × (Actual rate – Standard rate)
= 18,000 × (Rs 8 – Rs 10)
= Rs 36,000 (Favourable)

Labour efficiency variance = (Actual hours – Standard hours for actual production) × SR
= (18,000 – 16,000) × Rs 10
= Rs 20,000 (Adverse)

### *Example 18.20*

The standard output of production 'EXE' is 25 units per hour in manufacturing department of a company employing 100 workers. The standard wage rate per labour hour is Rs 6.

In a 42 hour week, the department produced 1,040 units of 'EXE' despite 5% of the time paid was lost due to an abnormal reason. The hourly wage rate actually paid were Rs 6.60, Rs 6 and Rs 5.70 respectively to 10, 30 and 60 of the workers.

Compute relevant variances. *(CA Inter, May 1997)*

*Solution*

*Basic Calculations*

1. *Standard man hours per unit:*
   25 units is the standard output when 100 workers work for 1 hour. Hence, standard man hours per unit are 100/25 = 4.

| 2. *Standard Output: 1,040 units* | | | *Actual Output: 1,040 units* | | | | |
|---|---|---|---|---|---|---|---|
| *Man hours for actual output* | *Rate per hr.* | *Amount* | *Actual hours paid for* | *Idle time hrs.* | *Prod. hrs.* | *Rate per hour* | *Amount paid for production* |
| | | *Rs* | *Rs* | | | *Rs* | *Rs* |
| 4,160 | 6 | 24,960 | 420 | 21 | 399 | 6.20 | 2,604 |
| (1,040 units × 4 hrs.) | | 1,260 | 63 | 1,197 | | 6.00 | 7,560 |
| | | 2,520 | 126 | 2,394 | | 5.70 | 14,364 |
| | 24,960 | 4,200 | 210 | 3,990 | | | 24,528 |

***Computations of Variances***

*Labour Cost Variance:*

= Standard Labour Cost – Actual Labour Cost

= Rs 24,960 – Rs 24,528 = Rs 432 (F)

*Labour Rate Variance:*

= Actual Time paid for × (Standard Rate – Actual Rate)

(i) 410 × (6 – 6.20) = 84 (A)

(ii) 1,260 × (6 – 6) = —

(iii) 2,520 × (6 – 5.70) = 756 (F)

672 (F)

Labour Efficiency Variance (after segregating Idle Time Variance);

= Standard Rate × (Standard Time for actual output – Actual Time worked)

= Rs 6 × (4,160 hrs. – 3,990 hrs.) = Rs 1,020 (F)

*Labour Idle Time Variance:*

= Idle Time hrs. × Standard Rate

= 210 hrs. × Rs 6 = Rs 1,260 (A)

***Example 18.21***

From the following records of Apollo Bolt Nut Manufacturing Company, you are required to compute material and labour variances:

An input of 100 kg of material yields to standard output of 10,000 units.
Standard price per kg of material = Rs 20
Actual quantity of material issued and used by production department 10,000 kg.
Actual price per kg of material = Rs 21 per kg.
Actual output = 9,00,000 units
Number of employees = 200
Standard wage rate per emmployee per day = Rs 40
Standard daily output per employee = 100 units
Total number of days worked = 50 days
(Idle time paid for and included in the above half day for each employee)
Actual wage rate per day = Rs 45

*(B. Com. (Hons), Delhi 1998)*

*Solution*

*Direct Material Variances*

DMCV = Standard Cost for Actual output – Actual Cost
= 9,000 × 20 – 10,000 × 21
= 1,80,000 – 2,10,000
= Rs 30,000 (A)

Direct Material Cost Variance (DMCV) can be segregated into Direct Material Price Variance (DMPV) and Direct Material Usage Variance (DMUV) as shown below:

DMPV = Actual Quantity × (Standard Rate – Actual Rate)
= 10,000 kg × (20 – 21)
= Rs 10,000 (A)

DMUV = Standard Rate × (Standard Quantity for Actual Output – Actual Quantity)
= 20 × (9,000 – 10,000)
= Rs 20,000 (A)

*Verification:*

DMCV = DMPV + DMUV
30,000 (A) = 10,000 (A) + 20,000 (A)

*Direct Labour Variances*

DLCV = Standard Labour Cost for Actual output – Actual Labour Cost
= 9,00,000 × .40 – 50 × 200 × 45
= 3,60,000 – 4,50,000
= Rs 90,000 (A)

Direct Labour Cost Variance (DLCV) may be segregated into Direct Labour Rate Variance (DLRV), Direct Labour Idle Time Variance (DLITV) and Direct Labour Revised Efficiency Variance (DLREV).

DLRV = Actual Time paid for × (SR – AR)

$= 50 \times 200 \times (40 - 45)$
$= \text{Rs } 50{,}000 \text{ (A)}$

DLITV $= \text{Idle Hours} \times \text{Std. Rate}$
$= 25 \times 200 \times 40$
$= \text{Rs } 2{,}00{,}000 \text{ (A)}$

DLREV $= \text{Standard Rate} \times (\text{Std. Time for Actual Output} - \text{Actual Time Worked})$
$= 40 \times (9{,}000 - 5{,}000)$
$= 40 \times 4{,}000 = \text{Rs } 1{,}60{,}000 \text{ (F)}$

*Verification:*

DLCV $= \text{DLRV} + \text{ITV} + \text{DLREV}$

Rs 90,000 (A) $= \text{Rs } 50{,}000 \text{ (A)} + \text{Rs } 2{,}00{,}000 \text{ (A)} + \text{Rs } 1{,}60{,}000 \text{ (F)}$

***Example 18.22***

From the following data prepare a unit cost statement showing the prime cost of products *A* and *B* together with analysis of variances:

| | | *Product A* | *Product B* |
|---|---|---|---|
| Material: | Standard | 600 kg. @ Rs 5.00 | 90 kg. @ Rs 3.00 |
| | Actual | 580 kg. @ Rs 5.50 | 100 kg. @ Rs 2.80 |
| Labour: | Standard | 80 hrs. @ Rs 2.00 | 16 hrs. @ Rs 2.80 |
| | Actual | 92 hrs. @ Rs 1.75 | 14 hrs. @ Rs. 2.00 |

*(ICWA Inter, June, 1998)*

*Solution*

**Unit Cost Statement**

| *Particulars* | *Product A* | | *Product B* |
|---|---|---|---|
| | Rs | | Rs |
| 1. *Standard Prime Cost:* | | | |
| Material: 600 kg. @ Rs 5.00 | 3,000.00 | 90 kg. @ Rs 3.00 | 270.00 |
| Labour: 80 hrs. @ Rs 2.00 | 160.00 | 6 hrs. @ Rs 2.80 | 44.80 |
| | 3,160.00 | | 314.80 |
| 2. *Actual Prime Cost:* | | | |
| Material: 580 kg. @ Rs 5.50 | 3,190,00 | 100 kg. @ Rs 2.80 | 280.00 |
| Labour: 92 hrs. @ Rs 1.75 | 161.00 | 14 hrs. @ Rs 2.60 | 36.40 |
| | 3,351,00 | | 316.40 |
| 3. *Total Cost Variance* (1) – (2) | 191.00 (A) | | 1.60 (A) |

**Analysis of Variances**

| | *Product A* | *Product B* |
|---|---|---|
| Material Price Variance | 580 kg. (Rs 5 – 5.50) | = 100 kg × (Rs 3 – Rs 2.80) |
| AQ × (SP – AP) | = Rs 290 (A) | = Rs 20 (F) |
| Usage Variance | = Rs 5 × (600 kg – 580 kg) | = Rs 3 × (90 kg – 100 kg) |
| SP × (SQ – AQ) | = Rs 100 (F) | = Rs 30 (A) |
| Material Cost Variance | = Rs 290 (A) + Rs 100 (F) | = Rs 20 (F) + Rs 30 (A) |
| (Price Variance + Usage | = Rs 190 (A) | Rs 10 (A) |

| Variance) | | |
|---|---|---|
| Labour Rate Variance | = 92 hrs × (Rs 2.00 – Rs 1.75) | = 14 hrs. × (Rs 2.80 – Rs 2.60) |
| AH × (SR – AR) | = Rs 23.00 (F) | = 2.80 (F) |
| Labour Efficiency Variance | = Rs 2 × (80 hrs. – 92 hrs.) | = Rs 2.80 × (16 hrs. – 14 hrs.) |
| | = Rs 24 (A) | = Rs 5.60 (F) |
| Labour Cost Variance | = Rs 23 (F) + Rs 24 (A) | = Rs 2.80 (F) + Rs 5.60 (F) |
| (Labour Rate Variance + | = Re. 1 (A) | = Rs 8.40 (F) |
| Labour Efficiency Variance) | | |

***Example 18.23***

The following standards have been set to manufacture a product:

Direct materials:

| | |
|---|---|
| 2 units of A at Rs 4 per unit | 8.00 |
| 3 units of B at Rs 3 per unit | 9.00 |
| 15 units of C at Rs 1 per unit | 15.00 |
| | 32.00 |
| Direct labour 3 hrs @ Rs 8 per hour | 24.00 |
| Total standard prime cost | 56.00 |

The company manufactured and sold 6,000 units of the product during the year. Direct material cost were as follows:

12,500 units of A at Rs 4.40 per unit.
18,000 units of B at Rs 2.80 per unit.
88,500 units of C at Rs 1.20 per unit.

The company worked 17,500 direct labour hours during the year. For 2,500 of these hours the company paid at Rs 12 per hour while for the remaining the wages were paid at the standard rate. Calculate materials price and usage variances and labour rate and efficiency variances.

*(B. Com. (Hons), Delhi)*

Output 6,000 units

| | *Standard* | | | *Actual* | | |
|---|---|---|---|---|---|---|
| | *Qty units* | *Rate Rs* | *Amount Rs* | *Qty units* | *Rate Rs* | *Amount Rs* |
| A | 12,000 | 4.00 | 48,000 | 12,500 | 4.40 | 55,000 |
| B | 18,000 | 3.00 | 54,000 | 18,000 | 2.80 | 50,400 |
| C | 90,000 | 1.00 | 90,000 | 88,500 | 1.20 | 1,06,200 |
| Total | 1,20,000 | | 1,92,000 | 1,19,000 | | 2,11,600 |

Material price variance = Actual quantity × (Actual rate – Standard rate)

| | | |
|---|---|---|
| A = 12,500 × (4.40 – 4) | = | 5,000 (A) |
| B = 11,000 × (2.80 – 3) | = | 3,600 (F) |
| C = 88,500 × (1.20 – 1) | = | 17,700 (A) |
| Total | | 19,100 (Adverse) |

Material usage variance = Standard rate × (Actual quantity – Standard quantity for actual output)

| | | |
|---|---|---|
| A = 4 × (12,500 – 12,000) | = | 2,000 (A) |
| B = 3 × (18,000 – 18,000) | = | Nil |
| C = 1 × (88,500 – 90,000) | = | 1,500 (F) |
| Total | | Rs 500 (Adverse) |

Labour rate variance = Actual hrs × (Actual rate – Standard rate)

| | | | |
|---|---|---|---|
| (i) | = 2,500 × (12 – 8) | = | 10,000 (A) |
| (ii) | = 15,000 × (8 – 8) | = | Nil |
| Total | | = | Rs 10,000 (Adverse) |

Labour efficiency variance = Standard rate × (Actual time – Standard time for actual output)
= 8 × (17,500 – 6,000 × 3)
= Rs 4,000 (Favourable)

***Example 18.24***

From the following data of A and Co. Ltd. relating to budgeted and actual performance for the month of March, 2002, compute the Direct Material and Direct Labour Cost Variances.

| | |
|---|---|
| Budgeted data for March: | |
| Units to be manufactured | 1,50,000 |
| Units of direct material required (based on standard rates) | 4,95,000 |
| Planned purchase of raw materials (Units) | 5,40,000 |
| Average unit cost of direct material | Rs 8 |
| Direct labour hours per unit of finished goods | 3/4 hr |
| Direct labour cost (Total) | Rs 29,92,500 |
| Actual data at the end of March: | |
| Units actually manufactured | 1,60,000 |
| Direct material cost (Purchase cost based on units actually issued) | Rs 43,41,900 |
| Direct material cost (Purchase cost based on units actually purchased) | Rs 45,10,000 |
| Average units cost of direct material | Rs 8.20 |
| Total direct labour hours for March | 1,25,000 |
| Total direct labour cost for March | Rs 33,75,000 |

*(ICWA Inter, Dec.)*

*Solution*

*Direct Material Variances*

MCV = Actual material cost – Standard material cost of actual output
= 43,41,900 – 1,60,000 × 3.3 × 8
= 43,41,900 – 42,24,000
= 1,17,900 (Adverse)

MPV = Actual quantity × (Actual rate – Standard rate)
= 5,29,500 × (8.20 – 8)
= Rs 1,05,900 (Adverse)

MUV = Standard rate × (Actual quantity – Standard quantity for actual output
= 8 × (5,29,500 – 1,60,000 × 3.30)
= 8 × (5,29,500 – 5,28,000)
= Rs 12,000 (Adverse)

*Direct Labour Variances*

LCV = Actual labour cost – Standard labour cost for actual output
= 33,75,000 – 1,60,00 × 3/4 × 26.60
= 33,75,000 – 31,92,000
= Rs 1,83,000 (Adverse)

LRV = Actual time × (Actual rate – Standard rate)
= 1,25,000 × (27 – 26.60)
= Rs 50,000 (Adverse)

LEV = Standard rate × (Actual time – Standard time for actual output)
= 26.60 × (1,25,000 – 1,60,000 × 3/4)
= 26.60 × (1,25,000 – 1,20,000)
= Rs 1,33,000 (Adverse)

**Working Notes:**

(i) Standard units of direct material required per unit of output;

$$= \frac{4,95,000}{1,50,000} = 3.30 \text{ units}$$

(ii) Total actual quantity of direct materials used

$$= \frac{43,41,900}{8.20} = 5,29,500 \text{ units}$$

(iii) Standard direct labour cost per hour

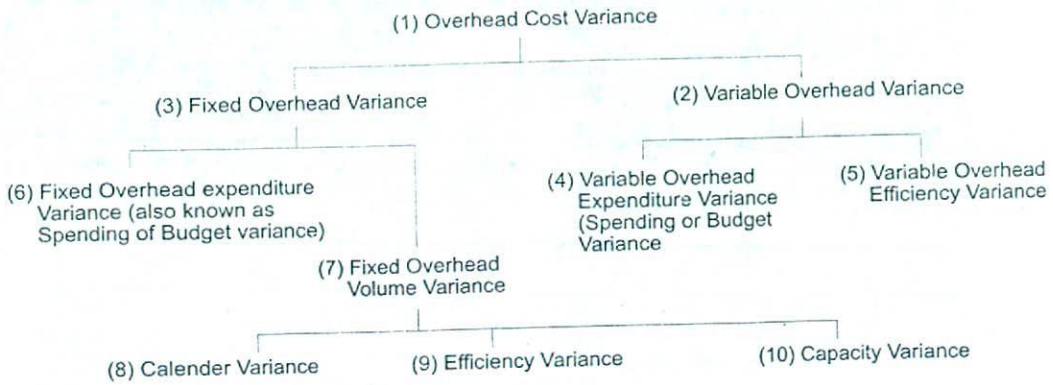
$$= \frac{29,92,500}{1,50,000 \times 3/4} = \frac{29,92,500}{1,12,500} = \text{Rs } 26.50$$

(iv) Actual direct labour cost per hour

$$= \frac{33,75,000}{1,25,000} = \text{Rs } 27$$

## OVERHEAD VARIANCES

The analysis of factory overhead variances is more complex than variance analysis for direct materials and direct labour. Generally, overhead variances constitute the following variances:




## 1. Total Overhead Cost Variance

This overall overhead variance is the difference between the actual overhead cost incurred and the standard cost of overhead for the output achieved. This can be computed by applying the following formula:

(Actual overhead incurred – Standard hours for the actual output × Standard overhead rate per hour)

or

Actual overhead incurred – (Actual output × Standard overhead rate per unit)

To illustrate the overall overhead variance, assume that the actual overhead for a department amounts to Rs 10,00,000 for the month of January, 2002 and standard (or allowed) hours for work performed total 4,500 hours, while actual hours used are 5,000. If overhead rate is Rs 200 per hour, the overall overhead variance will be the following:

| | |
|---|---|
| Actual department overhead | Rs 10,00,000 |
| Overhead charged to production (4,500 hr × Rs 200) | Rs 9,00,000 |
| Overall or net overhead variance (Unfavourable) | Rs 1,00,000 |

## 2. Variable Overhead Variance

It is the difference between actual variable overhead cost and standard variable overhead allowed for the actual output achieved. The formula for computing this variance is as follows:

Actual overhead cost – (Actual output × Variable overhead rate per unit)

or

Actual overhead cost – (Standard hours for actual output × Standard variable overhead rate per hour)

## 3. Fixed Overhead Variance

This variance indicates the difference between the actual fixed overhead cost and standard fixed overhead cost allowed for the actual output. This variance is found by using the following formula.

Fixed overhead variance = Actual overhead cost – Fixed overhead absorbed

or

Actual overhead cost – (Standard hours for actual output × Standard fixed overhead rate per hour).

### 4. Variable Overhead Expenditure (Spending or Budget) Variance

This variance indicates the difference between actual variable overhead and budgeted variable overhead based on actual hours worked. This variance is found by using the following formula:

(Actual variable overhead – Budgeted variable overhead)

### 5. Variable Overhead Efficiency Variance

This variance is like labour efficiency variance and arises when actual hours worked differ from standard hours required for good units produced. The actual quantity produced and standard quantity fixed might be different because of higher or lower efficiency of workers employed in the manufacturing of goods. This variance is found by using the following formula:

(Actual hours – Standard hours for actual output) × Standard variable overhead rate per hour

### 6. Fixed Overhead Expenditure (Spending or Budget) Variance

This variance indicates the difference between actual fixed overhead and budgeted fixed overhead. The formula for computing this variance is as follows:

(Actual fixed overhead – Budgeted fixed overhead)

If actual fixed overhead costs are greater than budgeted fixed costs, an unfavourable variance results because actual costs exceed the budget. Actual overhead costs seldom equal budgeted costs because property tax rates may change, insurance premiums may increase or equipment charges may affect depreciation rates. As an illustration, assume that a company completed 36,000 units (equal to 18,000 standard productive hours) in 18,500 hours at the recorded fixed cost of Rs 75,100. The standard fixed cost rate per hour is Rs 4. Therefore,

Expenditure variance = (Actual overhead costs – Budgeted overhead costs)

That is = (75,100 – 18,500 × 4)

= (75,100 – 74,000)

= Rs 1,100 (unfavourable)

The expenditure or budget variance provides management with information which helps in controlling costs. The budget variance is usually prepared on a departmental basis and the factors that cause the budget variance are, therefore, controllable by departmental managers.

### 7. Fixed Overhead Volume Variance

Volume variance relates to only fixed overhead. This variance arises due to the difference between the standard fixed overhead cost allowed (absorbed) for the actual output and the budgeted fixed overhead based on standard hours allowed for actual output achieved during the period. The variance shows the over-or-under-absorption of fixed overheads during a particular period. If the actual output is more than the standard output, there is over-absorption and variance is favourable. If actual output is less than the standard output, the volume variance is unfavourable. The formula for computing this variance is as follows:

(Budgeted overhead applied to actual output – Budgeted fixed overhead based on standard hours allowed for actual output)

or

(Actual production – Budgeted production) × Standard fixed overhead rate per unit

Volume variance is further sub-divided into three variances.

## 8. Fixed Overhead Calander Variance

It is that portion of volume variance which is due to the difference between the number of actual working days in the period to which the budget is applicable and budgeted number of days in the budget period.

If actual working days is more than the budgeted working days, the variance is favourable as work has been done on days more than budgeted or allowed and vice-versa. The formula is as follows:

(No. of actual working days – No. of budgeted working days) × Standard fixed overhead rate per day

Calander variance can be computed based on hours or output. Then the formulae are:

*Hours Basis:*

Calander variance = (Revised budget capacity hours – Budgeted hours) × Standard fixed overhead rate per hour

If revised budgeted capacity hours are more than the budgeted hours, the variance will be favourable. In the reverse situation, the variance will be unfavourable.

### *Output Basis*

Calander variance = (Revised budgeted quantity in terms of actual number of days worked – Budgeted quantity) × Standard fixed overhead rate per unit

If revised budgeted quantity is more than the budgeted quantity the variance is favourable; if revised budgeted quantity is less, the variance will be unfavourable.

## 9. Fixed Overhead Efficiency Variance

It is that portion of volume variance which arises when actual hours of production used for actual output differ from the standard hours specified for that output. If actual hours worked are less than the standard hours, the variance is favourable and when actual hours are more than the standard hours, the variance is unfavourable. The formula is:

Fixed overhead efficiency variance = (Actual hours – Standard hours for actual production) × Standard fixed overhead rate per hour

or

Fixed overhead efficiency variance = (Actual production – Standard production as per actual time available) × Standard fixed overhead rate per unit

## 10. Fixed Overhead Capacity Variance

It is that part of fixed overhead volume variance which is due to the difference between the actual capacity (in hours) worked during a given period and the budgeted capacity (expressed in hours). The formula is:

Capacity variance = (Actual capacity hours – Budgeted capacity hours) × Standard fixed overhead rate per hour

This variance represents idle time also. If actual capacity hours are more than the budgeted capacity hours, the variance is favourable and if actual capacity hours less than the budgeted capacity hours, the variance will be unfavourable.

In case actual number of days and budgeted number of days are also given, then budgeted capacity hours will be calculated in terms of actual number of days and it will be known as revised budgeted capacity hours, i.e. budgeted hours for actual days worked. In this situation, the formula for calculating capacity variance will be as follow:

Capacity variance = (Actual capacity hours – Revised budgeted capacity hours) × Standard fixed overhead rate per hour

In the above formula, the variance will be favourable if actual capacity hours are more than the revised budgeted hours. However, if actual capacity hours are lesser than the revised budgeted hours, the variance will be adverse as lesser hours means that lesser actual hours have been worked taking the actual days utilised into account.

## Two-way, Three-way and Four-way Variance Analysis

The above overhead variances are also classified as Two-way, Three-way and Four-way variance. The difference variances under these categories are listed below. The formulae for computing these variances are similar to as explained in the preceding section.

### *A. Two-way Variance Analysis*

1. Controllable variance (Budget variance)
2. Volume variance (Uncontrollable variance)

### *B. Three-way Variance Analysis*

1. Expenditure variance (Spending variance)
2. Capacity variance
3. Efficiency variance

### *C. Four-way Variance Analysis*

1. Expenditure variance (Spending variance)
2. Variable overhead efficiency variance
3. Fixed overhead efficiency variance
4. Capacity variance

### *Example 18.25*

From the following data, calculate overhead variances:

| | *Budget* | *Actual* |
|---|---|---|
| Output | 15000 units | 16000 units |
| No. of working days | 25 | 27 |
| Fixed overheads | Rs 30000 | Rs 30500 |
| Variable overheads | Rs 45000 | Rs 47000 |

There was an increase of 5% in capacity.

*Solution*

1. Total overhead cost variance:
   (Actual overhead cost – Actual units × Standard rate)

(Rs 30,500 + 47,000 – 16,000 × Rs 5)
Rs 77,500 – Rs 80,000 = Rs 2,500 (Favourable)

$$\text{Standard rate} = \frac{\text{Standard overhead}}{\text{Standard output}}$$

2. Variable overheads expenditure variance:
(Actual variable cost – Actual units × Standard rate)
(47,000 – 16,000 × Rs 3)
47,000 – Rs 48,000 = Rs 1,000 (Favourable)
3. Fixed overhead variance:
Actual fixed overhead cost – (Actual units × Standard rate of fixed overhead)
30,500 – (16,000 × 2)
30,500 – 32,000 = Rs 1,500 (Favourable)
4. Volume variance:
Actual units × Standard rate – Budgeted fixed overheads
16,000 × Rs 2 – Rs 30,000 = Rs 2,000 (Favourable)
5. Expenditure variance:
Actual fixed overheads – Budgeted fixed overheads
Rs 30,500 – Rs 30,000 = Rs 500 (Unfavourable)
6. Capacity variance:
Standard rate (Revised budgeted units – Budgeted units)
Revised budgeted units = Budgeted units + Increase in capacity

$$= 15{,}000 + \frac{5}{10} \times 15{,}000 = 15{,}750 \text{ units}$$

Capacity variance = Rs 2 (15,750 units – 15,000 units)
= Rs 2 × 750 = Rs 1,500 (Favourable)

7. Calendar variance:
Increase or decrease in production due to more or less working days × Standard rate per unit
Within 25 days, Standard production with increased capacity = 15,750 units

$$\text{Within 2 days (27 – 25), production will be increased by} = \frac{15{,}750 \times 2}{25} = 1{,}260 \text{ units}$$

Calendar variance = 1,260 units × Rs 2
= Rs 2,520 (Favourable)

8. Efficiency variance:
Standard rate (Actual production – Standard production)
Standard production:

| | |
|---|---|
| Budgeted production | = 15,000 units |
| Production increased due to increase in capacity | = 750 units |
| Production increased due to 2 more working days | = 1,260 units |
| | 17,010 units |

Efficiency variance = Rs 2 (16,000 units – 17,010 units)
= Rs 2 (– 1,010 units) = Rs 2,020 (Unfavourable)

*Example 18.26*

In a factory the standard units of production for the year were fixed at 1,20,000 units and overhead expenditures were estimated to be:

| | Rs |
|---|---|
| Fixed | 12,000 |
| Variable | 6,000 |
| Semi-variable | 1,800 |

Actual production during April of the year was 8,000 units. Each month has 20 working days. During the month in question there was one statutory holiday. The actual overheads amounted to:

| | Rs |
|---|---|
| Fixed overhead | 1,190 |
| Variable | 480 |
| Semi-variable | 192 |

Semi-variable charges are considered to include 60% expenses of a fixed nature and 40% of a variable character. Find out the expenditure, volume and calendar variances. *(CA Inter)*

*Solution*

Total overhead cost variance = Actual overheads – Recovered overheads
= 1,862 – 1,320 = Rs 542.00 (Adverse)

(a) *Expenditure variance:*

Variable overheads = Actual variable overheads – Standard variable overheads absorbed
= Rs 556.80 – Rs 448 = 108.80 (Adverse)

Fixed overheads = Actual fixed overheads – Budgeted fixed overheads
= 1,305.20 – 1,090 = 215.20 (A)

Total overhead expenditure variance = 324.00 (Adverse)

(b) *Volume variance:*

For fixed overheads = Recovered overheads – Budgeted overheads
= Rs 872 – 1,090 = 218.00 (Adverse)

Total = 542.00 (Adverse)

(c) Calendar variance (included in the volume variance):
= Fixed overhead to be absorbed per day

$$= \text{Rs } \frac{13,080}{240} = 54.50$$

= Loss due to one day Rs 54.50 (Adverse)

**Working Notes:**

1. (A) Standard rate of absorption per unit:

| | | |
|---|---|---|
| Fixed overheads: | $\frac{\text{Budgeted fixed overheads}}{\text{Budgeted output}}$ | |
| | $\frac{12,000}{1,20,000}$ | Re 0.10 |
| Fixed overheads element in semi-variable overheads, i.e. 60% of Rs 1,800 | $\frac{1,080}{1,20,000}$ | Re 0.009 |

| | | |
|---|---|---|
| Standard rate of absorption of fixed overheads per unit | | Re 0.009 |
| (B) Budgeted variable overheads: | | Rs 6,000 |
| *Add:* Variable element in semi-variable overheads 40% of Rs 1,800 | | 720 |
| Total budgeted variable overheads | | 6,720 |
| Standard variable cost per unit | 6,720 / 1,20,000 | 0.056 |

Variable overheads for 8,000 units @ Re 0.056 = Rs 448

2. Budgeted annual fixed overheads are:
   Rs 12,000 + 60% of Rs 1,800 = 13,080
   Budgeted monthly fixed overheads are = Rs 1,090
3. Actual fixed overheads are Rs 1,090 + 60% of Rs 192 = Rs 1,305.20
4. Actual variable overheads are Rs 480 + 40% of Rs 192 = Rs 556.80

### *Example 18.27*

The following information was obtained from the records of a manufacturing unit using Standard Costing System:

| | *Standard* | *Actual* |
|---|---|---|
| Production | 4,000 units | 3,800 units |
| Working days | 20 | 21 |
| Fixed overhead Rs | 40,000 | 39,000 |
| Variable overhead Rs | 12,000 | 12,000 |

You are required to calculate the following overhead variances:

(a) Variable overhead variance
(b) Fixed overhead variance
   (i) Expenditure variance
   (ii) Volume variance
   (iii) Efficiency variance
   (iv) Calendar variance
(c) Also prepare a Reconciliation Statement for the standard fixed expenses worked out at Standard fixed overhead rate and the Actual fixed overhead. *(CA Inter, ICWA Inter)*

*Solution*

| *Basic calculations* | *Budgeted data* | *Actual data* |
|---|---|---|
| Variable overhead (Rs) | 12,000 | 12,000 |
| Fixed overhead (Rs) | 40,000 | 39,000 |
| Production (units) | 4,000 | 3,800 |
| Working (days) | 21 | 20 |

$$\text{Standard variable overhead rate per unit} = \frac{12{,}000}{4{,}000 \text{ units}} = \text{Rs } 3$$

$$\text{Standard production per day} = \frac{4{,}000 \text{ units}}{20 \text{ days}} = 200 \text{ units}$$

Standard fixed overhead per day = 200 × Rs 10 = Rs 2,000

(a) Variable overhead cost variance = Actual variable overhead – Recovered variable overhead
= 12,000 – 3,800 × 3
= 12,000 – 11,400 = Rs 600 (A)

(b) Fixed overhead variance = (Actual fixed overheads – Recovered fixed overheads)
= 39,000 – 3,800 × 10
= 39,000 – 38,000 = Rs 1,000 (A)

(i) Fixed overhead expenditure variance = Actual overheads – Budgeted overheads
= 39,000 – 40,000 = Rs 1,000 (F)

(ii) Fixed overhead volume variance = Recovered overheads – Budgeted overheads
= 38,000 – 40,000 = Rs 2,000 (A)

(iii) Fixed overhead efficiency variance = Standard fixed overhead rate per day × (Actual time – Standard time for actual output)
= 2,000 × (21 – 3,800/200)
= 2.00(21 – 19) = 4,000 (A)

(iv) Fixed overhead calendar variance = Standard fixed overhead rate per day × (Actual days – Budgeted days)
= 2,000 × (21 – 20)
= Rs 2,000 (F)

or

Standard fixed overhead rate per day × Extra days/Deficit worked
= 2,000 × 1 = 2,000 (F)

(c) Reconciliation statement

| | | |
|---|---|---|
| Standard fixed overheads 3800 × 100 | | Rs 38,000 |
| *Less:* Fixed overhead expenditure variance | 1,000 (F) | |
| *Less:* Fixed overhead calendar variance | 2,000 (F) | 3,000 (F) |
| | | 35,000 |
| *Add:* Fixed overhead efficiency variance (A) | | 4,000 |
| Actual Fixed Overheads | | 39,000 |

***Example 18.28***

A Company has normal capacity of 100 machines working 8 hours per day of 25 days in a month. The budgeted fixed overheads of a month are Rs 1,50,000. The Standard time required to manufacture one unit of product is 4 hours. In a particular month, the Company worked for 24 days of 750 machine hours per day and produced 4,500 units of the product. The actual fixed overheads incurred were Rs. 1,45,000. Compute:

(a) Efficiency variance,
(b) Capacity variance,
(c) Calendar variance
(d) Expenditure variance,

(e) Volume variance and
(f) Total fixed overhead variance *(CA Inter, May 2001)*

*Solution*

| Standard/Budgeted data | | Actual data | |
|---|---|---|---|
| Budgeted fixed overhead (Rs) | 1,50,000 | Actual fixed overhead (Rs) | 1,45,000 |
| Budgeted output units | 5,000 | Actual output units | 4,500 |
| Budgeted hours | 20,000 | Actual hours | 18,000 |
| Budgeted days | 25 | Actual days | 24 |
| Standard labour hours per unit | 4 | | |
| Standard hours worked per day | 800 | | |
| Standard rate per unit (Rs) | 30 | | |
| Standard rate per hour (Rs) | 7.50 | | |
| Standard fixed overhead rate per day (Rs.) | 6,000 | | |

**Computation of variances:**

(a) *Efficiency variance:*
= Standard fixed overhead rate per unit {Actual quantity of output – Standard quantity of output}
= Rs 30 {4,500 units – 4,500 units} = Nil

(b) *Capacity variance:*
= Standard fixed overhead rate per hour {Actual capacity hours – Budgeted capacity hours}
= Rs 7.50 (18,000 hours – 24 days × 800 hours)
= Rs 7.50 (18,000 hours – 19,200 hours)
= Rs 9,000 (Adverse)

(c) *Calendar variance:*
= Standard fixed overhead rate per day {Actual days – Budgeted days}
= Rs 6,000 (24 days – 25 days)
= Rs 6,000 (Adverse)

(d) *Expenditure variance:*
= {Budgeted fixed overhead – Actual fixed overhead}
= {Rs 1,50,000 – Rs 1,45,000}
= Rs 5,000 (Favourable)

(e) *Volume variance:*
= Standard fixed overhead rate per unit {Actual output – Budgeted output}
= Rs 30 (4,500 units – 5,000 units)
= Rs 15,000 (Adverse)

(f) *Total fixed overhead variance*
= {Fixed overhead recovered on actual output – Actual fixed overhead incurred}
= {4,500 units × Rs 30 – Rs 1,45,000}
= Rs 10,000 (Adverse)

**Verification:**

| | |
|---|---|
| Total fixed overhead variance or Rs. 10,000 (Adverse) | = Expenditure variance + Volume variance<br>= Rs 5,000 (Favourable) + Rs 15,000 (Adverse) |
| and | |
| Volume variance Rs 15,000 (Adverse) | = Efficiency variance + Capacity variance + Calendar variance<br>= Nil + Rs 9,000 (Adverse) + Rs 6,000 (Adverse) |

### *Example 18.29*

The following data is given:

| | *Budget* | *Actuals* |
|---|---|---|
| Production (in units) | 400 | 360 |
| Man-hours to produce above | 8,000 | 7,000 |
| Variable overheads (in rupees) | 10,000 | 9,150 |

The standard time to produce one unit of the product is 20 hours.

Calculate variable overhead variances and give necessary journal entries to record the transactions.

*(CA Inter, Nov. 1997, B. Com. (Hons), Delhi 2000)*

*Solution*

**Basic Calculations**

1. Standard Variable Overhead per unit:
   Rs 10,000/400 units= Rs 25 per unit
2. Standard Variable Overhead per hour:
   Rs 10,000/8,000 hrs = Rs 1.25 per hour
3. Recovered Variable Overhead:
   = Actual Output × Standard Variable Overhead per hour
   = 360 units × Rs 25 = Rs 9,000
4. Budgeted Variable Overhead (based on actual hours worked):
   = Actual Hours Worked × Standard Variable Overhead per hour
   = 7,000 Hrs. × Rs 1.25 = Rs 8,750
5. Standard Hours for actual output:
   = Actual Output × Standard Hours per unit
   = 360 units × 20 Hours = 7,200 hours

*Computation of Variances:*

(i) Variable Overhead Cost Variance:
= Recovered Variable Overhead – Actual Variable Overheads
= Rs 9,000 – Rs 9,150 = Rs 150 (A)

(ii) Variable Overhead Budget or Expenditure Variance:
= Budgeted Variable Overheads – Actual Variable Overheads
= Rs 8,750 – Rs 9,150 = Rs 400 (A)

(iii) Variable Overhead Efficiency Variance:
= Standard Variable Overhead per hour (Standard Hours for Actual Output – Actual Hours)
= Recovered Variable Overheads – Budgeted Variable Overheads
= Rs 9,000 – Rs 8,750
= Rs 250 (F)

*Verification*

Variable Overhead Cost Variance = Variable Overhead Budgets Variance + Variable Overhead Efficiency Variance

Rs 150 (A) = Rs 400 (A) + Rs 250 (F)

*Journal Entries:*

| | | *Dr.* Rs | *Cr.* Rs |
|---|---|---|---|
| 1. Variable Overheads Control A/c | Dr. | 8,750 | |
| Variable Overheads Expenditure Variance A/c | Dr. | 400 | |
| To Bank/Creditors | | | 9,150 |
| 2. Work-in-progress Control A/c | Dr. | 9,000 | |
| To Variable Overheads Control A/c | | | 8,750 |
| To Variable Overheads Efficiency Variance A/c | | | 250 |

The above journal entries have been passed according to 'Single Plan' procedure for the recording of standard costs.

### *Example 18.30*

The following data has been collected from the cost records of a unit for computing the various fixed overhead variances for a period:

| | |
|---|---|
| Number of Budgeted Working Days | 25 |
| Budgeted Man-hours per day | 6,000 |
| output (budgeted) per man hour ( in units) | 1 |
| Fixed Overhead cost as budgeted | Rs 1,50,000 |
| Actual Number of Working days | 27 |
| Actual man-hours per day | 6,300 |
| Actual Output per man-hour (in units) | 0.9 |
| Actual Fixed Overhead Variances: | Rs 1,56,000 |

Calculate Fixed Overhead Variances:

(a) Expenditure Variance;
(b) Calendar Variance;
(c) Capacity Variance;
(d) Efficiency Variance;
(e) Volume Variance;
(f) Fixed Cost Variance. *(ICWA Inter, Dec. 1995)*

*Solution*

(a) FOEXV = Budgeted Fixed Overheads – Actual Fixed Overheads
= Rs 1,50,000 – Rs 1,56,000
= Rs 6,000 (Adverse)

(B) FOCALV = No. of Excess Working Days × Fixed Overhead Rate per Day
= 2 × 6,000 = Rs 12,000 (Favourable)

| | |
|---|---|
| OR | Possible Overheads – Budgeted Overheads |
| | $= 27 \times 6,000 - 25 \times 6,000$ |
| | = Rs 1,52,000 – 1,50,000 = Rs 12,000 (Favourable) |
| (c) FOCAPV (Revised) | = Standard Overheads – Possible Overheads |
| | = Re. $1 \times 6,300 \times 27 - 1,62,000$ |
| | = Rs 1,70,100 – 1,62,000 = Rs 8,100 (Favourable) |
| (d) FOEFFV | = Recovered Overheads – Standard Overheads |
| | $= 9 \times 6,300 \times 27 - 1,70,100$ |
| | = Rs 1,53,090 – 1,70,100 = Rs 17,010 (Adverse) |
| (e) FOCV | = FOEXPV + FOVV |
| | = FOEXPV + FOCALV + FORCAPV + FOEFFV |
| | = Rs 6,000 (A) + Rs 12,000 (F) + 8,100 (F) + 17,010 (A) |
| | = Rs 2,910 (Adverse) |

***Example 18.31***

The details regarding a food product manufactured by ABC Co. for the last one week are as follows:

| | | Rs |
|---|---|---|
| Standard Cost (For one unit) | | |
| Direct Materials | 10 units @ Rs 1.50 | 15 |
| Direct Wages | 5 hours @ Rs 8.00 | 40 |
| Production Overheads | 5 hours @ Rs 10.00 | 50 |
| | | 105 |

| | |
|---|---|
| Actuals (For whole activity) | |
| Direct Materials | Rs 6,435 |
| Direct Wages | Rs 16,324 |
| Analysis of Variances | |
| Direct Materials | |
| Price | Rs 585 (Adverse) |
| Usage | Rs 375 (Favourable) |
| Direct Wages (Labour) | |
| Rate | Rs 636 (Favourable) |
| Efficiency | Rs 360 (Adverse) |
| Production Overheads | |
| Expenditure | Rs 400 (Favourable) |
| Volume | Rs 750 (Favourable) |

You are required to calculate:

(i) actual output units;
(ii) actual price of material per unit;
(iii) actual wage rate per labour hour;
(iv) the amount of production overhead incurred and
(v) the production overhead efficiency variance

*(CA Inter, May 1999)*

*Solution*

(i) Computation of Actual Output in units

DMCV = DMPV + DMUV
= Rs 585 (A) + Rs 375 (F)
= Rs 210 (A)

or DMCV = Standard Cost for Actual Output – Actual Cost

Let units produced be taken as X

or 210 (A) = $15x$ – 6,435
or – 15X = – 6225
or X = 415 units.

(ii) *Actual Price of Material per unit*

DMUV = SR × (Standard Qty. for Actual Output – Actual Qty.)
or 375 (F) = 1.5 × (4,150 – X)
or 375 (F) = 6,225 – 1.5X
or 1.5X = 5,850
or X = 3,900 units

$$\text{Actual Price of Material per unit} = \frac{\text{Actual Cost}}{\text{Actual Quantity}}$$

$$= \frac{6,435}{3,900} = \text{Rs } 1.65$$

(iii) Actual Wage Rate per hour

DLRV = Actual Hrs. × (SR – AR)
636 (F) = Standard Wages – Actual Wages
636 (F) = 8 × X* – 16,324

* Presuming as actual hours worked.

or 8X = Rs 16,960
or X = 2,120 hours

$$\text{Actual Wage Rate per hour} = \frac{\text{Actual Wages}}{\text{Actual Hours}}$$

$$\frac{16,324}{2,120} = \text{Rs } 7.70 \text{ per hour}$$

(iv) *Amount of Production Overheads incurred*

Production Overhead Cost Variance = Expenditure Variance + Volume Variance
= Rs 400 (F) + Rs 750 (F)
= Rs 1,150 (F)

Production Overhead Cost Variance = Recovered Overheads – Actual Overheads

Rs 1,150 (F) = 415 × 50 – X*

*taking overheads as X

or Rs 1,150 (F) = 20,750 – X
or X = Rs 19,600

Production Overhead Efficiency Variance $= \left(\begin{matrix}\text{Std. Overhead} \\ \text{Rate per hour}\end{matrix}\right) \times \left(\begin{matrix}\text{Std. Hrs. for Actual} - \text{Actual} \\ \text{Production} \qquad\quad \text{Hours}\end{matrix}\right)$

$= \text{Rs } 10 \times (415 \times 5 - 2{,}120)$

$= \text{Rs } 10 \times (2{,}075 - 2{,}120)$

$= \text{Rs } 10 \times 45 = \text{Rs } 450 \text{ Adverse}$

### *Example 18.32*

A Company manufacturing two products uses standard costing system. The following data relating to April, 2000 have been furnished to you:

| Products | A | B |
|---|---|---|
| Standard Cost per unit: | Rs | Rs |
| Direct Materials | 2 | 4 |
| Direct Wages | 8 | 6 |
| Fixed Overheads | 16 | 12 |
| | 26 | 22 |
| Units processed/in Process | | |
| Beginning of the month: All materials applied and 50% complete in respect of labour and overheads | 4,000 | 12,000 |
| End of the month: All materials applied and 80% complete in respect of labour and overheads | 8,000 | 12,000 |
| Units completed and transferred to Warehouse during the month | 16,000 | 20,000 |

You may use average cost method to analyse.

The following were the actual costs recorded during the month:

Direct materials purchased at standard price amount to Rs 2,00,000 and actual cost of which is Rs 2,20,000. Direct materials used for consumption at standard price amount to Rs 1,75,000.

Direct Wages for actual hours worked at standard wages rates were Rs 4,20,000 and at actual wage rates were Rs 4,12,000.

Fixed overheads budgeted were Rs 8,25,000 and actual fixed overheads incurred were Rs 8,50,000.

Required:

(i) Direct material price variance at the point of consumption and at the point of purchase.
(ii) Direct material usage variance.
(iii) Direct wage rate and efficiency variance.
(iv) Fixed overheads volume and expenditure variance.
(v) Standard cost of WIP at the end of the month.

*(CA Inter, Nov. 1996, May 2000)*

*Solution*

**(a) Working Notes:**

**1. Using Average Cost Method:**

**Equivalent Production Statement**

| *Particulars* | *Units out* | *Material* | | *Labour and Overheads* | |
|---|---|---|---|---|---|
| | | *% completion* | *Units* | *% completion* | *Units* |
| *Product A:* | | | | | |
| Units completed | 16,000 | 100 | 16,000 | 100 | 16,000 |
| Closing WIP | 8,000 | 100 | 8,000 | 80 | 6,400 |
| | 24,000 | | 24,000 | | 22,400 |
| *Product B:* | | | | | |
| Units completed | 20,000 | 100 | 20,000 | 100 | 20,000 |
| Closing WIP | 12,000 | 100 | 12,000 | 80 | 9,600 |
| | 32,000 | | 32,000 | | 29,600 |

**2. Direct Materials**

| | *Product A* | *Product B* | *Total* |
|---|---|---|---|
| Equivalent units: (I) | 24,000 | 32,000 | |
| Std. cost/unit (Rs.) (II) | 2 | 4 | |
| Std. cost of standard requirement of materials (Rs.): {(I) × (II)} | 48,000 | 1,28,000 | 1,76,000 |
| St. cost of actual qty. of materials used (Rs.) | – | – | 1,75,000 |
| Actual cost of actual quantity of materials $\left\{ \text{Rs.} \frac{2,20,00}{2,00,00} \times \text{Rs. } 1,75,00 \right\}$ | | | 1,92,500 |

**3. Direct Labour**

| | *Product A* | *Product B* | *Total* |
|---|---|---|---|
| Equivalent units: (I) | 22,400 | 29,600 | |
| Standard direct wages/unit (Rs.): (II) | 8 | 6 | |
| Standard direct wages at standard rate (Rs.): {(I) x (II)} | 179,200 | 1,77,600 | 3,56,800 |
| Direct wages for actual hours at standard rate (Rs) | | | 4,20,000 |
| Actual direct wages at actual wage rate (Rs) | | | 4,12,000 |

**4. Fixed Overheads**

| | *Product A* | *Product B* | *Total* |
|---|---|---|---|
| Equivalent units: (I) | 22,400 | 29,600 | – |
| Fixed overhead/unit (Rs.): (II) | 16 | 12 | – |
| Fixed overheads charged to production (Rs.): {(I) × (II)} | 3,58,400 | 3,55,200 | 7,13,600 |
| Budgeted fixed overheads (Rs.) | – | – | 8,25,000 |
| Actual fixed overheads (Rs.) | – | – | 8,50,000 |

(i) *Direct material price variance (at the point of consumption): (Refer to Working note 2)*

= (Std. of cost of actual quantity – Actual cost of actual quantity)

= (Rs 1,75,000 – Rs 1,92,500) = Rs 17,500 (Adv.)

*Direct material price variance (at the point of purchase):*

= (Std. price of material purchased – Actual cost of material purchased)

= (Rs 2,00,000 – Rs 2,20,000) = Rs 20,000 (Adv.)

(ii) *Direct material usage variance: (Refer to Working note 2)*

= (Std. cost of std. qty of material – Std. cost of actual quantity of material used)

= (Rs 1,76,000 – Rs 1,75,000) = Rs 1,000 (Fav.)

(iii) *Direct wage rate variance: (Refer to Working note 3)*

= (Direct wages at std. rate – Actual direct wages at actual rate)

= (Rs 4,20,000 – Rs 4,12,000) = Rs 8,000 (Fav.)

*Labour efficiency variance:*

= (Std. direct wages at std. rate – Direct wages for actual hours at std. rate)

= (Rs 3,56,800 – Rs 4,20,000) = Rs 63,200 (Adv.)

(iv) *Fixed overhead volume variance: (Refer to Working note 4)*

= (Fixed overhead charged to production – Budgeted fixed overhead)

= (Rs 7,13,600 – Rs 8,25,000) = Rs 1,11,400 (Adv.)

*Fixed overhead expenditure variance: (Refer to Working note 4)*

= (Budgeted fixed overhead – Actual fixed overhead)

= (Rs 8,25,000 – Rs 8,50,000) = Rs 25,000 (Adv.)

(v) *Valuation of closing WIP:*

| | *Product A* | | *Product B* | |
|---|---|---|---|---|
| | *Material* | *Labour and Overhead* | *Material* | *Labour and Overhead* |
| Equivalent units: | 8,000 | 6,400 | 12,000 | 9,600 |
| Std. cost/unit (Rs) | 2/- | 24/- | 4/- | 18/- |
| Value of WIP (Rs) | 16,000 | 1,53,600 | 48,000 | 1,72,800 |
| Total (Rs) | 1,69,600 | | 2,20,800 | |

## CONTROL RATIOS

Control ratios are useful to management to know whether the deviations of actuals from budgeted results are favourable or unfavourable. These control ratios are expressed in percentage. The ratio is taken as favourable if it is 100% or more. In case it is less than 100%, the ratio is considered as unfavourable. Control ratios are as follows:

1. *Activity Ratio* Activity ratio is used to measure the level of activity achieved over a period. It is obtained when the number of standard hours equivalent to the output produced are expressed at a percentage of the budgeted hours.

$$\text{Activity ratio} = \frac{\text{Standard hrs for actual production}}{\text{Budgeted hours}} \times 100$$

2. *Capacity Ratio* This ratio points out to what extent budgeted hours have been utilised. This ratio shows the relationship between actual working hours and budgeted working hours.
3. *Efficiency Ratio* Efficiency ratio shows the degree of efficiency achieved in production. It is derived when the standard hours equivalent to the output produced, are expressed as a percentage of the actual hours spent in producing the output.

$$\text{Efficiency ratio} = \frac{\text{Standard hours for actual production}}{\text{Actual hours worked}} \times 100$$

### *Example 18.33*

In a manufacturing shop product X requires 2.5 man-hours and product Y requires 6 man-hours. In a month of 25 working days of 8 hours a day, 2,000 units of X and 1,000 units of Y were produced. The company employs 50 workers in the shop and the budgeted man-hours are 1,08,000 for the year. You are required to work out the capacity ratio, activity ratio and efficiency ratio.

*(ICWA, Inter)*

*Solution*

Standard man-hours produced:

| | | |
|---|---|---|
| Product X: 2,000 units @ | 2.5 Man-hours | = 5,000 Man-hours |
| Product Y: 1,000 units @ | 6 Man-hours | = 6,000 Man-hours |
| | Total | = 11,000 Man-hours |

Budgeted man-hours per month = 1,08,000/12
= 9,000

Actual man-hours worked = 50 workers × 25 days × 8 hours = 10,000 man-hours

Ratios:

$$\text{Capacity ratio} = \frac{\text{Actual Man-hours worked}}{\text{Budgeted Man-hours}} \times 100$$

$$= \frac{10{,}000}{9{,}000} \times 100 = 111.11\%$$

$$\text{Activity ratio} = \frac{\text{Standard man-hours produced}}{\text{Budgeted man-hours}} \times 100$$

$$= \frac{11{,}000}{9{,}000} \times 100 = 122.22\%$$

$$\text{Efficiency ratio} = \frac{\text{Standard man-hours produced}}{\text{Actual man-hours worked}} \times 100$$

$$= \frac{11{,}000}{10{,}000} \times 100 = 111.00\%$$

***Example 18.34***

If the 'activity ratio' and 'capacity ratio' of a company is 104% and 96% respectively, find out its 'efficiency ratio'. *(CA Inter, may 1997)*

*Solution*

The various ratios are calculated as under:

(i) $\text{Activity Ratio} = \frac{\text{Standard hours for actual production}}{\text{Budgeted hours}} \times 100$

(ii) $\text{Capacity Ratio} = \frac{\text{Actual hours worked}}{\text{Budgeted hours}} \times 100$

(iii) $\text{Efficiency Ratio} = \frac{\text{Standard hours for actual production}}{\text{Actual hours worked}} \times 100$

From the above, it is clear that the Efficiency Ratio can be obtained by dividing Activity Ratio by Capacity Ratio.

Hence,

$$\text{Efficiency Ratio (in percentage)} = \frac{\text{Activity Ratio}}{\text{Capacity Ratio}} \times 100$$

$$= \frac{104\%}{96\%} \times 100 = 108.33\%$$

***Example 18.35***

Calculate from the following figures:

(i) Efficiency ratio
(ii) Activity Ratio and
(iii) Capacity Ratio

| | |
|---|---|
| Budgeted Production | 880 units |
| Standard Hours Per Unit | 10 |
| Actual Production | 750 units |
| Actual Working Hours | 6,000 |

*(CA Inter, May 1999; B. Com (Hons), Delhi)*

*Solution*

$$\text{(i) Efficiency Ratio} = \frac{\text{Standard hours for actual production}}{\text{Actual hours worked}} \times 100$$

$$= \frac{750 \text{ units} \times 10 \text{ hours}}{6{,}000} \times 100 = 125\%$$

$$\text{(ii) Activity Ratio} = \frac{\text{Standard hours for actual production}}{\text{Budgeted hours}} \times 100$$

$$= \frac{750 \text{ units} \times 10 \text{ hours}}{880 \text{ units} \times 10 \text{ hours}} \times 100 = 85.23\%$$

$$\text{(iii) Capacity Ratio} = \frac{\text{Actual hours worked}}{\text{Budgeted hours}} \times 100$$

$$= \frac{6{,}000 \text{ hours}}{880 \text{ units} \times 10 \text{ hours}} \times 100 = 68.18\%$$

## SALES VARIANCES

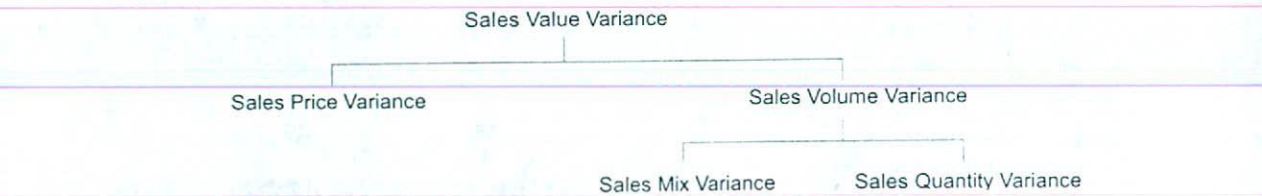
Sales variance is the difference between the actual value of sales achieved in a given period and budgeted value of sales. There are many reasons for the difference in actual sales and budgeted sales such as selling price, sales volume, sales mix. Sales variances can be calculated by using any one of the following two methods.

A. *Sales variance based on turnover*
B. *Sales variances based on margin (i.e. contribution margin of profit)*

The first approach, i.e. sales variance based on turnover, accounts for difference in actual sales and budgeted sales. The sales variances using margin approach accounts for differences in actual profit and budgeted profit. In the margin method it is assumed that cost of production is constant, i.e. no difference is assumed between actual cost of production and standard cost of production. The reason for this assumption is that cost variances are calculated separately to analyse the difference between actual cost and standard cost of production. Therefore, cost side of the sales variance is assumed constant under the margin method. Sales variances computed under these two methods show different amounts of variance.

The different sales variances under these two approaches and their formulae are given below:

### (A) Sales Variances Based on Turnover



(i) *Sales Value Variance*—Also known as sales variance, this variance shows the difference between actual sales value and budgeted sales value. The formula is

Sales value variance = (Actual value of sales – Budgeted value of sales)

Actual sales = Actual quantity sold × Actual selling price

Budgeted sales = Standard quantity × Standard selling price

or

Sales value variance = (Actual quantity × Actual selling price) – (Standard quantity × Standard selling price)

If actual sales are more than the budgeted sales, there is favourable variance and if actual sales less than the budgeted sales, unfavourable variance arises.

(ii) *Sales Price Variances*—This variance is due to the difference between actual selling price and standard or budgeted selling price. The formula is:

Sales price variance = (Actual selling price – Budgeted selling price) × Actual quantity

If actual selling price is less than the budgeted selling price, variance is unfavourable and if actual selling price is more than the budgeted selling price, there will be favourable sales price variance.

(iii) *Sales Volume Variance*—Sales volume variance arises when the actual quantity sold is different from the budgeted quantity. If actual sales quantity exceeds the budgeted sales quantity, there is a favourable sales volume variance and if actual quantity sold is less than the budgeted quantity, the variance is unfavourable. The formula is:

Sales volume variance = (Actual quantity – Budgeted quantity) × Budgeted selling price

Sales volume variance is divided into two variances:

(a) Sales mix variance (b) Sales quantity variance.

(a) Sales mix variance—Sales mix variance is one part of overall sales volume variance. This variance shows the difference between actual mix of goods sold and budgeted mix of goods sold. The formula is:

Sales Mix variance = (Actual mix of quantity sold – Actual quantity in standard proportion) × Standard selling price

Sales mix variance = (Budgeted Price per unit of actual mix – Budgeted price per unit of budgeted mix) × Total actual quantity

If actual mix of sales are more than the actual mix sales in standard or budgeted proportion, the variance is favourable and if actual mix sales are less than the standard mix (of actual sales), the variance is unfavourable. Similarly, if budgeted price per unit of actual mix is more than the budgeted price per unit of budgeted mix, favourable variance will arise. In the reverse situation, variance will be unfavourable.

(b) *Sales Quantity Variance*—This variance is also a part of overall volume variance. This variance shows the difference between total actual sales quantity and total budgeted sales quantity. If total actual quantity is more than the total budgeted quantity, variance will be favourable and if total actual quantity less than the total budgeted quantity, there will be unfavourable sales quantity variance. The formula is

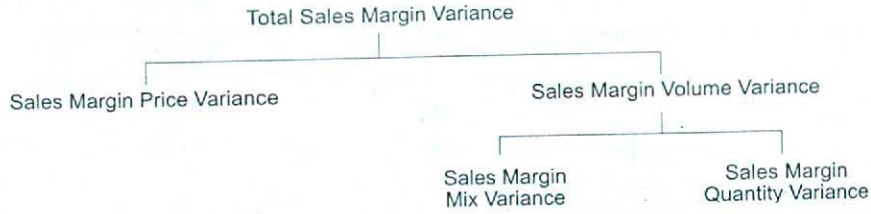
Sales quantity variance = (Total actual quantity – Total budgeted quantity) × Budgeted price per unit of budgeted mix

The total of sales mix variance and sales quantity variance will be equal to sales volume variance.

## (B) Sales Variance based on Margin (i.e. Contribution Margin or Profit)

As stated earlier, the sales variances using margin approach show the difference in actual profit and budgeted profit only, whereas sales variances based on turnover show the difference between total actual sales and total budgeted sales.

The following sales variances are calculated if margin or profit is the basis of calculation:




(i) *Total Sales Margin Variance*—This variance indicates the aggregate or total variance under the margin method. This variance shows the difference between actual profit and budgeted profit. The formula is:

Total sales margin variance = Actual profit – Budgeted profit

If actual profit is more than the budgeted profit, variance will be favourable and if actual profit less than the budgeted profit, unfavourable variance will arise.

(ii) *Sales Margin Price Variance*—This variance is one part of total sales margin variance and arises due to the difference between actual margin per unit and budgeted margin per unit. It is significant to note that, assuming cost of production being constant, the difference in the actual margin and budgeted margin will only be because of the difference between actual selling price and budgeted selling price. The formula for calculating sales margin price variance is:

Sales margin price variance = (Actual margin per unit – Budgeted margin per unit) × Actual quantity

If actual margin per unit is more than the budgeted margin per unit, favourable variance will be found and if actual margin less than the budgeted margin, variance will be unfavourable.

(iii) *Sales Margin Volume Variance*—This variance shows the difference between actual sales units and budgeted sales unit. The formula is:

Sales margin volume variance = (Actual quantity – Budgeted quantity) × Budgeted margin per unit

If actual sales units are more than budgeted sales units, variance will be favourable and if actual sales units less than the budgeted sales unit, unfavourable variance will arise.

Sales margin volume variance can be calculated using another formula which is:

Sales margin volume variance = (Standard profit on actual quantity of sales – Budgeted profit)

If standard profit exceeds budgeted profit, variance will be favourable and if standard profit is less than the budgeted profit, unfavourable variance will emerge.

Sales margin volume variance consists of (a) sales margin mix variance and (b) sales margin quantity variance.

(a) *Sales Margin Mix Variance*—This variance shows the difference between actual mix of goods sold and budgeted (standard) mix of goods sold. The formula is

Sales margin mix variance = (Actual sales mix – Standard proportion of actual sales mix) × Budgeted margin per unit

If budgeted margin per unit on actual sales mix is more than the budgeted margin per unit on budgeted mix, variance will be favourable. In the reverse situation, unfavourable variance will arise.

(b) *Sales Margin Quantity Variance*—This variance will be found when the total actual sales quantity in standard proportion is different from the total budgeted sales quantity. The formula is:

Sales margin quantity variance = (Actual sales in standard proportion – Budgeted sales) × Budgeted margin per unit on budgeted mix

If actual sales (in standard proportion) are more than the budgeted sales, variance will be favourable and if actual sales are less than the budgeted sales, unfavourable variance will arise.

***Example 18.36***

Compute the following variance from the data given below:

1. Total sales margin variance
2. Sales margin volume variance
3. Sales margin price variance
4. Sales margin quantity (sub-volume) variance.

| | *Budgeted Qty units* | *Actual Qty units* | *Budgeted sale price per unit Rs* | *Actual sale price per unit Rs* | *Standard cost per unit Rs* |
|---|---|---|---|---|---|
| X | 240 | 400 | 50 | 45 | 30 |
| Y | 160 | 200 | 25 | 20 | 15 |

*(CA Inter)*

*Solution*

| *Product* | *Budgeted sale price per unit Rs* | *Standard cost per unit Rs* | *Standard sales margin Rs* | *Budget qty* | *Budgeted profit Rs* | *Actual sales price Rs* | *Actual sales margin Rs* | *Actual sales qty* | *Actual profit Rs* |
|---|---|---|---|---|---|---|---|---|---|
| X | 50 | 30 | 20 | 240 | 4,800 | 45 | 15 | 400 | 6,000 |
| Y | 25 | 15 | 10 | 160 | 1,600 | 20 | 5 | 200 | 1,000 |
| | | | | | 6,400 | | | | 7,000 |

1. Total sales margin variance = Actual profit – Budgeted profit
   = Rs 7,000 – Rs 6,400
   = Rs 600 (F)
2. Sales margin volume variance = Budgeted margin per unit × (Actual quantity – Budgeted quantity)

| | | |
|---|---|---|
| X | = 20 × (400 – 240) | 3,200 (F) |
| Y | = 10 × (200 – 160) | 400 (F) |
| | | Rs 3,600 (F) |

3. Sales margin price variance = Actual quantity × (Actual margin per unit – Budgeted margin per unit)

| | | |
|---|---|---|
| X | = 400 × (15 – 20) per unit | 2,000 (A) |
| Y | = 200 × (5 – 10) per unit | 1,000 (A) |
| | | Rs 3,000 (A) |

4. Sales margin quantity (sub-volume) variance:
   Budgeted margin per unit of budgeted mix × (Actual quantity – Budgeted quantity)

$$\frac{6,400}{400} \times (600 - 400) = 16 \times 200 = \text{Rs } 3,200 \text{ (F)}$$

***Example 18.37***

From the following information about sales, calculate:

(a) Total Sales Variance
(b) Sales Price Variance
(c) Sales Volume Variance
(d) Sales Mix Variance
(e) Sales Quantity Variance

| | *Product nos.* | *Standard rate in Rs per unit* | *Rs* | *Product* | *Actual rate in Rs per unit* | *Rs* |
|---|---|---|---|---|---|---|
| A | 5,000 | 5 | 25,000 | 6,000 | 6 | 36,000 |
| B | 4,000 | 6 | 24,000 | 5,000 | 5 | 25,000 |
| C | 3,000 | 7 | 21,000 | 4,000 | 8 | 32,000 |
| | 12,000 | | 70,000 | 15,000 | | 93,000 |

*(ICWA Inter)*

*Solution:*

(a) Total sales variance:

Actual sales – Standard sales
Rs 93,000 – Rs 70,000 — Rs 23,000 (F)

(b) Sales price variance:

Actual quantity (Actual price – Standard price)
A: 6,000 (6 – 5) = 6,000 (F)
B: 5,000 (5 – 6) = 5,000 (A)
C: 4,000 (8 – 7) = 4,000 (F) — Rs 5,000 (F)

(c) Sales volume variance:

Standard price (Actual quantity – Standard quantity)
A: 5(6,000 – 5,000) = 5,000 (F)
B: 6(5,000 – 4,000) = 6,000 (F)
C: 7(4,000 – 3,000) = 7,000 (F) — Rs 18,000 (F)

(d) Sales mix variance:

(Actual mix – Revised sales mix) × SP per unit

| Revised mix | Rs | Actual mix | Rs | |
|---|---|---|---|---|
| A 6,250 @ Rs 5 | 31,250 | 6,000 | @ Rs 5 | 30,000 |
| B 5,000 @ Rs 6 | 30,000 | 5,000 | @ Rs 6 | 30,000 |
| C 3,750 @ Rs 7 | 26,250 | 4,000 | @ Rs 7 | 28,000 |
| 15,000 | 87,500 | 15,000 | | 88,000 |

Mix variance = 88,000 – 87,500 = Rs 500 (F)

(e) Sales quantity variance:
Standard unit sales price × (Actual quantity – Standard quantity)

$$\frac{70000}{12} = (15{,}000 - 12{,}000)$$

$$= \text{Rs } 17{,}500 \text{ (F)}$$

***Example 18.38***

The budgeted and the actual sales for a period in respect of three products are given below:

**Budgeted Figures**

| *Product* | *Quantity* | *Price* Rs | *Value* Rs |
|---|---|---|---|
| A | 1,000 | 5 | 5,000 |
| B | 750 | 10 | 7,500 |
| C | 500 | 15 | 7,500 |
| | 2,250 | | 20,000 |

**Actuals**

| *Product* | *Quantity* | *Price* Rs | *Value* Rs |
|---|---|---|---|
| A | 1,200 | 6 | 7,200 |
| B | 700 | 9 | 6,300 |
| C | 600 | 14 | 8,400 |
| | 2,500 | | 21,900 |

Calculate Sales Variances. *(CA Inter, Nov. 1998)*

*Solution*

*Basic Calculations*

| | *Budgeted* | | | *Actual* | | | *Standard Sales* |
|---|---|---|---|---|---|---|---|
| *Products* | *Qty.* | *Price* Rs | *Value* Rs | *Qty.* Rs | *Price* | *Value* Rs | *(Actual Qty. × Budgeted Price)* Rs |
| A | 1,000 | 5 | 5,000 | 1,200 | 6 | 7,200 | 6,000 |
| B | 750 | 10 | 7,500 | 700 | 9 | 6,300 | 7,000 |
| C | 500 | 15 | 7,500 | 600 | 14 | 8,400 | 9,000 |
| | 2,250 | | 20,000 | 2,500 | | 21,900 | 22,000 |

*Computation of Sales Variances*

1. Sales Value Variance = Budgeted Sales – Actual Sales
= Rs 20,000 – 21,900
= Rs 1,900 (F)

2. Sales Price Variance = Actual Quantity × (Std. Price – Actual Price)

| | | |
|---|---|---|
| A | = 1,200 × (5 – 6) | = Rs 1,200 (F) |
| B | = 700 × (10 – 9) | = Rs 700 (A) |
| C | = 600 × (15 – 14) | = Rs 600 (A) |
| | | Rs 100 (A) |

3. Sales Volume Variance = Std. Selling Price × (Budgeted Qty. – Actual Qty.)

| | | |
|---|---|---|
| A | = 5 × (1,000 – 1,200) | = Rs 1,000 (F) |
| B | = 10 × (750 – 700) | = Rs 500 (A) |
| C | = 15 × (500 – 600) | = Rs 1,500 (F) |
| | | Rs 2,000 (F) |

4. Sales Mix Variance = Std. Price × (Revised Std. Qty. – Actual Qty.)

A $= 5 \times \left(\frac{2,500}{2250} \times 1000 - 1,200\right)$

$= 5 \times \left(\frac{10}{9} \times 1,000 - 1,200\right)$ = Rs 444 (F)

B $= 10 \times \left(\frac{2,500}{2250} \times 750 - 700\right)$

$= 10 \times \left(\frac{7,500}{9} - 700\right)$ = Rs 1,333 (A)

C $= 15 \times \left(\frac{2,500}{2250}\right) \times 500 - 600$

$= 15 \times \left(\frac{5,000}{9} - 600\right)$ = Rs 667 (F)

222 (A)

5. Sales Qty. Variance = Std. Rate × (Budgeted Qty. – Revised Std. Qty.)

A $= 5 \times \left(1,000 - \frac{10,000}{9}\right)$ = Rs 556 (F)

B $= 10 \times \left(750 - \frac{7,500}{9}\right)$ = Rs 883 (F)

C $= 15 \times \left(500 - \frac{5,000}{9}\right)$ = Rs 833 (F)

Rs 2,222 (F)

***Example 18.39***

In a chemical manufacturing company production is carried on in batches. Details of standard input of materials, labour, overheads, etc. are as follows:

Standard input of materials per batch of 1,000 kg.

| | | |
|---|---|---|
| A | : | 60% of output @ Rs 15/kg. |
| B | : | 20% of input @ Rs 20/kg. |
| C | : | 20% of input @ Rs 25/kg. |
| Labour | : | 1,200 hrs. per batch @ Rs 10 per hour. |
| Variable Overhead | : | Rs 2 per kg. |
| Fixed Overhead | : | Rs 50,000 per month. |
| Selling Price | : | Rs 50 per kg. |
| Standard production per month | : | 10 batches. There is no processing loss. |

Actual details for November 1996 were as follows:

| | | | |
|---|---|---|---|
| Number of batches processed | : | 8 | |
| Materials consumed | X | 5,000 kg – Rs 76,000 | |
| | Y | 1,500 kg – Rs 30,000 | |
| | Z | 1,500 kg – Rs 48,000 | |
| Labour engaged for 9,800 hrs. Wages paid | | | Rs 95,000 |
| Variable Overhead | | | Rs 15,000 |
| Fixed Overhead | | | Rs 52,000 |

The output for the month was sold @ Rs 54 per kg.

*Required:*

(i) Budgeted Profit for November, 1996 and Actual Profit made.

(ii) Analysis of the Variance in Profit. *(ICWA Inter, Dec. 1996)*

*Solution*

**(i) Computation of Budgeted Profit**

| | | | | Rs |
|---|---|---|---|---|
| Cost per batch (1,000 kg.) | | | | |
| Materials: Input 1,000 kg | A | 600 kg @ Rs 15 = | 9,000 | |
| | B | 200 kg @ Rs 20 = | 4,000 | |
| | C | 200 kg @ Rs 25 = | 5,000 | 18,000 |
| Labour: 1,200 hours @ Rs 10 | | | | 12,000 |
| Variable Overhead @ Rs 2 per kg | | | | 2,000 |
| Fixed Overhead (Rs 50,000 for 10 batches) | | | | 5,000 |
| | | | | 37,000 |

| | |
|---|---|
| Standard Cost per kg of put | = Rs 37 |
| Selling Price | = 50 |
| Profit per kg as per standard | = 13 |
| Budgeted Profit per month | = 10 × 1,000 kg × Rs 13 = Rs 1,30,000 |

**Computation of Actual Profit for the Month**

| | | | | |
|---|---|---|---|---|
| No. of batches processed | = 8 | | | |
| Materials consumed: | A | 5,000 kg | 76,000 | |
| | B | 1,500 kg | 30,000 | |
| | C | 1,500 kg | 48,000 | 1,54,000 |
| Direct Labour for (wages paid for 9,800 hours) | | | | 95,000 |
| Variation overhead | | | | 15,000 |
| Fixed Overhead | | | | 52,000 |
| | Total Cost | | | 3,16,000 |
| Total Sale Value of 8,000 kg @ Rs 54 | | | | 4,32,000 |
| | Actual Profit | | | 1,16,000 |

Variance in Profit = Rs 1,30,000 – 1,16,000 = Rs 14,000 (A)

(ii) *Variance Analysis*

Material Price Variance = Actual Qty. × (SR – AR)

$$A = \left(5{,}000 \times \text{Rs } 15 - \frac{76{,}000}{5{,}000}\right) = 1{,}000 \text{ (A)}$$

$$B = \left(1{,}5000 \times \text{Rs } 20 - \frac{30{,}000}{1{,}500}\right) = \text{Nil}$$

$$C = \left(1{,}500 \times \text{Rs } 25 - \frac{48{,}000}{1{,}500}\right) = 10{,}500 \text{ (A)}$$

11,500 (Adverse)

Material Usage Variance = SR × (Std. Qty for Actual Output – Actual Qty)

A = Rs 15 × (8 × 600 = 5,000 kg) = 3,000 (A)

B = Rs 20 × (8 × 200 – 1,500 kg) = 2,000 (F)

C = Rs 25 × (8 × 200 – 1,500 kg) = 2,500 (F)

1,500 (F)

Labour Rate Variance = Actual Time × (SR – AR)

$$= 9{,}800 \times \left(10 - \frac{95{,}000}{9{,}800}\right)$$

= Rs 3,000 (F)

Labour Efficiency Variance = SR – (Std. Time for actual output – Actual Time)

= 10 × (1,200 × 8 – 9,800 hrs.)

= 10 × (9,600 hrs. – 9,800 hrs.)

= Rs 2,000 (A)

| | | | |
|---|---|---|---|
| Variable Overhead Variance | = Recovered Overheads – Actual Overheads | | |
| | = (8,000 kg × Rs 2 – Rs 15,000) | = | 1,000 (F) |
| Fixed Overhead Expenditure Variance | = Budgeted Overheads – Actual Overheads | | |
| | = Rs 50,000 – Rs 52,000 | = | 2,000 (A) |
| Fixed Overhead Volume Variance | = (40,000 – 50,000) | = | 10,000 (A) |
| Sale Price Variance | = 8,000 × (Rs 50 – Rs 54) | = | 32,000 (F) |
| Sales Volume Variance (for profit) | = Std. Rate × (Budgeted Qty – Actual Qty) | | |
| | = 13 × (10,000 – 8,000) | = | 26,000 (A) |

**Summary of Variances**

| *Adverse* | *Rs.* | *Favourable* | *Rs* |
|---|---|---|---|
| Material Price | 11,500 | Material Usage | 1,500 |
| Labour Efficiency | 2,000 | Labour Rate | 3,000 |
| Fixed Overhead Expenditure | 2,000 | Variable Overhead | 1,000 |
| Fixed Overhead Volume | 10,000 | Sales Price | 32,000 |
| Sales Volume (for Profit) | 26,000 | | |
| | 51,500 | | 37,500 |

Net Profit Variance Rs 14,000 (A). Thus, it has got reconciled.

### Revision Variance

When a budget is revised, but where, as a matter of policy the change is not incorporated in the standard cost rate, a variance will arise termed as a Revision Variance. Revision variance is the difference between the basic standard cost and the revised standard cost.

## DISPOSITION OF VARIANCE

Variance may be disposed off in either of the following ways:

1. Inventories and the cost of goods sold may be adjusted to reflect the actual costs.
2. Variances may be transferred to the profit and loss account.

Under the first method, all variances are allocated between the inventory accounts and cost of goods sold account. This method, in fact, converts the accounts balances from standard costs to actual historical costs.

The following arguments are given in support of this method:

1. Only actual costs should be recorded in the cost of goods sold account and inventory accounts. The supporters of this method do not favour standard costs as true costs or costs suitable for use in the profit and loss account but as merely guides in factory management.
2. Variances from the standard are costs and not losses and therefore should be reflected in the inventory valuations and cost of goods sold.
3. If the variances are large, standard costs do not represent the actual costs and therefore are not good measures to determine the costs of goods sold and inventory.

Under the second method, the variances are considered as profit or loss items in the period in which they occurred. The work-in-process, finished goods inventory, and cost of goods sold are stated at standard costs. Unfavourable cost variances are deducted from the gross profit at standard costs. Favourable cost variances are added to the gross profit calculated at standard cost. The treatment of the cost variances under this method is shown on the income statement given below.

**ABC Company**
**Income Statement for the Year Ending December 31, 2002**

| | Rs | Rs |
|---|---|---|
| Sales revenue | | 5,00,000 |
| Cost of sales (standard) | 3,00,000 | |
| Selling and administrative expenses (standard) | 1,50,000 | 4,50,000 |
| Net Income (standard) | | 50,000 |
| Deduct unfavourable variance from net income: | | |
| Material price | 200 | |
| Material usage | 800 | |
| Labour efficiency | 900 | |
| Overhead: | | |
| Volume | 2,000 | |
| Budget | 1,100 | 5,000 |
| Net income (actual) | | 45,000 |

The second method has the following arguments in its favour:

1. Standard costs help in the preparation of statements at the early date; actual cost delays the determination of inventory costs and cost of goods sold.
2. Standard costs avoid the inclusion of costs due to wastage, losses, inefficiencies, excessive overheads from low production volume. Standard cost represent normal costs and therefore inventory figures are conservative and acceptable for income determination and other purposes.
3. In a multi-product company, it may be difficult to determine accurately how much variance should be distributed to each product.
4. In taking corrective action managers may find it more useful when variance are depicted in the profit and loss account. Managerial attention is usually hampered when variances are combined with cost of goods manufactured.

It is difficult to suggest which method should be followed in accounting for variances. If the variances are large and significant, the first method, i.e., distribution of variances to the respective accounts appears to be appropriate for financial reporting, tax and job and contract pricing purposes. The second method may be preferable when the variances are insignificant. Thus, the treatment of variances depends on many factors such as (i) size of variance, (ii) accuracy of standard costs, (iii) cause of variances such as incorrect standard costs, (iv) timing of variances, e.g. caused by seasonal fluctuation, (v) type of variance–material, labour, and overhead.

## MANAGERIAL USES OF VARIANCES

Determination of variances is only the first step in the process of standard cost variance analysis. Mere computation of material, labour and overhead variances is useless for cost control and performance

evaluation. The final objective of variance analysis is to determine the person(s) responsible for each variance and to pinpoint the cause(s) for incurrence of these variances. That is, before management can take effective action for improving control over costs, it needs to know not only the amount of variances, but also where the variances originated, who was responsible for them, and what caused them to arise.

## Analysis of Variances by Responsibilities

Variances must be identified with the manager responsible for the costs incurred who should be held responsible for that cost. The cost factors which are directly controllable by operating supervision must be separated from those costs factors from which executive management is responsible.

Specific titles of individuals who are responsible for each type of variance differ among business enterprises. Generally speaking, the following personnel are held accountable for variances noted against them:

**Responsibility for Cost Variances**

| *Variance* | *Personnel Responsible* |
|---|---|
| (i) Materials price variance | Purchasing agent or purchasing manager. |
| (ii) Materials quantity variance | Plant superintendent, departmental supervisors, machine operators, quality control department and material handlers. |
| (iii) Labour rate standard | Personnel (employment) department manager, departmental supervisor and plant superintendent. |
| (iv) Labour efficiency variance | Plant superintendent, departmental supervisors, production scheduling department, quality control department, material handlers and machine operators. |
| (v) Overhead expenditure variance | Variable portion is the responsibility of the individual foreman or supervisor, they are expected to keep actual expenses within the budget. Fixed portion is the responsibility of top management. |
| (vi) Overhead efficiency variance | Same personnel who are responsible for labour efficiency variance. |
| (vii) Overhead volume variance | Top management and production schedulers. |

## Analysis of Variances by Causes

Reasons for the variance should be determined and plans for necessary corrective action made either by discussing possible causes with the supervisors or by examining underlying data and records. The analysis of variances by causes is therefore an important aspect of the use of standard costs to attain effective cost control. For any standard cost variance, there are many possible causes. The following list is not all inclusive but does indicate causes responsible for variances.

## Possible Causes of Standard Cost Variances

### *Materials Price Variance*

1. Recent changes in purchase price of materials.

2. Failure to purchase anticipated quantities when standards were established resulting in higher prices owing to non-availability of quantity purchase discounts.
3. Not taking cash discounts anticipated at the time of setting standards resulting in higher prices.
4. Substituting raw material differing from original materials specifications.
5. Freight cost changes and changes in purchasing and storekeeping costs if these are debited to the materials cost.

### *Materials Quantity Variance*

1. Poor materials handling.
2. Inferior workmanship by machine operator.
3. Faulty equipment.
4. Cheaper, defective raw material causing excessive scrap.
5. Inferior quantity control inspection.
6. Pilferage.
7. Wastage due to inefficient production method.

### *Labour Rate Variance*

1. Recent labour rate changes within industry.
2. Employing a man of a grade different from the one laid down in the standard.
3. Labour strike leading to utilisation of unskilled help.
4. Labour layoff causing skilled labour to be retained at higher rates, so as to prevent resignations and job switching.
5. Employee sickness and vacation time.
6. Paying a higher overtime allowance than provided for in the standard.

### *Labour Efficiency Variance*

1. Machine breakdown, use of defective machinery and equipment.
2. Inferior raw materials.
3. Poor supervision.
4. Lack of timely material handling.
5. Poor employee performance.
6. Inefficient production scheduling—delays in routing work, materials, tools and instructions.
7. Inferior engineering specifications.
8. New inexperienced employees.
9. Insufficient training of workers.
10. Poor working conditions—inadequate or excessive heating, lighting, ventilation, etc.

### *Overhead Volume Variance*

(Factors causing either idle time or overtime of plant and facilities)

1. Failure to utilise normal capacity.
2. Lack of sales order
3. Too much idle capacity
4. Inefficient or efficient utilisation of existing capacity
5. Machine breakdown

6. Defective materials
7. Labour troubles
8. Power failures.

### Overhead Efficiency Variance

These included all causes which are listed under labour efficiency variance.

#### *Analysis of Variances by Products*

Since management usually wants current true costs when decisions are to be made with respect to pricing and related questions, variances are often analysed by products in order to arrive at current product costs. Companies producing non-standard goods according to customer's specifications may also help analyse variances by job orders. The analysis of variances by causes is useful in deciding whether or not cost variances should be allocated to products in arriving at product costs for pricing. Standard product costs should be reviewed periodically and revised when it is found that the standard product costs in use are no longer useful for the purpose.

#### *Variance Reports to Management*

Variance reports basically aim to inform managers responsible for the operation when actual performance differs from the standards. To be effective, the report must be timely, accurate and clearly understood by the recipients.

Control of production and costs is a matter of timing; the effectiveness of the control is often in direct proportion to the speed with which variances are reported. Timely reporting often requires daily and weekly reporting of performance information. Therefore, it is important to focus managerial attention on off-standard conditions immediately following each shift, day or week, rather than to accumulate and summarise variances from standards each month. A month, and generally even a week, is too long a period for many off-standard conditions to remain unchecked and uncorrected, because the time interval may prevent positive identification of employees who are responsible for the unsatisfactory work.

Variance analysis reports are primarily control reports. In developing and reporting the variances, it should be remembered that the results must (i) deal with relevant distinctions, (ii) be understandable, (iii) measure with reasonable accuracy what they are supposed to measure, (iv) be presented and explained concisely, (v) be timely, and (vi) provide the amount of details needed by different persons at each level of management.

## LIMITATIONS OF STANDARD COSTING

Standard costs are not without their shortcomings. The first limitation is regarding the predetermined nature of standard costs. The accuracy of standard costs is limited by the knowledge and skill of the people who created them and they contain the prejudices of their makes. Such badly conceived standard costs do not enjoy the confidence of the users of the system.

Secondly, it is difficult to select a type of standard (ideal, currently attainable, normal, etc.) which can help in cost control and achieve other managerial purposes. If standards are too low, they defeat the objective of standard costing and bring the operating efficiency down. If they are too high, they can create ill-will and encourage employees to beat the system by fair means or foul.

Thirdly, a good programme of standard costing requires that both management and operating personnel should have full confidence in it and standards should be fair and workable. Educating employees is necessary in this regard. However, lack of acceptability, education and communication is a major difficulty in operating a standard costing system.

In spite of the above limitations, standard costing has developed into an extraordinary and very useful tool and has contributed much in providing different kinds of cost data for so many different purposes.

## THEORY QUESTIONS

1. Define and explain the concepts of standard cost and standard costing. *(B. Com. (Hons), Delhi, 2000)*
2. Discuss briefly the use of standard costs in the following management activities: cost reductions, operating performance, evaluation, product pricing decisions and providing incentives.
3. Compare and contrast the usefulness of ideal standards, basic standards, and currently attainable standards.
4. "Standard costs are bases for a proper managerial control of manufacturing operation." Define standard cost and explain the above statement. *(B. Com. (Hons), Delhi)*
5. What is standard costing and how would you distinguish it from budgetary control?
6. What are the points of similarity and difference between budgeted and standard costs.
7. "Variance analysis is an integral part of standard cost accounting." Explain this statement.
8. By purchasing low-grade materials, a company reports favourable material price variance, but it consistently experiences unfavourable material quantity variances. What relationship may exist between these conditions? Is the price variances really favourable?
9. What are the shortcomings of historical costs for managerial uses?
10. What is the difference between an estimated cost and a standard cost?
11. Describe briefly how standard costs are set for (a) material (b) labour.
12. Briefly explain the meaning of each of the following variances: material prices, material usage, labour efficiency, and labour rate.
13. Discuss some of the problems that might be created by standards which are set too high and by standards which are too loose.
14. What are the advantages and limitations of standard costing? *(B. Com. (Hons), Delhi)*
15. Discuss briefly some of the limitations of standard costs.
16. Explain why overhead variances are generally treated as period costs.
17. Discuss the information which a well-designed cost report should give to management from the point of view of production and control. How should such information be given?
18. What is a "two variance analysis" of factory overheads. Give a brief description. *(B. Com. (Hons), Delhi)*
19. Explain the term 'variance' and distinguish between controllable and uncontrollable variances. *(B. Com. (Hons), Delhi 2000)*
20. Describe briefly the managerial use of variances. *(B. Com. (Hons), Delhi 2001)*

## SELF-EVALUATION QUESTIONS

Choose the correct answer for the following multiple-choice questions.

1. The difference between the standard hours for the actual output and actual hours is

(a) Labour rate variance.
(b) Overhead cost variance.
(c) Labour efficiency variance.
(d) Overhead volume variance.

2. Cost variance include all but one of the following
   (a) Direct material variance.
   (b) Direct labour variance.
   (c) Variable overhead variance.
   (d) Sales variance.
3. A standard cost system may be used in
   (a) Either job order costing or process costing.
   (b) Job order costing but not process costing.
   (c) Process costing but not job order costing.
   (d) Neither process costing nor job costing.
4. If actual hours worked exceed the standard hours allowed what type of variance will occur
   (a) Favourable labour usage (efficiency) variance.
   (b) Favourable labour rate variance.
   (c) Unfavourable labour usage (efficiency) variance.
   (d) Unfavourable labour rate variance.
5. An unfavourable materials price variances occurs because of
   (a) Price increases in raw materials.
   (b) Price decreases in raw materials.
   (c) Less than anticipated normal wastage in the manufacturing process.
   (d) More than anticipated normal wastage in the manufacturing process.
6. Which of the following is a purpose of standard costing?
   (a) Determine a break even production level.
   (b) Control costs.
   (c) Allocate cost with more accuracy.
   (d) Eliminate the need for subjective decisions by management.
7. When calculating variances from standard costs, the difference between actual and standard price multiplied by actual quantity gives a
   (a) Total price and quantity variance.
   (b) Price variance.
   (c) Volume variance.
   (d) Mix variance.
8. If a company follows a practice of isolating variances at the earliest point in time, what would be the appropriate time to isolate and calculate a material price variance?
   (a) When material is issued.
   (b) When material is purchased.
   (c) When material is used in production.
   (d) When purchased order is originated.
9. In a standard cost system the materials price variance is obtained by multiplying the
   (a) Actual price by the difference between actual quantity purchased and standard quantity used.
   (b) Actual quantity purchased by the difference between actual price and standard price.
   (c) Standard price by the difference between standard quantity purchased and standard quantity used.
   (d) Standard quantity purchased by the difference between actual price and standard price.
10. How is a labour rate variance computed?
    (a) Difference between standard and actual rate multiplied by standard hours.

(b) Difference between standard and actual hours multiplied by actual rate.
(c) Difference between standard and actual rate multiplied by actual hours.
(d) Difference between standard and actual hours multiplied by the difference between standard and actual rate.

11. Materials usage variances are normally chargeable to which department?
(a) Production (b) Purchasing
(c) Finished goods (d) Materials storage

## PROBLEMS

1. The standard quantity and standard price of raw material required for one unit of Product A are given as follows:

| | *Quantity* | *Selling price* |
|---|---|---|
| Material X | 2 kg | Rs 3 per kg |
| Material Y | 4 kg | Rs 2 per kg |
| | 6 kg | |

The actual production and relevant data are as follows:
Output 500 units of Product A

| *Material* | *Total quantity for 500 units* | *Total cost (Rs)* |
|---|---|---|
| X | 1,100 kg | 3,410 |
| Y | 1,800 kg | 3,960 |

*Calculate the variances.*

*Ans:* Material cost variance Rs 370(A): usage variance Rs 100(F);
Material price variance Rs 470 (A)

2. From the data given below, calculate the materials price variance, the materials usage variance and materials mix variance. Consumption per 100 units of product:

| *Raw material* | *Standard* | *Actual* |
|---|---|---|
| A | 40 units @ Rs 50 per unit | 50 units @ Rs 50 per unit |
| B | 60 units @ Rs 40 per unit | 60 units @ Rs 45 per unit |

*(ICWA Inter)*

*Ans:* Material price variance Rs 300(A); Mix variance Rs 60(A); Usage variance Rs 500(A)

3. XY Ltd., manufacturers of Product P, uses a standard cost system. Standard product and cost specifications for 1,000 kg of Product P are as follows:

| *Ingredients* | *Quantity (kg)* | *Price Rs per kg* | *Cost* |
|---|---|---|---|
| A | 800 | 2.50 | 2,000 |
| B | 200 | 4.00 | 800 |
| C | 200 | 1.00 | 200 |
| Input | 1,200 | | 3,000 = Rs 2.50 per kg |
| Output | 1,000 | | 3,000 = Rs 3.00 per kg |

| Material records indicate: | Consumption in January |
|---|---|
| A | 1,57,000 kg @ Rs 2.40 |
| B | 38,000 kg @ Rs 4.20 |
| C | 36,000 kg @ Rs 1.10 |

Actual finished production for the month of January is 2,00,000 kg calculate:

1. Materials price variance
2. Materials mix variance
3. Materials yield variance *(ICWA Inter)*

*Ans:* Rs 4,500 (F); Rs 3,000 (A); Rs 22,500 (F).

4. The following standard and actual data is given about a product.

| | | *Standard* | | | *Actual* | |
|---|---|---|---|---|---|---|
| *Material* | *Qty* | *Price* | *Total* | *Qty* | *Price* | *Total* |
| A | 500 | 6 | 3,000 | 400 | 6 | 2,400 |
| B | 400 | 3.75 | 1,500 | 500 | 3,60 | 1,800 |
| C | 300 | 3.00 | 900 | 400 | 2.80 | 1.120 |
| | 1,200 | | | 1,300 | | |
| *Less:* | | | | Actual loss 220 | | |
| 10% loss | 120 | | | | | |
| | 1,080 | | 5,400 | 1,080 | | Rs 5,320 |

Calculate: (i) Material cost variance
(ii) Materials price variance
(iii) Materials mix variance
(iv) Materials yield variance
(v) Total material usage variance.

*Ans:* (i) Rs 80 (A) (ii) Rs 155 (F) (iii) Rs 375 (F) (iv) Rs 450 (A) (v) Rs 75 (A).

5. The standard cost of a certain chemical mixture is:
   40% Material A at Rs 200 per tonne
   60% Material B at Rs 300 per tonne
   A standard loss of 10% is expected in production. During a period materials used are:
   90 tonnes Material A at the cost of Rs 180 per tonne.
   110 tonnes Material B at the cost of Rs 340 per tonne.
   The weight produced is 182 tonnes of good production.
   *Calculate and present:*
   (i) Materials price variance
   (ii) Materials usage variance
   (iii) Materials mix variance
   (iv) Materials yield variance

*Ans:* (i) Rs 2600 (A) (ii) Rs 1577.77 (F) (iii) Rs 1000 (F) (iv) Rs 577.77 (F)

6. Mixers Ltd., is engaged in producing a 'standard mix' using 60 kg of chemical X and 40 kg of chemical Y. The standard loss of production is 30%. The standard price of X is Rs 5 per kg and of Y is Rs 10 per kg.
   The actual mixture and yield were as follows:
   X 80 kg @ Rs 4.50 per kg and
   Y 70 kg @ Rs 8.00 per kg
   Actual yield 115 kg *(B. Com. (Hons), Delhi)*
   Calculate material variances

*Ans:* Material cost variance Rs 230 (F)
Material price variance Rs 180 (F)
Material usage variance Rs 50 (F)
Material mix variance Rs 50 (A)

7. Information on Greatsky Company's direct materials cost is as follows:

| | |
|---|---|
| Standard price per materials unit | Rs 3.60 |
| Actual quantity used | 1,600 units |
| Standard quantity allowed for production | 1,450 units |
| Materials price variance | Rs 240 (Favourable) |

What was the actual purchase price per unit.

*Ans:* Rs 3.45

8. The standard cost of a certain chemical mixture is: 40% material A @ Rs 20 per tonne; 60% material B @ Rs 3000 per tonne. A standard loss of 10% is expected in production. During a period of one month 90 tonnes of material A @ Rs 1800 per tonne and 100 tonnes of material B @ 3400 per tonne were used to produce 182 tonnes of good production. Calculate the (a) materials price variance (b) materials mix variance, and (c) materials yield variance. *(ICWA Inter)*

*Ans:* (a) Rs 2600 (A); (b) Rs 10000 (F); (c) Rs 578 (F)

9. (a) The standard set for material consumption was 100 kg @ Rs 2.25 per kg

In a cost period:

| | | |
|---|---|---|
| Opening stocks was | 100 | kg @ Rs 2.25 per kg |
| Purchase made | 500 | kg @ Rs 2.15 per kg |
| Consumption | 110 | kg |

*Calculate:*

(a) Usage variance.

(b) Price variance: (i) when variance is calculated at point of purchase; (ii) when variance is calculated at point of issue on FIFO basis; (iii) when variance is calculated at point of issue on LIFO basis.

(c) What is the effect on closing stock valuation when materials are charged out to cost on basis (ii) and (iii) above? *(ICWA Inter)*

*Ans:* (a) Usage variance Rs 22.50 (A)

(b) (i) Rs 50 (F) (ii) Re 1 (F) (iii) Rs 11 (F)

10. From the data given below, calculate labour variances for the two departments:

| | *Deptt. A* | *Deptt. B* |
|---|---|---|
| Actual gross wages (Direct) | Rs 2,000 | Rs 1,800 |
| Standard hours produced | 8,000 | 6,000 |
| Standard rate per hour | Rs 30 | Rs 35 |
| Actual hours worked | 8,200 | 5,800 |

*(ICWA Inter)*

11. The details regarding composition and the weekly wage rates of labour force engaged on a job scheduled to be completed in 30 hours are as follows:

| *Category of workers* | *No. of labourers* | *Standard hourly wage rate* | *Actual no. of labourers* | *Hourly wage rate* |
|---|---|---|---|---|
| Skilled | 75 | 60 | 70 | 70 |
| Semi-skilled | 45 | 40 | 30 | 50 |
| Unskilled | 60 | 30 | 80 | 20 |

The work is actually completed in 32 hours. Calculate the various labour variances.

*Ans:* Labour cost variance, Rs 13,000 (A), Rate variance Rs 6,400 (A), Labour efficiency 6,600 (A), Mix variance Rs 9,600 (F), Labour sub efficiency Rs 16,200 (A).

12. A chemical company gives you the following standard and actual data of its Chemical No. 1456. You are required to calculate variances.

| *(kg)* | *Standard data (Rs)* | *Total (Rs)* | *Actual data* | | *Total (Rs)* |
|---|---|---|---|---|---|
| 450 | of Material A @ 20 per kg | 9,000 | 450 kg @ 19 per kg | 8,550 | |
| 360 | of Material B @ 10 per kg | 3,600 | 360 kg @ 11 per kg | 3,960 | 12,510 |
| 810 | | 12,600 | 810 | | |
| | 2,400 skilled hours | 4,8000 | 2,400 hrs @ 25 | | |
| | @ Rs 20 per hour | | 5,400 | 60,000 | |
| | 1,200 unskilled hours | 1,2000 | 1,200 hrs @ 15 | 18,000 | |
| | @ Re 10 per hour | 6,0000 | 1,500 | | 78,000 |
| 90 | Normal loss | | 50 kg Actual loss | | |
| 720 | | 72600 | 760 kg | | 90,510 |

13. The following data is supplied to you:

| *Input* | *Material* | *Rs per kg* | *Standard Rs* | *Total Rs* | *Input kg* | *Rs per kg* | *Actual Rs* | *Total (Rs)* |
|---|---|---|---|---|---|---|---|---|
| 400 | A | 50 | 20,000 | | 420 | 45 | 18,000 | |
| 200 | B | 20 | 4,000 | | 240 | 25 | 6,000 | |
| 100 | C | 15 | 1,500 | 25,500 | 90 | 15 | 1,350 | 26,250 |
| 700 | | | | | 750 | | | |
| | Labour | | | | | | | |
| | 100 man hours @ Rs 20 per hr | | 2000 | | 120 hr @ Rs 25 per hr | | 3000 | |
| | 200 women hr @ Rs 15 per hr | | 3000 | 5000 | 240 hr @ Rs 16 per hr | | 3840 | 6840 |
| 25 kg Normal loss | | | | | 75 kg Actual loss | | | |
| 675 kg | | | | 30,500 | 675 kg | | | 33,090 |

From the above information calculate variances.

14. Calculate standard labour time for machine part No. 2235 from the following data:

| | |
|---|---|
| Standard batch size | 100 pieces |
| Set-up time | 64 minutes |
| Operating time (each piece): | |
| Fixing job on machine | = 2 minutes |
| Cutting time | = 10 minutes |
| Removing job from machine | = 3 minutes |

Allow 10% on total operation time for inspection during process and allow further 5% on total time for fatigue. *(ICWA Inter)*

*Ans:* Standard time for 100 pieces 1800 minutes.

15. Vinak Ltd. has furnished you the following information for the month of August, 2002:

| | Budget | Actual |
|---|---|---|
| Output (Units) | 30,000 | 32,500 |
| Hours | 30,000 | 33,000 |
| Fixed overhead | Rs 45,000 | 50,000 |

| | | |
|---|---|---|
| Variable overhead | Rs 60,000 | 68,000 |
| Working days | 25 | 26 |

Calculate the variances.

*(ICWA Inter (NS), CA Inter (NS))*

*Ans:* Total overhead cost variance Rs 4,250 (A)
Variable overhead cost variance Rs 3,000 (A)
Fixed overhead cost variance Rs 1,250 (A)
Expenditure variance Rs 1,250 (A)
Volume variance Rs 3,750 (F)
Efficiency variance Rs 750 (A)
Capacity variance Rs 4,500 (F)
Calender variance Rs 1,800 (F)

16. (a) The following figures are extracted from the books of a company: Budgeted overhead Rs 10,000 (Fixed Rs 6,000; Variable Rs 4,000)

| | |
|---|---|
| Budgeted hours | 2,000 |
| Actual overhead | 10,400 (fixed Rs 6,100; variable Rs 4,300) |

Actual hours Rs 2100
Compute the overhead variances.

*Ans:* Overhead cost Rs 100 (F), Variable overhead 100 (A), Fixed overhead Rs 200 (F)

17. Pioneer Plastics Limited operates a budgetary control and standard costing system. From the following data calculate:
    (i) Sales variance
    (ii) Sales volume variance
    (iii) Sales price variance

| | *Budget* | | | | *Actual* | |
|---|---|---|---|---|---|---|
| *Product* | *Std. selling price per unit* | *Std. cost price per unit* | *Units to be sold* | *Sales value* | *Units sold* | *Sales volume* |
| A | 10.00 | 12.00 | 100 | Rs 1,200 | 100 | 1,100 |
| B | 9.40 | 12.00 | 50 | 600 | 50 | 600 |
| C | 7.50 | 9.00 | 100 | 900 | 200 | 1,700 |
| D | 4.00 | 6.00 | 75 | 450 | 50 | 300 |
| Total | — | — | 325 | 3,150 | 400 | 3,700 |

*Ans:* Sales value variance Rs 550 (F), Sales price variance Rs 200 (A), Sales volume variance Rs 750 (F).

18. The budgeted sales for one month and the actual results achieved are as under:

| *Product* | *Budget* | | | *Actual* | | |
|---|---|---|---|---|---|---|
| | *Quantity Nos* | *rate Rs* | *Amount Rs* | *Quantity Nos* | *rate Rs* | *Amount Rs* |
| A | 1,000 | 100 | 1,00,000 | 1,200 | 125 | 1,50,000 |
| B | 700 | 200 | 1,40,000 | 800 | 150 | 1,20,000 |
| C | 500 | 300 | 1,50,000 | 600 | 300 | 1,80,000 |
| D | 300 | 500 | 1,50,000 | 400 | 600 | 2,40,000 |
| | 2,500 | | 5,40,000 | 3,000 | | 6,90,000 |

Calculate in respect of each product, the sales variances.

*Ans:* Sales value Rs 1,50,000 (F); Sales price Rs 30,000 (F); Sales volume Rs 1,20,000 (F).

19. From the following data calculate the various sales variances:

| *Product* | *Standard qty (units)* | *Standard price per unit (Rs)* | *Total (Rs)* | *Units* | *Actual sale price (Rs)* | *Total (Rs)* |
|---|---|---|---|---|---|---|
| A | 1,600 | 24.00 | 38,400 | 2,400 | 20.00 | 48,000 |
| B | 1,400 | 18.00 | 25,200 | 1,400 | 18.00 | 25,200 |
| C | 600 | 12.00 | 7,200 | 750 | 14.00 | 10,500 |
| D | 400 | 15.00 | 6,000 | 450 | 14.00 | 6,300 |
| | 4,000 | | 76,800 | 5,000 | | 90,000 |

20. PH Ltd. furnishes the following information relating to budgeted sales and actual sales for April 2002.

| | *Product* | *Sales quantity (units)* | *Selling price per unit (Rs)* |
|---|---|---|---|
| Budgeted sales | A | 1,200 | 15 |
| | B | 800 | 20 |
| | C | 2,000 | 40 |
| Actual sales | A | 880 | 18 |
| | B | 880 | 20 |
| | C | 2,640 | 38 |

Calculate the following variances:

(i) Sales quantity variance
(ii) Sales mix variance
(iii) Sales price variance
(iv) Total sales variances *(CA Inter)*

*Ans:* Rs 22,400 (F); Rs 11,000 (F); (Rs 2640 (A), Rs 19,760 (F)

21. Narang Ltd., produces two commodities, Good and Better, in one of its departments. Each unit takes 5 hrs and 10 hrs as production time, respectively. 1,000 units of Good and 600 units of Better were produced during March 2002. Actual man-hours spent in this production were 10,000. Yearly budgeted hours are 96,000. Compute the various control ratios.

*Ans:* Capacity ratio 1.25
Efficiency ratio 1.10
Activity ratio 1.8

22. ABC Ltd. manufactures two products A and B. Product A takes 6 hours to make while product B take 12 hours. In a month of 25 days of 8 hours each, 1,200 units of A and 750 units of B were produced. The firm employs 75 men in the department responsible for producing these two products. The budgeted hours are 1,86,000 per annum. You are required to calculate activity ratio, capacity ratio and efficiency ratio.

*Ans:* Activity ratio 104.5%
Capacity utilisation ratio 96.8%
Efficiency ratio 108%

23. From the following data, calculate activity ratio. A factory manufactures two products A and B. Standard time to manufacture product A is 2 hours and product B 10 hours. The budgeted and actual production in December 2002 were as follows:

| | *Budgeted production* | *Actual production* |
|---|---|---|
| Product A | 125 units | 100 units |
| Product B | 30 units | 24 units |

Total hours worked were 660

*Ans:* Activity ratio 80%

19

# Budgeting

## CONCEPT OF BUDGETING

One of the primary objectives of cost accounting is to provide information to business managements for planning and control. Budgeting acts as tool of both planning and control. Budgeting is a formal process of financial planning using estimated financial and accounting data. The Institute of Cost and Management. Accountants (UK) defines a budget as "a financial and/or quantitative statement, prepared and approved prior to a defined period of time, of the policy to be pursued during that period for the purpose of attaining a given objective. It may include income, expenditure and the employment of capital."

### Budgeting and Forecasting

Sometimes the terms "budgeting" and "forecasting" are used interchangeably. Both terms have some similarities, for example, both relate to furture events and involve prediction of something. The basic difference between budgeting and forecasting lies in degree of sophistication involved in the predictions used by them. According to the National Association of Accountants (USA), "forecasting is a process of predicting or estimating a future happening". Forecasting is an essential part of the budgeting process. Forecasting is estimating future events and their effects on the budget. Forecasting comes to an end after mere estimating. Budgeting is a process of preparing budgets and further control aspects are involved in its procedure. Besides, forecasting can be made by a firm for purposes other than budgeting, such as a forecast of general business conditions. Such forecasts are sometimes not used in budgeting.

Thus, budgeting is not merely forecasting of a particular event. It is not simply an estimation or prediction; it is a plan. In simple terms, budgeting is an attempt, at the begining of the year (or at any other period), to plan the profit and loss account for the year and to aim for a definite balance sheet at its end, instead of relying upon chance.

## CONCEPT OF BUDGETARY CONTROL

Budgetary control is a means of control in which the actual state affairs is compared with the budget so that appropriate action may be taken with regard to any deviations before it is too late. Briefly, the use of a budget to control a firm's activities is known as budgeting control. Budgetary control has the following main objectives:

1. To provide an organised procedure for planning. It provides a detailed plan of action for a business over a definite period of time.
2. To coordinate all the activities of various departments of a business firm in such a manner that the maximum profit will be achieved for the minimum use of resources.
3. To provide a means of determining the responsibility for all deviations from the plan (budget), and to supply information on the basis of which necessary corrective action may be taken. Thus, budgetary control has the objective of controlling cost.

## OBJECTIVES AND FUNCTIONS OF BUDGETING

An effective budgeting system is vital to the success of a business firm. Budgeting is needed in organizations to perform the following functions: (i) Planning, (ii) coordination, (iii) communication, and (iv) control and performance evaluation.

### Planning

Almost all business activities require some planning to ensure efficient and maximum use of scarce resources. The budget is a formal planning framework that provides specific deadlines to achieve departmental objectives and contributes towards the overall objectives of an organization. A budget incorporates expected performance and present managerial targets. These targets guide the business operations and help in overcoming problems and analyzing the future. Budgeting influences the formulation of all business strategies and subsequently assists business managers in executing such strategies.

### Coordination

Coordination is a managerial function under which all factors of production and all departmental activities are balanced and integrated to achieve the objectives of the organization. The budgeting process provides the basis for individuals in all parts of the organization to exchange ideas on how best to achieve these objectives. According to Horngreen*, budgets help management to coordinate in the following ways:

1. The existence of a well-laid plan is the major step towards achieving coordination. Executives are forced to think of the relationships among individual operations, and the company as a whole.
2. Budgets help to restrain the empire-building efforts of executives. Budgets broaden individual thinking by helping to remove unconscious biases on the part of engineers, sales and production officers.
3. Budgets help to search out weaknesses in the organisational structure. The formulation and administration of budgets isolate problems of communication, of fixed responsibility, and of working relationships.

#### *Communication*

It is necessary in an efficient organisation that all people be informed about the objectives, policies, programmes and performances. This is made possible through their participation in the budgeting proc-

* Charles T. Horngreen, *Cost Accounting*, A Managerial Emphasis, Prentice-Hall of India, New Delhi, p. 123.

ess. Budgets inform each manager of what others have agreed to do. They also inform managers of the resources available to achieve objectives and targets.

## Control and Performance Evaluation

Budgeting enters into control at three points:

1. When a budget is being formulated, departments analyse their plans for the furture and submit estimates as per their requirements, justfying each of their demands by demonstrating a need.
2. After budgets of different departments have been reviewed and approved they become targets that set desirable limits on spending.
3. At the end of the budget period, a comparison of actual expenditures with budget expenditure is made as a means of judging performance and fixing responsibility for deviations.

Budgets are the basis of performance evaluation in an organisation as they reflect realistic estimates of acceptable and expected performance. It is more accurate, reliable and reasonable to measure current performance against a budget rather than against a vague expectation or against results of previous year when conditions might have changed.

## Advantages of Budgeting

Budgeting plays an important role in the effective use of resources and achieving overall organisational goals. It has the following advantages:

1. Budgeting compels and motivates management to make an early and timely study of its problems. It generates a sense of caution and care, and adequate study among managers before decisions are made by them.
2. Budgeting provides a valuable means of controlling income and expenditure of a business as it is a "plan for spending".
3. Budgeting provides a tool through which managerial policies and goals are periodically evaluated, tested and established as guidelines for the entire organisation.
4. Budgeting helps in directing capital and other resources into the most profitable channels.
5. Budgeting coordinates and correlates all business activites. It enables management to decentralise responsibility without losing control of the business. It reveals weaknesses, inefficiencies, deviations in the organisation very promptly which can be checked immediately to achieve a desired goal.
6. The use of budgeting in an organisation develops an attitude of "cost consciousness," stimulates the effective use of resources, and creates an environment of profit-mindedness throughout the organisation.
7. It provides a norm, basis or yardstick for measuring performance of departments and individuals working in organisations.
8. Budgeting encourages productive competition, provides incentive to perform efficiently and gives a senses of purpose to each individual in the organisation.
9. Budgeting provides a systematic and disciplined approach to the solution of problems in the organisation. Horngreen observes: "The uppermost point is that budgets provide a discipline that brings planning to the forefornt as a key managerial responsiblity."

10. Budgeting, if executed in nearly every enterprise, helps the total national economy by providing stability of employment, economic use of resources and effective prevention of waste.

## LIMITATIONS OF BUDGETING

While budgeting has many advantages that are vital to an organisation, it has certain limitations which require careful consideration:

1. Planning, budgeting or forecasting is not an exact science; it uses approximations and judgement which may not be cent per cent accurate. At best, a budget is an estimate; no one knows precisely what will happen in the future.
2. The success and utility of budgeting depends on the cooperation and participation of all members of management. Many a time budgeting has failed because executive management has paid only lip service to its execution.
3. A budget is only a tool and does not eliminate nor take over the place of management. Executives generally feel "circled in" by a budget and its related figures. They fail to understand that budget is meant to provide detailed information, goals and targets which may help them in achieving the company objectives.
4. The establishment of a budgeting process takes time. Also, sometimes too much is expected from a budget and in case expectations are not fulfilled, the blame is put on the budget.
5. Excessive emphasis on budgeting may result in attempts by lower level management and employees to buck the system by providing inaccurate estimates of future costs and revenues. As the end of budget period approaches and employees realise that actual expenses have not been as great as allowed by the budget, there may be a temptation to spend excessive amounts in order to "use up" the budget allowance. Such activities result in sub-optimal profits for the company.

## BUDGETING PROCESS

The budgeting process or programme varies widely from one organisation to another. Differences in management style, organisation objectives, structure of competition and similar factors affect the procedures companies adopt in budget preparations. However, there are a set of guidelines (procedures) which are used in the budgeting process by a large number of organisations. These common steps can be listed as follows:

1. *Obtaining estimates of sales, production levels, expected costs, and availability of resources from each sub-unit/division/department* The departmental heads or managers are required to provide estimates of future conditions and activities that will have an impact on the company.
2. *Coordinating estimates* In many organisations, the budget committee evaluates the different plans submitted by various organisational units to determine the potentiality of plans in the overall interest of the company and to estimate what resources are available and can be fairly allocated among the various units of the organisation.
3. *Communicating the budget to responsible managers and the concerned departments* After individual budget plans have been approved in the light of organisational goals and availability of resources, the budgets should be communicated to departments and responsible managers.

Changes and modifications incorporated in the final budget should be made known to managers to obtain their cooperation and support for the budgets.

4. *Implementing the budget plan* The final budget is presented to the managers concerned and adopted as the plan of operation for the coming budget period.
5. *Reporting interim progress towards budgeted objectives* As a feedback in the budgeting process, performance reports are prepared to inform departmental managers and top management about the performances achieved in terms of budgeted figures. Such an investigation may call for a need to revise the budget during the year. This feedback of information can also be used as a basis for preparing the next year's budget.

## ORGANISATION FOR BUDGETING (THE BUDGET COMMITTEE)

Responsibility for budget direction and execution is usually placed in the hands of a Budget Committee which reports directly to top management. In large companies the budget committee is composed of executives incharge of major functions of the business and includes the sales manager, personnel manager, finance manager, the production manager, the chief engineer, the treasurer and the chief accounts officer.

The principal functions of the budget committee are to:

1. Decide the company's general policies and objectives.
2. Receive and review individual budget estimates concenting different departments/divisions.
3. Suggest changes, modifications in accordance with organisational objectives.
4. Approve budgets which act as an authority/target for departmental action.
5. Receive and analyse performance reports regarding the implementation of budgets.
6. Suggest corrective action to improve efficiency and achieve budgetary goals.

## BUDGET MANUAL

A budget manual is a document which defines the responsibilities of persons engaged in a budgetary programme and sets out the routine, the forms and records required under budgeting. Budget manuals specify the procedures to be followed in developing the budget. Since organisations differ in terms of structure, method of production, and operating requirements, it is difficult to prepare a budget manual suitable for use in all business enterprises.

## THE BUDGET PERIOD

The budget period is an import factor in developing a comprehensive budgeting programme. The length of the budget period depends on the type of business, the length of the manufacturing cycle from raw material to finished product, the ease of difficulty of forecasting future market conditions and other factors. However, a business enterprise generally prepares a Short-range budget, and a Long-range budget.

### Short-range Budget

Short-range budgets may cover periods of three, six or twelve months depending upon the nature of the business. Most manufacturing firms use one year as the planning period. Wholesale and retail firms

usually employ a six-month budget which is related to their selling seasons. In determining the period of the short-range budget, the following factors should be considered:

1. The budget period should be long enough to cover complete production of various products.
2. For business of a seasonal nature, the budget period should cover at least one entire seasonal cycle.
3. The budget period should be long enough to allow for the financing of production well in advance of actual needs.
4. The budget period should coincide with the financial accounting period to compare actual results with budget estimates and thus to facilitate better interpretation of the performance.

### Long-range Budget

A long-range budget or planning is defined as a systematic and formalised process for directing and controlling future operations towards a desired objective for periods extending beyond one year. Such budgets cover specific areas, such as future sales, future production, long-term capital expenditures, extensive research and development programmes, financial requirements, profit forecast. They evaluate the future implications associated with present decisions and help management in making present decisions and select the most profitable alternative.

There are many factors which are duly considered while preparing long term budgets, such as market trends, economic factors, growth of population, consumption pattern, industrial production, national income, government economic and industrial policy. Quantitative sales can be budgeted for a three to five years period. After forecasting sales, a budgeted profit and loss account can be prepared relating anticipated sales to corresponding cost and thus net operating profit can be forecasted. Likewise, a balance sheet for many years can be prepared to forecast cash, inventory levels, accounts receivable, accounts payable, liabilities, etc. The forecasted profit and loss account and balance sheet for a long-range is a very useful tool in accomplishing the objectives of the organisation as a whole.

## ELEMENTS OF A SUCCESSFUL BUDGETING PLAN

The success of the budgeting process in an organisation depends on the following essential elements:

1. *Accurate forecasting of business activities* Forecasting is a prerequisite in a budgeting process. It is not only the starting point, but is also critical to the development of an accurate budget.
2. *Coordinating business activities* Budgeting needs to coordinate all the individual budgets into an integrated plan as each budget has certain implications for the other budgets. There must be coordination between sales, production, purchasing, personnel budgets.
3. *Communicating the budgets* The success of a comprehensive budgeting programme depends on communication of individual budgets to the different units in the organisation. Managers are not responsible for budget unless the budget is communicated clearly, concisely and in an authoritative manner to them.
4. *Acceptance and cooperation* Successful budgeting also requires that budgets should be accepted by the people who must execute them. Budgeting should have the active cooperation of the entire organisation from the top to the bottom.
5. *Reasonable flexibility* The budgeting programme should contain reasonable flexibility if the situation so demands. However, it should be noted that too much flexibility and too much tight-

ness are both undesirable. Too much flexibility will weaken the cost control and the budget will become inoperative. Similarly, too much rigidity not permitting reasonable deviations will create problems and restrictions in the implementation of the budget.

6. *Providing a framework for evaluation* Budgeting provides a basis to evaluate the performance of different departments.

## BUDGET CENTRES

An organisation is usually broken down into different budget centres for administrative and control purposes. A budget centre is the lowest level in an organisation for which detailed costs are budgeted, separately from those of other budget centres. The main factor is setting up budget centres is one of the fixing responsibility for action and inaction. To ensure adequate cost control, the budget centres should fulfil the following conditions:

1. The budget of a particular budget centre should specify precisely the costs controllable by the person responsible for that centre.
2. Costs for which responsibility is joint, e.g., work carried out by a maintenance department, should be kept separate from costs which can be controlled by one manager.
3. Cost that are apportioned between two or more budget centres should also be controlled and for such costs one person should be made responsible.

## LIMITING OR PRINCIPAL BUDGET FACTOR

When budgets are made, there is invariably some factor which governs or sets a limit to the quantity which can be made or sold. This is known as the limiting or principal budget factor. The Institute of Cost and Management Accountant (UK) defines a principal budget factor as "the factor the extent of whose influence must first be assessed in order to ensure that the functional budgets are reasonably capable of fulfilment." In the field of sales, the limiting factor is customer demand which is influenced by many factors, such as price and quality of the product, competition, the general purchasing power of the public, advertising, etc. In the field of production, the principal budget factor may be plant capacity, the supply of labour of the right quality, or the availability of scarce materials.

## BUDGETS AND STANDARD COSTS

Standard costs and budgets are both vital tools in planning, operation and control of a business enterprise. Both differ in the following respects:

1. A standard costing system can operate without any comprehensive budgeting system. But budgets in absence of standard costs will only be fair estimates and cannot provide a reasonable base against which the actual results can be compared.
2. The objectives of budgeting are different from standard costing. A budget is a profit plan reflecting anticipated financial inflows and outflows. Budgets include both income expenditure, but standards are set usually for expenses only. Standard costs are developed only for the production and related manufacturing cost.
3. Budgets project the volume of business and levels of costs which should be maintained. That is,

they reflect cost ceilings which should not be exceeded if the budgeted profit is to be attained. Standard costs emphasise the cost levels to which cost should be reduced. If costs reach this level, profit will be increased. Standards are minimum targets which are to be attained by actual performance at specific efficiency.

4. Budgets covering the entire business present the forecasted profit and loss account and sometimes balance sheet also. Therefore, budgets act as guides for operating the business on a definite course of action. Standards are frequently used only in labour operation and do not represent expected costs but the cost that should be in a certain assumed conditions of performance. Horngreen * observes that the term "standard" is a unit concept and the term budgeted cost is a total concept. It may be helpful to think of a standard as a budget for the production of a single unit of output.
5. Budgets if achieved by the organisation do not usually involve much variance analysis. Under standard costing detailed variance analysis is carried out to find out deviations so that corrective action may be taken.
6. Review and revision of budgets is more frequently based on the changing circumstances than those of standard costs. Standard costs are more static and subject to less change.
7. Budgets are equally important for planning, organisation coordination and control functions of management. Standard costs contribute relatively more to the control function than other managerial functions although standards are used for all business functions.

In spite of the above differences, there are some similarities between standard costing and budgeting. Both have in common the establishment of predetermined measures of performance and the comparison of actual and planned performance so as to disclose deviations which are used for the purpose of cost control. Both help in the preparation of reports which compare actual costs and predetermined costs for management planning and control. Standards are almost indispensable to the work of establishing and operating a budget. A study made by the national Association of Accounts (USA) concludes that standard costs are especially valuable in developing the cost side of the budget because they provide a reliable and convenient source of data for converting the budgeted production schedule into requirements for raw materials, labour and services.

## FIXED AND FLEXIBLE BUDGETING

### Fixed Budgeting

The Institute of Costs and Management Accounts (UK) defines a fixed budget as the budget which is designed to remain unchanged irrespective of the level of activity actually attained. It is based on a single level of activity. A fixed budget performance report compares data from actual operations with the single level of activity reflected in the budget. Fixed budgets do not change when production level changes.

However, in practice, fixed budgeting is rarely used. The main reason is that actual output is often significantly different from the budgeted output. In such a case the budget cannot be used for the purpose of cost control. The performance report may be misleading and will not contain very useful information. For example, if actual production is 12,000 units in place of the budgeted 10,000 units, the costs incurred cannot be compared with the budget which relates to different levels of activity. Since, in fixed budgeting, units are overlooked, a cost to cost comparison without considering the units may give misleading results.

* Charles T. Horngreen, *Cost Accounting, A Managerial Emphasis*, Prentice-Hall of India, New Delhi p. 173.

The performance report prepared under fixed budgeting merely discloses whether actual costs were higher or lower than budgeted costs. Therefore, the fixed budget is unable to provide useful information when actual output differs significantly from expected or budgeted output. The fact the costs and expenses are affected by fluctuations in volume limits the use of the fixed budget. Clearly, the idea of comparing performance at one activity level with a plan that was developed at some other activity level is nonsense from the viewpoint of judging how efficiently the manager has produced any given output.

A fixed budget can be usefully employed when budgeted output is close enough to the actual output. If output can be estimated within close limits, the fixed budget can be a good basis for performance measurement. Maximum managerial control may be exercised by making comparisons with actual operating figures.

## FLEXIBLE BUDGETING

A flexible budget is a budget that is prepared for a range, i.e., for more than one level of activity. It is a set of alternative budgets to different expected levels of activity. The flexible budget is also known by other names, such as variable budget, dynamic budget, sliding scale budget, step budget, expenses formula budget and expenses control budget. The underlying principle of a flexible budget is that every business is dynamic, ever-changing, and never static. Thus, a flexible budget might be developed that would apply to a "relevant range" of production, say 8,000 to 12,000 units. Under this approach, if actual production slips to 9,000 units from a project 10,000 units, the manager has a specific tool (i.e., the flexible budget) that can be used to determine budgeted cost at 9,000 units of output. The flexible budget provides a reliable basis for comparisons because it is automatically geared to changes in production activity. A flexible budget has the following important features:

1. It covers a range of activity (output).
2. It is flexible, i.e., easy to change with variation in production levels.
3. It facilitates performance measurement and evaluation.

Planning or budgeting for a range of activity rather than for a single level of activity is always preferable due to the uncertainty about the changes in activity levels. In flexible budgeting, that range of activity is selected which is likely to occur. Most often, one activity level at each extreme of the activity range is selected, with one or more in between. Among different activity levels the most likely activity level is made the basis for planning business operations. Flexible budgeting makes it easy to adjust plans to changing production levels without any delay. The flexibility involved in this budget makes a very useful decision making tool for management.

### *Steps in Flexible Budgeting*

The following steps (stages) are involved in developing a flexible budget;

1. Deciding the range of activity to which the budget is to be prepared.
2. Determining the cost behaviour patterns (fixed, variable, semi-variable) for each element of cost to be included in the budget.
3. Selecting the activity levels (generally in terms of production) to prepare budgets at those levels.
4. Preparing the budget at each activity level selected by associating the activity level with corresponding costs. The corresponding costs to be attached with each activity level are determined in terms of their behaviour, i.e., fixed, variable, semi-variable.

### Advantages of Flexible Budgeting

Flexible budgeting is budgeting that is automatically tailored to any level of activity. Although it is most often associated with the control of overhead, a flexible budget may also include direct materials and direct labour. Welsch* has listed three specific uses of the flexible budget.

1. To facilitate development of the departmental expense budgets for inclusion in the profit plans.
2. To provide expense goals for the managers of responsibility centres during the period covered by the profit plan.
3. To provide adjusted budget allowances for comparison purposes (against actual expenses) in the monthly performance reports.

In general, flexible budgeting has the following important advantages:

1. *Accurate budgeting* The use of flexible budgets may result in the preparation of more accurate budgets. Flexible budgeting techniques require that consideration is to be given to the output factor in budget preparation. Since all costs do not behave in the same manner (as some costs rise faster than others when production increases) a budget giving consideration to the volume (output) factor is bound to be more accurate than one where volume is not considered.
2. *Accurate performance measurement* The flexible budgeting technique incorporates changes in activity level and compares actual results with the budget in terms of output achieved. This facilitates more meaningful comparison and evaluation between actual and budgeted data as comparable data are compared.
3. *Coordination* Flexible budgeting results in coordination between all activities/departments of a business. Production is planned in relation to expected sales, materials and labour are acquired to meet expected production requirements. Facilities are provided to achieve budgetary goals, and funds are made available for the investments necessary to have higher output.
4. *Control tool* Flexible budgeting is an effective management control tool. Comparisons between the budgeted costs (at the actual production level) and actual costs form the basis for analysing cost variances and fixing responsibility for the same. In fact, managers themselves feel motivated in controlling costs for which they are responsible. This contributes to cost control throughout the organisation.

### Example 19.1

From the following data, prepare a flexible budget for production of 40,000 units and 75,000 units, distinctly showing variable cost and fixed cost as well as total cost. Also indicate element-wise cost per unit. Budgeted output is 1,00,000 units and budgeted cost per unit is as follows:

| | |
|---|---|
| Direct Material | 95 |
| Direct labour | 50 |
| Production overhead (variable) | 40 |
| Production overhead (fixed) | 5 |
| Administration overhead (fixed) | 5 |
| Selling overhead (10% fixed) | 10 |
| Distribution overhead (20% fixed) | 15 |

*(B. Com. (Hons), Delhi 2000)*

*Glenn A, Welsch, *Budgeting, Profit Planning and Control*, p. 22.

*Solution*

**Flexible Budget**

| | *1,00,000 units* | | *40,000 units* | | *75,000 units* | |
|---|---|---|---|---|---|---|
| | *Per unit* | *Total* | *Per unit* | *Total* | *Per unit* | *Total* |
| **Variable cost:** | Rs | Rs. | Rs | Rs | Rs | Rs |
| Direct material | 95 | 95,00,000 | 95 | 38,00,000 | 95 | 71,25,000 |
| Direct labour | 50 | 50,00,000 | 50 | 20,00,000 | 50 | 37,50,000 |
| Production overhead | 40 | 40,00,000 | 40 | 16,00,000 | 40 | 30,00,000 |
| Selling overhead = $\frac{10 \times 90}{100}$ | 9 | 9,00,000 | 9 | 3,60,000 | 9 | 6,75,000 |
| Distribution overhead $= \frac{15 \times 80}{100}$ | 12 | 12,00,000 | 12 | 4,80,000 | 12 | 9,00,000 |
| Total variable cost | 206 | 20,600,000 | 206 | 82,40,000 | 206 | 1,54,50,000 |
| **Fixed Cost** | | | | | | |
| Production overhead | 5 | 5,00,000 | 12.50 | 5,00,000 | 6.67 | 5,00,000 |
| Administrative overhead | 5 | 5,00,000 | 12.50 | 5,00,000 | 6.67 | 5,00,000 |
| Selling overhead | 1 | 1,00,000 | 2.50 | 10,00,000 | 1.33 | 1,00,000 |
| Distribution overhead | 3 | 3,00,000 | 7.50 | 30,00,000 | 3.00 | 3,00,000 |
| Total fixed cost | 14 | 14,00,000 | 35.00 | 14,00,000 | 17.67 | 14,00,000 |
| Total Cost | 260 | 2,20,00,000 | 231.00 | 96,40,000 | 223.67 | 1,68,50,000 |

### *Example 19.2*

Goldman Company Limited operates on a system of Flexible Budgets. With the aid of the following information, you are required to prepare Flexible Budget at 80%, 90% and 100% level of activity showing the profits that would result at these levels:

(i) The present sale of 8,00,000 units at Rs 10 each is at the normal level of 80%. If the output is increased to 90%, the selling price will be reduced by 2.5% and if the output reached 100%, the original selling price will be reduced by 5% in order to reach a wider market.

(ii) The prime cost per unit is Rs 5 made up of Direct Materials Rs 3.50, Direct Labour Rs 1.25 and Direct Expenses Re 0.25. If output reaches 90% level of activity and above, a saving of 5% can be effected in the purchase price of raw materials.

(iii) Variable Overhead—Salesmen's commission will be 5% of the sales value.

(iv) Semi-variable overhead at normal level of activity are:

| | Rs |
|---|---|
| Supervision | 80,000 |
| Power | 70,000 |
| Heat and Light | 40,000 |
| Maintenance | 50,000 |
| Salesmen Expenses | 60,000 |
| Indirect Labour | 1,00,000 |
| Transport Costs | 2,00,000 |

These are expected to increase by 5% if output reaches 90% level and by a further 10% if it reaches the 100% level.

(v) Fixed overheads are:

| | Rs |
|---|---|
| Rent and Rates | 1,00,000 |
| Depreciation | 4,00,000 |
| Advertisement | 5,00,000 |
| Administration | 7,50,000 |
| Sales Department | 2,00,000 |
| General | 50,000 |

*(B. Com. (Hons), Delhi 1998)*

*Solution*

**Goldman Company Limited**
**Flexible Budget**

| | *Item* | *Capacity Levels* | | |
|---|---|---|---|---|
| | | *80%* | *90%* | *100%* |
| 1. | Sales (units) | 8,00,000 | 9,00,000 | 10,00,000 |
| 2. | Selling Price (Rs) | 10 | 9.75 | 9.50 |
| 3. | Sales (Rs) | 80,00,000 | 87,75,000 | 95,00,000 |
| 4. | Costs: | | | |
| | *A. Variable Costs* | | | |
| | Direct materials | 28,00,000 (8,00,000 × 3.50) | 29,92,500 9,00,000 × 3.325) | 32,25,000 (10,00,000 × 3.325) |
| | Direct Labour (@ Rs 1.25 per unit) | 10,00,000 | 11,25,000 | 12,50,000 |
| | Direct Expenses (@ Re 0.25 per unit) | 2,00,000 | 2,25,000 | 2,50,000 |
| | Variable Overhead: (Salesmen Commission @ 5% of Sales Value) | 4,00,000 | 4,38,750 | 4,75,000 |
| | *B. Semi-Variable Costs:* | | | |
| | Supervision | 80,000 | 84,000 | 88,000 |
| | Power | 70,000 | 73,500 | 77,000 |
| | Heat and Light | 40,000 | 42,000 | 44,000 |
| | Maintenance | 50,000 | 52,500 | 55,000 |
| | Salesmen Expenses | 60,000 | 63,000 | 66,000 |
| | Indirect Labour | 1,00,000 | 1,05,000 | 1,10,000 |
| | Transport Costs | 2,00,000 | 2,10,000 | 2,20,000 |
| | *C. Fixed Costs:* | | | |
| | Rent and Rates | 1,00,000 | 1,00,000 | 1,00,000 |
| | Depreciation | 4,00,000 | 4,00,000 | 4,00,000 |
| | Advertisement | 5,00,000 | 5,00,000 | 5,00,000 |
| | Sales Department | 2,00,000 | 2,00,000 | 2,00,000 |
| | General | 50,000 | 50,000 | 50,000 |
| | Administration | 7,50,000 | 7,50,000 | 7,50,000 |
| | Total Costs | 70,00,000 | 74,11,250 | 79,60,000 |
| 5. | Profit = (3) – (4) | 10,00,000 | 13,63,750 | 15,40,000 |

***Example 19.3***

Goodluck Ltd. is currently operating at 75% of its capacity. In the past two years, the level of operations were 55% and 65% respectively. Presently, the production is 75,000 units. The company is planning for 85% capacity level during 1999–2000. The cost details are as follows:

| | *55%* | *65%* | *75%* |
|---|---|---|---|
| | *Rs* | *Rs* | *Rs* |
| Direct Materials | 11,00,000 | 13,00,000 | 15,00,000 |
| Direct Labour | 5,50,000 | 6,50,000 | 7,50,000 |
| Factory Overheads | 3,10,000 | 3,30,000 | 3,50,000 |
| Selling Overheads | 3,20,000 | 3,60,000 | 4,00,000 |
| Administrative Overheads | 1,60,000 | 1,60,000 | 2,60,000 |
| | 24,40,000 | 28,00,000 | 31,60,000 |

Profit is estimated @ 20% on sales.

The following increase in costs are expected during the year.

| | *In percentage* |
|---|---|
| Direct Materials | 8 |
| Direct Labour | 5 |
| Variable Factory Overheads | 5 |
| Variable Selling Overheads | 8 |
| Fixed Factory Overheads | 10 |
| Fixed Selling Overheads | 15 |
| Administrative Overheads | 10 |

Prepare flexible budget for the period 1999–2000 at 85% level of capacity. Also ascertain profit and contribution. *(CA Inter, May 1999)*

*Solution*

**Flexible Budget at 85% Capacity Level (85,000 Units)**
***(for the period 1999–2000)***

| *Particulars* | *Cost based on previous year Rs* | *Increase in Cost Rs* | *Total Cost Rs* |
|---|---|---|---|
| *Variable Costs:* | | | |
| Direct Materials (*WN 1*) | 17,00,000 | 1,36,000 (8% × Rs 17,00,000) | 18,36,000 |
| Direct Labour (*WN 2*) | 8,50,000 | 42,500 (5% × Rs 8,50,000) | 8,92,500 |
| Variable Factory Overheads (*WN 3*) | 1,70,000 | 8,500 (5% × Rs 1,70,000) | 1,78,500 |
| Variable Selling Overheads (*WN 4*) | 3,40,000 | 27,200 (8% × Rs 3,40,000) | 3,67,200 |
| Total Variable Costs: (1) | | | 32,74,200 |
| *Fixed Costs:* | | | |
| Fixed Factory Overheads (*WN 5*) | 2,00,000 | 20,000 (10% × Rs 2,00,000) | 2,20,000 |

| *Particulars* | *Cost based on previous year Rs* | *Increase in Cost Rs* | *Total Cost Rs* |
|---|---|---|---|
| Fixed Selling Overheads (*WN 6*) | 1,00,000 | 15,000 (15% × Rs 1,00,000) | 1,15,000 |
| Administrative Overheads | 1,60,000 | 16,000 (10% × Rs 1,60,000) | 1,76,000 |
| Total Fixed Costs: (2) | | | 5,11,000 |
| Total Costs: (1) + (2) | | | 37,85,200 |
| *Add:* Profit: (20% on sale, or 25% on cost) | | | 9,46,300 |
| Sales Revenue: | | | 47,31,500 |
| *Less:* Total Variable Costs: | | | 32,74,200 |
| Contribution | | | 14,57,300 |

**Statement of Contribution and Profit**

| | Rs |
|---|---|
| Sales Total cost Rs 37,85,200 + Profit 25% on cost or 20% of sales | 47,31,500 |
| *Less:* Variable Costs | 32,74,200 |
| Contribution | 14,57,300 |
| *Less:* Fixed Costs | 5,11,000 |
| Profit | 9,46,300 |

**Working Notes:**

| *Particulars* | *Capacity Levels* | | | |
|---|---|---|---|---|
| | *55%* | *65%* | *75%* | *85%* |
| | *55,000 Units* | *65,000 Units* | *75,000 Units* | *85,000 Units* |
| 1. Direct Materials | 11,00,000 | 13,00,000 | 15,00,000 | 17,00,000 |
| 2. Direct Labour | 5,50,000 | 6,50,000 | 7,50,000 | 8,50,000 |
| 3. Variable Factory Overhead: $\frac{(Rs\ 3,30,000 - Rs\ 3,10,000)}{10,000\ units}$ = Rs 2 per unit | 1,10,000 | 1,30,000 | 1,50,000 | 1,70,000 |
| 4. Variable Selling Overhead $\frac{(Rs\ 3,60,000 - Rs\ 3,20,000)}{10,000\ units}$ = Rs 4 per unit | 2,20,000 | 2,60,000 | 3,00,000 | 3,40,000 |
| 5. Fixed Factory Overhead: (Total Factory Overheads – Variable Factory Overhead) | 2,00,000 | 2,00,000 | 2,00,000 | 2,00,000 |
| 6. Fixed Selling Overheads: Total Selling Overheads – Variable Selling Overheads) | 1,00,000 | 1,00,000 | 1,00,000 | 1,00,000 |

***Example 19.4***

For production of 10,000 electrical automatic irons, the following are the budgeted expenses:

| | *Per unit* |
|---|---|
| Direct materials | Rs 60 |
| Direct labour | 30 |
| Variable overheads | 25 |
| Fixed overheads (Rs 1,50,000) | 15 |
| Variable expenses (direct) | 5 |
| Selling expenses (10% fixed) | 15 |
| Administration expenses (Rs 50,000 rigid for all levels of production) | 5 |
| Distribution expenses (20% fixed) | 5 |
| Total cost of sale per unit | 160 |

Prepare a budget for production of 6,000; 7,000; and 8,000 irons, showing distinctly marginal cost and total cost.

*(CA Inter)*

*Solution*

**Flexible Budget of Electrical Automatic Irons**

| *Production* | *6,000 units* | | *7,000 units* | | *8,000 units* | |
|---|---|---|---|---|---|---|
| | *Total (Rs)* | *Per unit (Rs)* | *Total (Rs)* | *Per unit (Rs)* | *Total (Rs)* | *Per unit (Rs)* |
| Direct material | 3,60,000 | 60.00 | 42,20,000 | 60.00 | 4,80,000 | 60.00 |
| Direct labour | 1,80,000 | 30.00 | 2,10,000 | 30.00 | 2,40,000 | 30.00 |
| Direct variable expenses | 30,000 | 5.00 | 35,000 | 5.00 | 40,000 | 5.00 |
| *Variable overheads:* | | | | | | |
| Production | 1,50,000 | 25.00 | 1,75,000 | 25.00 | 2,00,000 | 25.00 |
| Selling | 81,000 | 13.50 | 94,500 | 13.50 | 1,08,000 | 13.50 |
| Distribution | 24,000 | 4.00 | 28,000 | 4.00 | 32,000 | 4.00 |
| Marginal cost | 8,25,000 | 137.50 | 9,62,500 | 137.50 | 11,00,000 | 137.50 |
| Fixed production overheads | 1,50,000 | 25.00 | 1,50,000 | 21.43 | 1,50,000 | 18.75 |
| Administration overheads | 50,000 | 8.33 | 50,000 | 7.14 | 50,000 | 6.25 |
| Selling overheads | 15,000 | 2.50 | 15,000 | 2.14 | 15,000 | 1.88 |
| Distribution overheads | 10,000 | 1.67 | 10,000 | 1.43 | 10,000 | 1.25 |
| Fixed cost | 2,25,000 | 37.50 | 2,25,000 | 32.14 | 2,25,000 | 28.13 |
| Total cost (Marginal cost plus fixed cost) | 10,50,000 | 175.00 | 11,87,500 | 169.64 | 13,25,000 | 165.63 |

**Working Notes:**

| | *Selling expenses* | *Distribution expenses* |
|---|---|---|
| Total for 10,000 units | 1,50,000 | 50,000 |
| Variable: 90% and 80% respectively | 1,35,000 | 40,000 |
| Variable expenses per unit | 13.50 | 4.00 |
| Fixed expenses 10% and 20% of total, respectively | 15,000 | 10,000 |

### *Example 19.5*

The following data are available in a manufacturing company for a yearly period.

| | *Rs (lakhs)* |
|---|---|
| Fixed expenses: | |
| Wages and salaries | 9.5 |
| Rent, rates and taxes | 6.6 |
| Depreciation | 7.4 |
| Sundry administrative expenses | 6.5 |
| Semi-variable expenses at 50% of capacity: | |
| Maintenance and repairs | 3.5 |
| Indirect labour | 7.9 |
| Sales department salaries, etc. | 3.8 |
| Sundry administrative salaries | 2.8 |
| Variable expenses (at 50% of capacity): | |
| Materials | 21.7 |
| Labour | 20.4 |
| Other expenses | 7.9 |
| Total cost | 98.0 |

Assume that the fixed expenses remain constant for all levels of production: semi-variable expenses remain constant between 45% and 65% of capacity, increasing by 10% between 65% and 80% capacity and by 20% between 80% and 100% capacity.

| *Sales at various levels are:* | *Rs (lakhs)* |
|---|---|
| 50% capacity | 100 |
| 60% capacity | 120 |
| 75% capacity | 150 |
| 90% capacity | 180 |
| 100% capacity | 200 |

Prepare a flexible budget for the year and forecast the profit at 60%, 75%, 90% and 100% capacity. *(ICWA Inter)*

*Solution*

**Flexible Budget for the Period**

*(Rs in lakhs)*

| Capacity level | 50% | 60% | 75% | 90% | 100% |
|---|---|---|---|---|---|
| Sales | 100 | 120 | 150 | 180 | 200 |
| Fixed expenses: | | | | | |
| Wages and salaries | 9.5 | 9.5 | 9.5 | 9.5 | 9.5 |
| Rent, rates and taxes | 6.6 | 6.6 | 6.6 | 6.6 | 6.6 |
| Depreciation | 7.4 | 7.4 | 7.4 | 7.4 | 7.4 |
| Sundry administrative expenses | 6.5 | 6.5 | 6.5 | 6.5 | 6.5 |
| (A) Total fixed costs | 30.0 | 30.0 | 30.0 | 30.0 | 30.0 |
| Semi-variable expenses: | | | | | |
| Maintenance and repairs | 3.5 | 3.5 | 3.8 | 4.2 | 4.2 |

*(Contd.)*

| | | | | | |
|---|---|---|---|---|---|
| Indirect labour | 7.9 | 7.9 | 8.7 | 9.5 | 9.5 |
| Sales department salaries | 3.8 | 3.8 | 4.2 | 4.6 | 4.6 |
| Sundry administrative expenses | 2.8 | 2.8 | 3.1 | 3.3 | 3.3 |
| (B) Total semi-variable costs | 18.0 | 18.0 | 19.8 | 21.6 | 21.6 |
| Variable expenses: | | | | | |
| Materials | 21.7 | 26.0 | 32.5 | 39.0 | 43.4 |
| Labour | 20.4 | 24.5 | 30.6 | 36.7 | 40.8 |
| Other expenses | 7.9 | 9.5 | 11.9 | 14.3 | 15.8 |
| (C) Total variable cost | 50.0 | 60.0 | 75.0 | 90.0 | 100.0 |
| (D) Total cost (A) + (B) + (C) | 98.0 | 108.0 | 124.8 | 141.6 | 151.6 |
| (E) Sales | 100.0 | 120.0 | 150.0 | 180.0 | 200.0 |
| (F) Profit (E – D) | 2.0 | 12.0 | 25.2 | 38.4 | 48.4 |

***Example 19.6***

A department of Company X attains sale of Rs 6,00,000 at 80% of the normal capacity and its expenses are given below:

| | Rs |
|---|---|
| Office salaries | 90,000 |
| General expenses | 2% of the sales |
| Depreciation | 7,500 |
| Rates and taxes | 8,750 |
| Selling costs: | |
| Salaries | 8% of the sales |
| Travelling expenses | 2% of the sales |
| Sales office | 1% of the sales |
| General expenses | 1% of the sales |
| Distribution costs: | |
| Wages | 15,000 |
| Rent | 1% of the sales |
| Other expenses | 4% of the sales |

Draw up a flexible administration, selling and distribution costs budget, operating at 90%, 100% and 110% of normal capacity.

*(B. Com. (Hons), Delhi 1997)*

*Solution*

**Flexible Budget of Department....of Company X**

| *Items* | *Basis* | *Level of Activity* | | | |
|---|---|---|---|---|---|
| | | *80%* *(Rs)* | *90%* *(Rs)* | *100%* *(Rs)* | *110%* *(Rs)* |
| Sales | | 6,00,000 | 6,75,000 | 7,50,000 | 8,25,000 |
| Administrative costs: | | | | | |
| Office salaries | Fixed | 90,000 | 90,000 | 90,000 | 90,000 |
| General expenses | 2% of sales | 12,000 | 13,500 | 15,000 | 16,500 |
| Depreciation | Fixed | 7,500 | 7,500 | 7,500 | 7,500 |
| Rates and taxes | Fixed | 8,750 | 8,750 | 8,750 | 8,750 |

*(contd.)*

| | | | | | |
|---|---|---|---|---|---|
| Total administrative costs | | 1,18,250 | 1,19,750 | 1,21,250 | 1,22,750 |
| Selling costs: | | | | | |
| Salaries | 8% of sales | 48,000 | 54,000 | 60,000 | 66,000 |
| Travelling expenses | 2% of sales | 12,000 | 13,500 | 15,000 | 15,000 |
| Sales office expenses | 1% of sales | 6,000 | 6,750 | 7,500 | 8,250 |
| General expenses | 1% of sales | 6,000 | 6,750 | 7,500 | 8,250 |
| Total selling costs | | 72,000 | 81,000 | 90,000 | 99,000 |
| Distribution costs: | | | | | |
| Wages | Fixed | 15,000 | 15,000 | 15,000 | 15,000 |
| Rent | 1% of sales | 6,000 | 6,750 | 7,500 | 8,250 |
| Other expenses | 4% of sales | 24,000 | 27,000 | 30,000 | 33,000 |
| Total distribution costs: | | 45,000 | 48,750 | 52,500 | 56,250 |
| Total admn., selling and dist. costs | | 2,35,250 | 2,49,500 | 2,63,750 | 2,78,000 |

*Note:* In the absence of information it has been assumed that office salaries, depreciation, rates and taxes and wages remain the same at 110% level of activity also. However, in practice some of these costs may change if present capacity is exceeded.

### *Example 19.7*

The budget manager of Jaypee Electricals Ltd. is preparing a flexible budget for the accounting year commencing from 1st April 2001. The company produces one product, component—Peekay. Direct material costs Rs 7 per unit. Direct labour averages Rs 2.50 per hour and requires 1.60 hours to produce one unit of Peckay.

Salesmen are paid a commission of Re 1 per unit sold. Fixed selling and administration expenses amount to Rs 85000 per year.

Manufacturing overhead has been estimated in the following amounts under specified conditions of volume:

| Volume of production (in units) | 1,20,000 | 1,50,000 |
|---|---|---|
| *Expenses:* | *(Rs)* | *(Rs)* |
| Indirect material | 2,64,000 | 3,30,000 |
| Indirect labour | 1,50,000 | 1,87,500 |
| Inspection | 90,000 | 1,12,500 |
| Maintenance | 84,000 | 1,02,000 |
| Supervision | 1,98,000 | 2,34,000 |
| Depreciation—Plant and Equipment | 90,000 | 90,000 |
| Engineering services | 94,000 | 94,000 |
| Total manufacturing overhead | 9,70,000 | 11,50,000 |

Normal capacity of production of the company is 1,25,000 units.

Prepare a budget of total cost at 1,40,000 units of output.

*(B. Com. (Hons), Delhi)*

*Solution*

**Flexible Budget for the Year April 2001 to March 2002**
**Production Volume 140000 Units**

| *Items of cost* | *Fixed costs (Rs)* | *Variable costs (Rs)* | | *Total cost (Rs)* |
|---|---|---|---|---|
| | | *Per unit* | *Total* | |
| Direct materials | – | 7.00 | 9,80,000 | 9,80,000 |
| Indirect labour | – | 4.00 | 5,60,000 | 5,60,000 |
| Indirect materials | – | 2.20 | 3,08,000 | 3,08,000 |
| Indirect labour | – | 1.25 | 1,75,000 | 1,75,000 |
| Inspection | – | 0.75 | 1,05,000 | 1,05,000 |
| Maintenance | 12,000 | 0.60 | 84,000 | 96,000 |
| Supervision | 54,000 | 1.20 | 1,68,000 | 2,22,000 |
| Depreciation—Plant and Equipment | 90,000 | – | – | 90,000 |
| Engineering service | 94,000 | – | – | 94,000 |
| Sales commission | – | 1.00 | 1,40,000 | 1,40,000 |
| Fixed selling and distribution expenses | 85,000 | – | – | 85,000 |
| Total | 3,35,000 | 18.00 | 25,20,000 | 28,55,000 |

**Working Notes:**

Segregation of semi-variable costs into fixed and variable components:

$$\text{Variable-cost per unit} = \frac{\text{Difference in cost}}{\text{Difference in output}}$$

Fixed cost = Total cost – Variable cost

(i) Maintenance – Variable cost per unit $= \dfrac{\text{Rs } 102000 - 84000}{150000 - 120000}$

$= \dfrac{\text{Rs } 18000}{30{,}000 \text{ unit}}$

= Re 0.60 per unit

Fixed cost = Rs 84,000 – (1,20,000 × .60)
= 84,000 – 72,000
= 12000

Variable cost = 14000 × .60 = Rs 84000

(ii) Supervision

Variable cost per unit $= \dfrac{\text{Rs } 2{,}34{,}000 - 1{,}98{,}000}{1{,}50{,}000 - 1{,}20{,}000}$

$= \dfrac{\text{Rs } 36{,}000}{30{,}000 \text{ units}}$

= Rs 1.20 per unit

Fixed cost = Rs 1,98,000 – (1,20,000 × 1.20)
= 1,98,000 – 1,44,000
= 54,000

Variable cost = 1,40,000 units × Rs 1.20
= Rs 1,68,000

(iii) Indirect materials, Indirect labour, Inspection are fully variable costs. This can be proved by taking these elements of costs and following the above method of segregation. For instance, as an example, indirect materials is taken.

Indirect materials

$$\text{Variable cost per unit} = \frac{\text{Rs } 3,30,000 - 2,64,000}{1,50,000 - 1,20,000}$$

$$= \frac{\text{Rs } 66,000}{30,000}$$

= Rs 2.20 per unit

Fixed cost = Rs 2,64,000 (12,000 × 2.20)
= 2,64,000 – 2,64,000
= No fixed cost

***Example 19.8***

The profitability statement of Gourmet Co. Ltd. has been summarized as follows:

| | *Rs* | *Rs* |
|---|---|---|
| Sales | 15,00,000 | |
| Direct materials | 4,50,000 | |
| Direct wages | 3,00,000 | |
| Variable overheads | 1,20,000 | |
| Fixed overheads | 4,40,000 | 13,10,000 |
| Profit | | 1,90,000 |

The budgeted capacity of the company is Rs 20,00,000 but the key factor is sales demand. It is proposed that in order to utilise the existing capacity the selling price of this only product manufactured by the company should be reduced by 5%.

You are required to prepare a forecast statement which should show the effect of the proposed reduction in selling price and include any changes in costs expected during the coming year. The following additional information is given:

(i) Sales forecast Rs 19,00,000 (after reduction).
(ii) Direct material prices are expected to increase by 2%.
(iii) Direct wage rates are expected to increase by 5% per unit.
(iv) Variable overheads are expected to increase by 5% per unit.
(v) Fixed overheads will increase by Rs 20,000. *(B. Com. (Hons), Delhi)*

*Solution*

**Forecast Statement of Profit**

| | | | |
|---|---|---|---|
| 1. | Sales | | 19,00,000 |
| 2. | *Less:* Variable costs: | | |
| | Direct material | 4,50,000 | |

| | | | |
|---|---|---|---|
| | *Add:* For increase on account of sales volume (1/3 × 4,50,000) | 1,50,000 | |
| | | 6,00,000 | |
| | *Add:* Increase in price (2% of Rs 6,00,000) | 12,000 | 6,12,000 |
| | Direct wages | 3,00,000 | |
| | *Add:* For increase in sales volume (1/3 of Rs 3,00,000) | 1,00,000 | |
| | | 4,00,000 | |
| | *Add:* For increase in wage rates (5% of Rs 4,00,000) | 20,000 | 4,20,000 |
| | Variable overheads | 1,20,000 | |
| | *Add:* For increase in sales volume (1/3 × 1.20,000) | 40,000 | |
| | | 1,60,000 | |
| | *Add:* For increase in rates (5% of Rs 1,60,000) | 8,000 | 1,68,000 |
| | Total variable costs | | 12,00,000 |
| 3. | Contribution (1) – (2) | | 7,00,000 |
| 4. | Fixed overheads | 4,40,000 | |
| | *Add:* Expected increase in fixed overheads | 20,000 | 4,60,000 |
| | Profit | | 2,40,000 |

*Note:*

Sales after price reduction = Rs 19,00,000

Sales before price reduction 19,00,000 × 100/95 = 20,00,000

Increase in sales volume from present sales Without price reduction over existing sales

$$\frac{5,00,000 \times 100}{15,00,000} = 33\frac{1}{3}\%$$

### *Example 19.9*

Paints Private Ltd. Company, manufacturing a single product, is facing severe competition in selling it at Rs 50 per unit. The company is operating at 60% level of capacity at which level the sales are Rs 12,00,000 and variable costs are Rs 30 per unit. Semi-variable costs may be considered as fixed at Rs 90,000 when output is nil and the variable elements in Rs 250 for each additional 1% level of activity. Fixed costs are Rs 1,50,000 at the present level of activity. But at 80% level of activity or above, these costs are expected to increase by Rs 50,000.

To cope with the competition, the management of the company is considering a proposal to reduce the selling price by 5%. You are required to prepare a statement showing the operating profit at levels of activity of 60%, 70%, 80%, 90% assuming that:

(a) The selling price remains at Rs 50

(b) The selling price is reduced by 5%

*Solution*

**Paints Private Ltd. Flexible Budget**

| | *60%* *(24,000 units)* *Rs* | *70%* *(28,000 units)* *Rs* | *80%* *(32,000 units)* *Rs* | *90%* *(36,000 units)* *Rs* |
|---|---|---|---|---|
| Variable cost | 7,20,000 | 8,40,000 | 9,60,000 | 10,80,000 |
| Semi-variable: | | | | |
| Fixed | 90,000 | 90,000 | 90,000 | 90,000 |
| Variable | 15,000 | 17,500 | 20,000 | 22,500 |
| Fixed cost | 1,75,000 | 1,50,000 | 2,00,000 | 2,00,000 |
| Total cost | 9,75,000 | 10,97,500 | 12,70,000 | 13,92,500 |
| (a) Sales (Selling price remaining at Rs 50) | 12,00,000 | 14,00,000 | 16,00,000 | 18,00,000 |
| Profit | 2,25,000 | 3,02,000 | 3,30,000 | 4,07,500 |
| (b) Sales (Selling price is reduce to Rs 47.50, 5% reduction) | 11,40,000 | 13,30,000 | 15,20,000 | 17,10,000 |
| Profit | 1,65,000 | 2,32,500 | 2,50,000 | 3,17,500 |

### *Example 19.10*

Viveka Elementary School has a total of 150 students consisting of 5 sections with 30 students per section. The school plans for a picnic around the city during the week-end to places such as the zoo, the amusement park, the planetarium, etc. A private transport operator has come forward to lease out the buses for taking the students. Each bus will have a maximum capacity of 50 (excluding 2 seats reserved for the teachers accompanying the students). The school will employ two teachers for each bus, paying them an allowance of Rs 50 per teacher. It will also lease out the required number of buses. The following are the other cost estimates:

| | *Cost per student (Rs)* |
|---|---|
| Breakfast | 5 |
| Lunch | 10 |
| Tea | 3 |
| Entrance fee at zoo | 2 |

Rent Rs 650 per bus
Special permit fee Rs 50 per bus.
Block entrance fee at the planetarium Rs 250.
Prizes to students for games Rs 250.

No costs are incurred in respect of the accompanying teachers (except the allowance of Rs 50 per teacher). You are required to prepare;

(a) A flexible budget estimating the total cost for the levels of 30, 60, 90, 120 and 150 students. Each item of cost is to be indicated separately.

(b) Compare the average cost per student at these levels.
(c) What will be your conclusions regarding the break-even level of students if the school proposes to collect Rs 45 per student?

*(CA Inter)*

*Solution*

**Viveka Elementary School**
**(a) Flexible Budget to Estimate the Total Cost Level of Students**

| Costs: | 30 | 60 | 90 | 120 | 150 |
|---|---|---|---|---|---|
| (i) *Variable:* | *Rs* | *Rs* | *Rs* | *Rs* | *Rs* |
| Breakfast | 150 | 300 | 450 | 600 | 750 |
| Lunch | 300 | 600 | 900 | 1,200 | 1,500 |
| Tea | 90 | 180 | 270 | 360 | 450 |
| Entrance fee | 60 | 120 | 180 | 240 | 300 |
| | 600 | 1,200 | 1,800 | 2,400 | 3,000 |
| (ii) *Semi-variable cost:* | | | | | |
| Rent of bus | 650 | 1,300 | 1,300 | 1,950 | 1,950 |
| Permit fee | 50 | 100 | 100 | 150 | 150 |
| Allowance to teachers | 100 | 200 | 200 | 300 | 300 |
| | 800 | 1,600 | 1,600 | 2,400 | 2,400 |
| (iii) *Fixed cost:* | | | | | |
| Block entrance fee at planetarium | 250 | 250 | 250 | 250 | 250 |
| Prizes to student for games | 250 | 250 | 250 | 250 | 250 |
| | 500 | 500 | 500 | 500 | 500 |
| (iv) *Total cost:* (i) + (ii) + (iii) | 1,900 | 3,300 | 3,900 | 5,300 | 5,900 |
| (b) Average cost (Rs) | 1,900 | 3,300 | 3,900 | 5,300 | 5,900 |
| per student | 30 | 60 | 90 | 120 | 150 |
| | = 66.63 | = 55 | = 43.33 | = 44.17 | = 39.33 |
| (c) Computation of break-even level: | | | | | |
| Collection per student | | 45 | | | |
| Variable cost per student | | 20 | | | |
| Contribution per student | | 25 | | | |

The semi-variable cost changes for every 50 students, fixed costs + semi-variable costs for three levels of students to be covered are as follows:

| | *Levels* | | |
|---|---|---|---|
| | *Upto 50 (Rs)* | *51 to 200 (Rs)* | *101 to 150 (Rs)* |
| Fixed costs (including semi-variable costs) | 1,300 | 2,100 | 2,900 |
| Contribution per student | 25 | 25 | 25 |
| Break-even point (number of students) | 52 | 84 | 116 |

The number of students required to break-even at the three levels, upto 50, 51 to 100 and 101 to 150 are 52, 84, and 116 respectively. The first level is only upto 50 students hence the figure of 52 students lies outside its level. However, the remaining figures 84 and 116 are within their prescribed levels. Hence, 84 and 116 students represent two break-even points.

## TYPES OF BUDGETS

Budgets are the end product of the budgeting process. The numbers and types of budgets in a business enterprise depend on the size and nature of the business. However, in a manufacturing concern, the following budgets are generally prepared:

(A) Operating and functional budgets:
1. Sales budget
2. Production budget
3. Production cost budget
   (i) Direct materials budget
   (ii) Direct labour budget
   (iii) Factory overhead budget
4. Ending inventories budget
5. Cost of goods sold budget
6. Selling expense budget
7. Administrative expense budget
8. Budgeted income statement

(B) Financial budgets:
1. Capital expenditure budget
2. Research and development budget
3. Cash budget
4. Budgeted balance sheet
5. Budgeted statement of changes in financial position.

### Sales Budget

The most important budget, which all other budgets are contingent upon, is the sales budget. All budgets, such as production budget, selling and distribution budget and others are all affected by the sales budget and are dependent upon the revenue derived from sales.

**ABC Company Ltd.**
**Sales Budget for the year Ending December 31, 2002**

| Products | Budgeted sales units | Budgeted sales price (Rs) | Total |
|---|---|---|---|
| A | 70,000 | 80,000 | 56,00,000 |
| B | 80,000 | 1,20,000 | 96,00,000 |
| Total | 1,50,000 | | 1,52,00,000 |

Fig. 19.1

### *Forecasting Sales*

Developing a sales budget requires forecasting future sales levels. The three main factors that should be considered by management in forecasting sales are: (a) information concerning past performance, (b) information about present conditions within the individual company and in each sales territory, and (c) data concerning the industry and general business conditions.

The information about past performance is the starting point for sales forecasting. The sales record for past years, and particularly for the year just ending should be available to management in minute detail.

The second essential step in forecasting sales is the accumulation of data regarding conditions within the company and in each sales territory. The management can obtain a good picture of sales prospects through information sent to the head office by salesmen, dealers, and sales officers of different territories.

Information about general business conditions are known as "business barometers" and they should be considered in preparing a sales forecast. The following are important business indicators:

1. Gross national product, which is the total market value of output of goods and services produced in the entire economy.
2. Personal income and purchasing power of the population.
3. Unemployment conditions.
4. Government crop reports.
5. Steel, coal and oil production.
6. Wholesale price indices.
7. Business failures.
8. Industrial production index.
9. Governmental policies.
10. Cyclical phases of the country's economy.

### *Sales Analysis*

After collecting all relevant information for a sales forecast, a sales analysis or budget is prepared. The sales budget is usually prepared on the lines of (i) product, (ii) territory, and (iii) customer.

## Production Budget

After preparing the sales budget, the production budget is prepared. A production budget is stated in physical units. it specifies the number of units of each product that must be produced to satisfy the sales forecasts and to achieve the desired level of closing finished goods inventory. Essentially, the production budget is the sales budget adjusted for inventory changes as follows:

Units to produce = Budgeted sales + Desired closing inventory of finished goods – Beginning inventory of finished goods

A specimen production budget in given in Fig. 19.2.

**ABC Company**
**Total Production Budget for the Month of December, 2002**

| | *Products* | |
|---|---|---|
| | A | B |
| Budgeted sales (units) | 70,000 | 80,000 |
| *Add:* Desired closing finished goods inventory | 20,000 | 30,000 |
| | 90,000 | 1,10,000 |
| *Less:* Beginning finished goods inventory | 40,000 | 50,000 |
| Units to be produced | 50,000 | 60,000 |

**Fig. 19.2** Production Budget

The production budget, like other budgets, is detailed by months or quarters along with a tentative annual budget. Further, budgets are prepared for every production centre for comparison with actual production.

## Production Cost Budget

A production cost budget summarises the materials budget, labour budget, the factory overhead budget, and may be expressed and analysed by departments and or products. A production cost budget, also known as a manufacturing budget is made up of three budgets: (i) materials, (ii) labour, and (iii) factory overhead.

### *Direct Materials Budget*

This budget specifies the cost of direct materials used and the cost of the direct materials purchased. Figure 19.3 explains the calculation of the direct materials budget. The usage part of the direct materials budget determines the cost of purchases of direct materials.

**ABC Company**
**Direct Materials Budget for the Year Ending December 2002**

*A. Usage Budget*

| | *Products* | | |
|---|---|---|---|
| | *A* | *B* | *Total* |
| Budgeted production in units | 50,000 | 60,000 | |
| Direct materials requirements | | | |
| Product A 5 kg per unit | × 5 | | |
| Product B 8 kg per unit | | × 8 | |
| Direct materials usage (kg) | 2,50,000 | 4,80,000 | |
| Cost per kg | Re 1.00 | Rs 1.50 | |
| Cost of direct materials used | Rs 2,50,000 | Rs 7,20,000 | Rs 9,70,000 |

*B. Purchase Budget*

| | *Direct material (in kg)* | | |
|---|---|---|---|
| | *A* | *B* | *Total* |
| Direct materials usage | 2,50,000 | 4,80,000 | |
| Budgeted closing direct materials inventory | + 50,000 | + 75,000 | |
| Total requirements | 3,00,000 | 5,55,000 | |

| | | | |
|---|---|---|---|
| Beginning direct materials inventory | 70,000 | 1,00,000 | |
| Purchase of direct materials | 2,30,000 | 4,55,000 | |
| Cost per kg | × Re 1.00 | × Rs 1.50 | |
| Cost of purchase | Rs 2,30,000 | Rs 6,82,500 | Rs 9,12,500 |

**Fig. 19.3** Direct Materials Budget

The direct materials budget is useful in the following ways:

1. It helps the purchasing department to prepare a schedule to ensure delivery of materials when needed.
2. It helps in fixing minimum and maximum levels of inventories in the stores department.
3. It helps the finance manager to determine the financial requirements to meet production targets.

The materials budget usually deals with direct materials only. Supplies and indirect materials are generally included in the factory overhead budget.

### *Direct Labour Budget*

The labour budget estimates the labour, adequate in number and grades, to enable the production budget to be achieved. It is generally preferable to prepare a separate direct labour budget and to include indirect labour in the factory overhead budget. The labour budget prepared must disclose the following information: (i) the number of each type or grade of worker required in each period to achieve the budgeted output; (ii) budgeted cost of such labour in each period; and (iii) period of training necessary for different types of workers.

Figure 19.4 illustrates the preparation of a direct labour budget.

**ABC Company**
**Direct Labour Budget for the Year Ending December 2002**

| | *Products* | | *Total* |
|---|---|---|---|
| | *A* | *B* | |
| Budgeted production requirements | 50,000 | 60,000 | |
| Direct labour hours per unit | 3 | 2 | |
| Total direct labour hours | 1,50,000 | 1,20,000 | 2,70,000 |
| Direct labour cost per hour | Rs 5.00 | Rs 5.00 | Rs 5.00 |
| Total direct labour cost (Rs) | Rs 7,50,000 | Rs 6,00,000 | Rs 13,50,000 |

**Fig. 19.4** Direct Labour Budget

### *Factory Overhead Budget*

The factory overhead budget is prepared on the basis of the chart of accounts which reflects different expense accounts and which properly classifies expenses accounts and details the cost centres or departments. Although expenses can be classified in different manners such as natural classification, variability, the preparation of the factory overhead budget requires that expenses should be classified by departments since expenses are incurred by various departments. In this way departmental heads should be held accountable for expenses incurred by their departments.

Figure 19.5 depicts the factory overhead budget where in overhead costs have been classified into fixed and variable components.

**ABC Company**
**Factory Overhead Budget for the Year Ending December 2002**
**(Based on budgeted capacity of 2,70,000 direct labour hours)**

| Items | Direct labour | Rate per direct hours Rs | Total cost Rs |
|---|---|---|---|
| A. *Variable factory overhead:* | | | |
| (i) Supplies | 2,70,000 | 1.00 | 2,70,000 |
| (ii) Repairs | 2,70,000 | 0.50 | 1,35.000 |
| (iii) Indirect labour | 2,70,000 | 1.00 | 2,70,000 |
| (iv) Others | 2,70,000 | 0.40 | 1,08,000 |
| Total variable factory overhead cost | | | 7,83,000 |
| B. *Fixed factory overhead cost:* | | | |
| (i) Supervision | | Rs 4,00,000 | |
| (ii) Depreciation | | 5,50,000 | |
| (iii) Property tax | | 2,50,000 | |
| (iv) Others | | 1,77,000 | |
| Total fixed factory overhead cost | | | 13,77,000 |
| Total factory overheads cost | | | 21,60,000 |

Predetermined overhead rate = Rs $\frac{21,60,000}{2,70,000}$ hours

= Rs 8.00 per direct labour hour

**Fig. 19.5** Factory Overhead Budget

**ABC Company**
**Ending Inventory Budget for the Year Ending December 2002**

| | | *Rs* |
|---|---|---|
| *Direct materials inventory* | | |
| Product A | 5,000 kg × Re 1.00 per kg | 50,000 |
| Product B | 75,000 kg × Rs 1.50 per kg | 1,12,500 |
| | | 1,62,500 |
| *Finished goods inventory* | | |
| Product A | 20,000 units × Rs 25.00 | 5,00,000 |
| Product B | 30,000 units × Rs 30.00 | 9,00,000 |
| | | 14,00,000 |

**Fig. 19.6** Ending Inventories Budget

## Ending Inventories Budget

An inventory budget can be prepared to find out the values of direct materials and finished goods inventory as shown in Fig. 19.6.

## Cost of Goods Sold Budget

After preparing direct materials, direct labour, factory overhead, and ending inventory budgets, the cost of goods sold budget can be prepared. The cost of goods sold budget summarises all the above budgets as shown in Fig. 19.7.

## Selling Expenses Budget

Closely related with the sales budget is the selling and distribution cost budget which shows the budgeted costs of promoting sales for the budget period. It is also known as the marketing expense budget. The selling cost budget is made up of a number of cost items, some of which are fixed and some variable. The principal fixed expenses are salaries and depreciation; the principal variable expenses are commissions, travel advertising and bad debts.

**ABC Company**
**Cost of Goods Sold Budget for the Year Ending Dec. 31, 2002**

| *Direct materials:* | *Rs* | *Rs* |
|---|---|---|
| Beginning inventory | 2,00,000 | |
| Purchases | 9,12,500 | |
| | 11,12,500 | |
| *Less:* Closing inventory | 1,62,500 | |
| Cost of direct materials used | | 9,50,000 |
| Direct labour | | 13,50,000 |
| Factory overhead | | 21,60,000 |
| Total factory cost | | 44,60,000 |
| Beginning finished goods inventory | | 25,00,000 |
| Total goods available for sale | | 69,60,000 |
| Closing finished goods inventory | | 14,00,000 |
| Cost of goods sold | | 55,60,000 |

**Fig. 19.7** Cost of Goods Sold Budget

Fig. 19.8 exhibits an annual selling expenses budget classified according to fixed and variable expenses. Separate budgets for each of these expenses may be prepared especially in the case of a large company.

**ABC Company**
**Selling Expense Budget for the Year Ending December 31, 2002**

| Items | Costs (Rs) | Total costs Rs |
|---|---|---|
| (A) *Variable selling expenses:* | | |
| (i) Sales commission | 35,000 | |
| (ii) Salary and wages | 40,000 | |
| (iii) Advertising | 15,000 | |
| (iv) Travelling | 22,000 | 1,12,000 |
| (B) *Fixed selling expenses:* | | |
| (i) Warehousing | 60,000 | |
| (ii) Advertising | 30,000 | |
| (iii) Marketing manager's salary | 60,000 | |
| (iv) Depreciation | 27,000 | |
| | | 1,77,000 |
| Total selling expenses | | 2,89,000 |

**Fig. 19.8** Selling Expenses Budget

## Administrative Expenses Budget

The administrative expenses budget covers the administrative costs for non-manufacturing business activities. The administrative expense budget contains expenses like directors' remuneration, legal charges, audit fees, salaries, rent, office expenses, interest, property taxes, postage, telephone, telegraph, etc. These expenses should be properly classified under different headings to determine the responsibility of cost incurrence and control. For example, these expenses can be classified into different categories such as company administration, general accounting, general office, etc. Figure 19.9 presents an administrative expense budget.

**ABC Company**
**Administrative Expenses Budget for the Year Ending December 31, 2002**

| Items | Amount Rs | Amount Rs |
|---|---|---|
| (A) Variable administrative expenses: | | |
| (i) Supplies | 35,000 | |
| (ii) Clerical wages | 60,000 | |
| Total variable administrative expenses | | 95,000 |
| Fixed administrative expenses: | | |
| (i) Director's remuneration | 1,20,000 | |
| (ii) Legal charges | 20,000 | |
| (iii) Depreciation | 25,000 | |
| (iv) Salaries | 30,000 | |
| (v) Rent | 60,000 | |
| (vi) Postage, telephone, etc. | 32,000 | |
| Total fixed administrative expenses | | 2,87,000 |
| Total administrative expenses | | 3,82,000 |

**Fig. 19.9** Administrative Expense Budget

## Budgeted Income Statement

A budgeted income statement summarises all the individual budgets, i.e., sales budget, cost of goods sold budget, selling budget, and administrative expense budget. No new estimates are made; figures are taken from budgets previously prepared. This budget determines income before taxes. If the tax rate is available, net income after taxes can also be computed. Figure 19.10 exhibits a budgeted or projected income statement.

## Capital Expenditure Budget

The budgeting of capital expenditure is one of the most important areas of managerial decisions. Capital expenditures represent long-term commitments. Also, the benefits of capital expenditure spread over a long period of time. Capital expenditure budgets are prepared for both short and long-range projects depending on the requirements of the business firm. Short-range projects are implemented during the current accounting period. Long-range projects are not executed in the current period, they are expressed only in general terms. They become budget commitments only when the time for their implementation approaches.

ABC Company
Budgeted Income Statement for the Year Ending December, 2002

| | | Rs |
|---|---|---|
| *Sales* | | 1,52,00,000 |
| Cost of goods sold | | 55,60,000 |
| Gross margin | | 96,40,000 |
| Selling expenses | 2,89,000 | |
| Administrative expenses | 3,82,000 | 6,71,000 |
| Income before taxes | | 89,69,000 |
| Income taxes (assuming 50%) | | 44,84,500 |
| Net Income | | 44,84,500 |

**Fig. 19.10** Budgeted Income Statement

## Research and Development Budget

The research and development budget is the most important tool for planning and controlling research and development costs. It compels management to think in advance about the fairness of these expenses both in total amounts and in each field of a research programme. It helps in coordination with the company's other plans and projects. Since the research and development programmes compete with other desirable activities in allocation of funds, coordination is needed to balance financially immediate and long-term company plans. Also, this budget guides the research and development department to plan correctly the staff and equipment requirements and special facilities needed for the work.

## Cash Budget

A cash budget contains detailed estimates of cash receipts (cash inflows) and disbursements (cash outflows) for the budget period or some other specific period. The preparation of a cash budget has the following objectives:

1. It indicates the effect on the cash position of seasonal requirements, large inventories, unusual receipts, and slowness in collecting receivables.
2. It indicates the cash requirements needed for a plant or equipment expansion programme.
3. It points up to the need for additional funds from sources such as bank loans or sales of securities and the time factors involved.
4. It indicates the availability of cash for taking advantage of discounts.
5. It assists in planning the financial requirements of bond redemption, income tax instalments, and payments to pensions and retirement funds.
6. It shows the availability of excess funds for short-term investments.

### *Period of Cash Budget*

The period of time covered by a cash budget depends on the type of business, management planning needs, and cash position. A cash budget many generally be related to the following time periods:

1. *Operational cash planning* Cash budgets may be prepared monthly, weekly or even daily to meet informational requirements of management.
2. *Short-range* Short-range cash budgeting is prepared annually and is in correspondence with the annual profit plan. It indicates cash inflows and outflows as generated by the annual profit plan.

3. *Long-range* Long-range budgeting does not disclose detailed estimates of revenue and expenses. The effects of business expansion and long-term trends are incorporated in long-range cash budgeting. Long-range cash projection is in accord with (i) the timing of the capital expenditure projects, and (ii) the timing of the long-range profit plan (usually five years).

### *Preparation of a Cash Budget*

A cash budget may be prepared by following either of the three generally accepted procedures:

1. The receipts and disbursements method.
2. The adjusted profit and loss or adjusted net income method.
3. Balance sheet method.

In the first method, all anticipated cash receipts are carefully forecasted such as cash sales, cash collections from debtors, dividends, interest on investments, proceeds from sale of assets, royalties, bank loans, etc. Likewise, cash disbursements for materials purchases, supplies, salaries, repayment of loans, dividends, taxes, expenses, purchases of plant or equipment are also determined. This method is useful for short-range cash projection but is not appropriate for long-term cash budgeting. This methods is in accord with the annual profit plan.

The second approach is the profit and loss or adjusted net income method. The starting point in this approach is budgeted profit reflected in the income statement. Basically, projected profit is converted from an accrual basis to a cash basis. That is, the budgeted profit of a period is adjusted for non-cash transactions and expected cash-oriented changes in asset and liability accounts not affected by profit calculations. Using the budgeted profit for a period as a starting point, various non-cash transactions are added back to net profit for the period. Non-cash items are depreciation, bad and doubtful accounts, expired insurance premiums, expenses, and income tax accruals. After this, anticipated decreases in assets or increase in liabilities are further added and anticipated increases in assets or decreases in liabilities are deducted. The budgeted cash at the end of a period is the cash balance at the beginning of the period plus the net cash increase (or minus the net cash decrease) as indicated in the analysis of the adjusted profit method.

The third approach is the balance sheet method. In this approach closing balances of all (budgeted) balance sheet items except cash and bank balances are found and put in a budgeted balance sheet. If the total of liabilities side items is more than the total of asset side items, the balancing figure will be cash/bank balance. On the contrary if the total of assets side items is more than the total of liabilities side items, the balancing figure will be bank overdraft or shortage in cash. Budgeted figures of closing balance sheet items can be found after adjusting the opening balance sheet items with the transactions anticipated for the year.

## Budgeted or Projected Balance Sheet

A projected balance sheet represents the expected financial position at a particular date. The projected balance sheet is prepared from the budgeted balance sheet at the beginning of the budget period and the expected changes in the account balances reflected in the operating budgets, capital expenditure budgets, and cash budget. The projected balance sheet also automatically determines the arithmetical accuracy of other budgets since they are used in preparing the forecasted balance sheet.

## Budgeted Statement of Changes in Financial Position

The projected statement of changes in financial position is usually prepared from data in the budgeted income statement and changes between the projected balance sheet at the beginning of the budget period

and projected balance sheet at the end of the budget period. This projected statement is very useful to management in the financial planning process.

### Master Budget

A master budget sometimes called a comprehensive budget, is the summary or total budget package for a business firm. It is the end product of the budget-making process. It shows the budgeted profit and loss account for the budget period and the budgeted balance sheet at the end of the period. It reveals the top management's goals of revenues, expenses, net income, cash flows, and financial position. The other budgets prepared by a business firm are specific, i.e. they deal with separate distinct activities of the organisation such as sales, production, selling and distribution and administrative activities. They incorporate plans and budgetory goals for a small segment of a business enterprise. However to achieve business objectives, it is necessary to have coordination among different budgets reflecting diverse activities of a business firm. For example, there should be coordination between sales and production departments and the goals of the production department should match the goals of the sales department. In the absence of coordination among the budgets, a business firm may have problems, such as surplus inventory, shortage of stock, non-availability of raw materials and other resources, employees dissatisfaction, etc. A master budget takes the macro (aggregate) view of the business enterprise and coordinates sales with production; raw materials, manpower, machinery and other resources with production targets, and the like. The master budget is an integrative tool that cuts across divisional boundaries in order to coordinate the firms' diverse activities. While master budgets provide plans for an entire system, operating budgets provide plans for the organisation's sub-system, that is, operating budgets constitute the building blocks used to complete the master budget.

## REVISION OF BUDGETS

As stated earlier in the chapter, successful budgets should have adequate flexibility to meet changing business conditions. Since budgets are used for planning, operation, coordination and control, they should be revised if changes occur in the environment. Revision of budgets may be necessary due to the following factors some of which might have been considered earlier in the development of budgets:

1. Errors committed in preparing the budgets which may subsequently be known.
2. Emergence of unforeseen and unanticipated situations which may cause the budget to be revised.
3. Changes in internal factors, e.g. production, forecast, capacity utilisation, etc.
4. Changes in external factors, e.g., market trends, nature of the economy, prices of inputs and resources, consumers' tastes and fashions.

Changes in the above factors do not affect a firm's budgets if they are of minor significance. Some changes, however, considerably affect budgets and in this situation management is faced with two problems:

1. Whether only individual budgets should be changed; and
2. Whether the master budget be changed.

Regarding the first question, most business firms are in agreement and suggest that specific individual budgets should be changed. For instance, if there is likely to be a significant change in expected sales (increase or decrease), production and purchasing departments should be informed about this to avoid over-stocking or under-stocking.

A reversion of the master budget is debatable and sometimes is opposed mainly on two counts: (i) the master budget process is highly complex and expensive; (ii) the evaluation process may take care of these changes if the changes take place. The second argument is more or less on middle ground. While it argues for revision when changes do occur, it focuses on actual effects rather than projected changes. It is felt that this avoids making small changes in the plan that are of little consequence. Those who support the revision of the master budget argue that the revised budget is a better and more effective basis for performance evaluation and control. By revising budget, all members of the organisation come to know of the expectations and standards for which they will accountable.

### *Example 19.11 (Materials Requirement)*

Bala Company expects to sell 84,000 units of finished goods over the next 3-months period. The company currently has 44,000 units of finished goods on hand and wishes to have an inventory of 48,000 units at end of the 3-month period. To produce 1 unit of finished goods requires 4 units of raw materials. The company currently has 2,00,000 units of raw materials on hand and wishes to have an inventory of 2,20,000 units of raw materials on hand at the end of the 3-months period. How many units of raw materials must the Bala Company. Purchase during the 3-months period?

*Solution*

*Material Requirements*

| | | | | | | |
|---|---|---|---|---|---|---|
| Finished units to be produced | = | (84,000 units) to be sold | + | (48,000 units in) Ending inventory | − | (44,000 units) Beginning inventory |
| Units to be produced | = | 88,000 | | | | |
| Units of raw materials to be used | = | 4 units of raw materials per Finished unit × 88, 000 units = 3,52,000 | | | | |
| Units of raw materials to be purchased | = | 3,52,000 units to be used | + | 2,20,000 units desired in ending inventory | − | 2,00,000 units in beginning inventory |
| | = | 3,72,000 units | | | | |

### *Example 19.12 (Production Budget)*

Gama Engineering Company Limited manufactures two products X and Y. An estimate of the number of units expected to be sold in the first seven months of 2001 is given below:

| | *Product X* | *Product Y* |
|---|---|---|
| January 2001 | 500 | 1,400 |
| February | 600 | 1,400 |
| March | 800 | 1,200 |
| April | 1,000 | 1,000 |
| May | 1,200 | 800 |
| June | 1,200 | 800 |
| July | 1,000 | 900 |

It is anticipated that:

1. There will be no work-in-progress at the end of any month; and
2. Finished units equal to half and anticipated sales for the next month will be in stock at the end of each month (including December 2000).

The budgeted production and production costs for the year ending 31st December, 2001 are as follows:

| | *Product X* | *Product Y* |
|---|---|---|
| Production (units) | 11,000 | 12,000 |
| Direct materials per unit (Rs) | 12 | 19 |
| Direct wages per unit (Rs) | 5 | 7 |
| Direct manufacturing charges apportionable to each type of product (Rs) | 33,000 | 48,000 |

You are required to prepare:

(a) A production budget showing the number of units to be manufactured each month.

(b) A summarised production cost budget for the six-month period January to June 2001.

*Solution*

**Gama Engineering Company Limited**

**(a) Production Budget (in Units) for the Six Months Ending 30th June, 2001**

| | *Jan.* | *Feb.* | *March* | *April* | *May* | *June* |
|---|---|---|---|---|---|---|
| Product X | | | | | | |
| Closing stock | 300 | 400 | 500 | 600 | 600 | 500 |
| Sales | 500 | 600 | 800 | 1,000 | 1,200 | 1,200 |
| | 800 | 1,000 | 1,300 | 1,600 | 1,800 | 1,700 |
| *Less:* Opening stock | 250 | 300 | 400 | 500 | 600 | 600 |
| Production (in units) | 550 | 700 | 900 | 1,100 | 1,200 | 1,100 |
| Product Y | | | | | | |
| Closing stock | 700 | 600 | 500 | 400 | 400 | 450 |
| Sales | 1,400 | 1,400 | 1,200 | 1,000 | 800 | 800 |
| | 2,100 | 2,000 | 1,700 | 1,400 | 1,200 | 1,250 |
| *Less:* Opening stock | 700 | 700 | 600 | 500 | 400 | 400 |
| Production (in units) | 1,400 | 1,300 | 1,100 | 900 | 800 | 850 |

**(b) Summarised Production Cost Budget for the Six Months Ending 30th June, 2001**

| | *X* | | *Y* | |
|---|---|---|---|---|
| Production (in units) | 5,550 | | 6,350 | |
| | *Unit cost* | *Total cost* | *Unit cost* | *Total cost* |
| Direct materials | Rs 12 | Rs 66,600 | Rs 19 | Rs 1,20,650 |
| Direct wages | 5 | 27,750 | 7 | 44,450 |
| Manufacturing charges | 3 | 16,650 | 4 | 25,400 |
| | 20 | 1,11,000 | 30 | 1,90,500 |

***Example 19.13***

A single product company estimated its sales for the next year quarterwise as under:

| *Quarter* | *Sales Units* |
|---|---|
| I | 30,000 |
| II | 37,500 |
| III | 41,250 |
| IV | 45,000 |

The opening stock of finished goods is 10,000 units and the company expects to maintain the closing stock of finished goods at 16,250 units at the end of the year. The production pattern in each quarter is based on 80% of the sales of the current quarter and 20% of the sales of the next quarter.

The opening stock of raw materials in the beginning of the year is 10,000 kg and the closing stock at the end of the year is required to be maintained at 5,000 kg. Each unit of finished output required 2 kg of raw materials.

The company proposes to purchase the entire annual requirement of raw materials in the first three quarters in the proportion and at the prices given below:

| *Quarter* | *Purchase of raw materials % to total annual requirement in quantity* | *Price per kg Rs* |
|---|---|---|
| I | 30% | 2 |
| II | 50% | 3 |
| III | 20% | 4 |

The value of the opening stock of raw materials in the beginning of the year is Rs 20,000. You are required to present the following for the next year, quarterwise:

(i) Production budget in units.
(ii) Raw material consumption budget in quantity.
(iii) Raw material purchase budget in quantity and value.
(iv) Priced stores ledger card of the raw material using First in First out method.

*(CA Inter, May 1995)*

*Solution*

**Basic Calculations**

**Total Annual Production (In Units)**

| | |
|---|---|
| Sales in 4 Quarters (units) | 1,53,750 |
| *Add:* Desired Closing Balance (units) | 16,250 |
| | 1,70,000 |
| *Less:* Opening Balance (units) | 10,000 |
| Total Number of units to be produced in the next year | 1,60,000 |

**(i) Production Budget (In Units)**

| *Quarters* | *I Units* | *II Units* | *III Units* | *IV Units* | *Total Units* |
|---|---|---|---|---|---|
| Sales | 30,000 | 37,500 | 41,250 | 45,000 | 1,53,750 |
| Production in Current Quarter *(80% of the sale of current quarter)* | 24,000 | 30,000 | 33,000 | 36,000 | |
| *Quarters* | *I Units* | *II Units* | *III Units* | *IV Units* | *Total Units* |
| Production for Next Quarter *(20% of the sale of next quarter)* | 7,500 | 8,250 | 9,000 | 12,250* | |
| Total Production | 31,500 | 38,250 | 42,000 | 48,250* | 1,60,000 |

*Difference in Balancing Figure.

**(ii) Raw Material Consumption Budget (In Quantity)**

| *Particulars* | *Quarters* | | | | *Total* |
|---|---|---|---|---|---|
| | *I* | *II* | *III* | *IV* | |
| Units to be produced in each Quarter (1) | 31,500 | 38,250 | 42,000 | 48,250 | 1,60,000 |
| Raw material consumption per unit (kg) (2) | 2 | 2 | 2 | 2 | |
| Total raw material consumption (kg) (1 × 2) | 63,000 | 76,500 | 84,000 | 96,500 | 3,20,000 |

**(iii) Raw Material Purchase Budget (In Quantity)**

| | |
|---|---|
| Raw Material Required for Production (kg) | 3,20,000 |
| *Add:* Desired Closing Balance of Raw Material (kg) | 5,000 |
| | 3,25,000 |
| *Less:* Opening Balance (kg) | 10,000 |
| Material to be Purchased (kg) | 3,15,000 |

**Raw Material Purchase Budget (In Value)**

| *Quarters* | *% of Annual Requirement (Qty.) for Purchasing Raw Material* | *Quantity of Raw Material to be purchased (kg)* | *Rate per Kg (Rs)* | *Amount (Rs)* |
|---|---|---|---|---|
| *1* | *2* | *3* | *4* | *5 = 3 × 4* |
| I | 30 | 94,500 (3,15,000 × 30% | 2 | 1,89,000 |
| II | 50 | 1,57,500 (3,15,000 × 50%) | 3 | 4,72,500 |
| III | 20 | 63,000 (3,15,000 × 20%) | 4 | 2,52,000 |
| Total | | 3,15,000 | | 9,13,500 |

**(iv) Priced Stores Ledger Card**
**(*of the raw material using FIFO method*)**

| *Particulars* | *Quarters* | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *I* | | | *II* | | | *III* | | | *IV* | | |
| | *Kg* | *Rate Rs* | *Value Rs* | *Kg* | *Rate Rs* | *Value Rs* | *Kg* | *Rate Rs* | *Value Rs* | *Kg* | *Rate Rs* | *Value Rs* |
| Opening Balance: (1) | 10,000 | 2 | 20,000 | 41,500 | 2 | 83,000 | 1,22,500 | 3 | 3,67,500 | 38,500 | 3 | 1,15,500 |
| | | | | | | | | | | 63,000 | 4 | 2,52,000 |
| Purchases: (2) | 94,500 | 2 | 1,89,000 | 1,57,500 | 3 | 4,72,500 | 63,000 | 4 | 2,52,000 | | | |
| Consumption: (3) | 63,000 | 2 | 1,26,000 | 41,500 | 2 | 83,000 | 84,000 | 3 | 2,52,000 | 38,500 | 3 | 1,15,500 |
| | | | | 35,000 | 3 | 1,05,000 | | | | 58,000 | 4 | 2,32,000 |
| Balance: (4) | 41,500 | 2 | 83,000 | 1,22,500 | 3 | 3,67,500 | 38,500 | 3 | 1,15,500 | 5,000 | 4 | 20,000 |
| (4) = (1) + (2) – (3) | | | | | | | 63,000 | 4 | 2,52,000} | | | |

***Example 19.14***

P Ltd. manufactures two products using one type of material and one grade of labour. Shown below is an extract from the company's working papers for the next period's budget:

| *Particulars* | *Product A* | *Product B* |
|---|---|---|
| Budgeted sales (unit) | 3,600 | 4,800 |
| Budgeted material consumption per product (kg) | 5 | 5 |
| Budgeted material cost Rs 12 per kg | | |
| Standard hours allowed per product | 5 | 4 |
| Budgeted wage rate Rs 8 per hour | | |

Overtime premium is 50% and is payable, if a worker works for more than 40 hours a week. There are 90 direct workers.

The target productivity ratio (or efficiency ratio) for the productive hours worked by the direct workers in actually manufacturing the products is 80%; in addition the non-productive downtime is budgeted at 20% of the productive hours worked.

There are twelve 5-day weeks in the budget period and it is anticipated that sales and production will occur evenly throughout the whole period.

It is anticipated that stock at the beginning of the period will be:

Product *A* 1,020 units: Product *B* 2,400 units; Raw material 4,300 kgs.

The target closing stock, expressed in terms of anticipated activity during budget period are: product *A* 15 days sales; Product *B* 20 days sales; Raw material 10 days consumption.

*Required:*

Calculate (a) the material purchases budget, and (b) the wages budget for the direct workers, showing the quantities and values, for the next period. *(CA Inter, Nov. 1995)*

*Solution*

**Material Purchase Budget**
**(*In quantities and Value*)**

| *Products* | *A* | *B* | *Total* |
|---|---|---|---|
| Budgeted Production in units (*WN 2*) | 3.480 | 4,000 | |
| Material Consumption (kg) | (3,480 units × 5 kg) | (4,000 units × 3 kg) | |
| | 17,400 | 12,000 | 29,400 |
| *Add:* Closing balance of material (kg) (*WN 3*) | | | 4,900 |
| | | | 34,300 |
| *Less:* Anticipated Opening Balance of Material (kg) | | | 4,300 |
| Total Quantity of Material (kg) to be purchased | | | 30,000 |
| Total Value of Material to be purchased (Rs) (30,000 kg × Rs 12) | | | 3,60,000 |

**Direct Workers Wages Budget**
**(*showing hours required and wages paid*)**

| *Products* | *A* | *B* | *Total* |
|---|---|---|---|
| Budgeted Production in units (*WN 2*) | 3,480 | 4,000 | |
| Standard hours for | (3,480 units × 5 hrs.) | (4,000 units × 4 hrs.) | |
| Budgeted production | 17,400 | 16,000 | 33,400 |
| Standard Hours for Budgeted Production at | | | |
| Targeted Efficiency Ratio (A) (*WN 4*) | | | 41,750 |
| *Add:* Non-productive Downtime to (A) (20% × 41.750 hours) | | | 8,350 |

*(con'd.)*

| *Products* | *A* | *B* | *Total* |
|---|---|---|---|
| Total Labour Hours Required | | | 50,100 |
| *Less:* Normal Labour Hours (90 workers × 12 weeks × 5 days × 8 hours) | | | 43,200 |
| Difference (Overtime hours) | | | 6,900 |
| Wages for Normal Hours (Rs) (43,200 hours × Rs 8) | | | 3,45,600 |
| Overtime Wages (Rs) (6,900 × Rs 12) | | | 82,800 |
| Total Wages | | | 4,28,400 |

**Working Notes:**

1. *Computation of Closing Stock Balance of Products A and B*

Budgeted Period of Sales (in days) = 12 weeks × 5 days = 60 days.

$$\text{Closing Stock of Product } A \text{ (units)} = \text{(15 days sales)} = \frac{3{,}600 \text{ units} \times 15 \text{ days}}{60 \text{ days}}$$

$$= 900 \text{ units}$$

2. Closing Stock of Product (units) = (20 days sales)

$$= \frac{4{,}800 \text{ units} \times 20 \text{ days}}{60 \text{ days}}$$

$$= 1{,}600 \text{ units}$$

| *Products* | *Production Budget (Units)* | |
|---|---|---|
| | *A* | *B* |
| Sales in units (60 days) | 3,600 | 4,800 |
| *Add:* Closing Stock (*WN 1*) | 900 | 1,600 |
| | 4,500 | 6,400 |
| *Less:* Anticipated Opening Balance | 1,020 | 2,400 |
| Total Number of Units to be produced | 3,480 | 4,000 |

3. Closing Balance of Material (kg)

$$\text{Closing Balance of Material} = \frac{\text{Total Material Consumption}}{60 \text{ days}} \times 10 \text{ days}$$

$$= \frac{29{,}400 \text{ kg}}{60 \text{ days}} \times 10 \text{ days}$$

$$= 4{,}900 \text{ kg}$$

4. Standard Hours for Budgeted Production = 33,400

5. Standard Hours for Budgeted Production at targeted 80% efficiency ratio

$$= \frac{33{,}400 \text{ Hrs.}}{80} \times 100$$

$$= 41{,}750 \text{ hrs}$$

***Example 19.15***

The following data pertains to Mr. *Y* for the month budget for November 2000:

| | Rs |
|---|---|
| Direct materials used | 847 |
| Beginning finished goods inventory | ? |

| | |
|---|---|
| Ending finished goods inventory | 94 |
| Direct manufacturing labour | 389 |
| Manufacturing overhead | ? |
| Cost of goods manufactured | 1,878 |
| Cost of goods sold | ? |
| Cost of goods available for sale | 1,949 |

Prepare the cost of goods sold budget for the month of Nov. 2000 by filling the missing figures.
*(B. Com. (Hons), Delhi 2001)*

*Solution*

| | Rs |
|---|---|
| Direct material used | 847 |
| Beginning finished goods inventory | ? |
| Ending finished goods inventory | 94 |
| Direct manufacturing labour | 389 |
| Manufacturing overhead | ? |
| Cost of goods manufactured | 1878 |
| Cost of goods sold | ? |
| Cost of goods available for sale | 1949 |

As, we know that cost of goods manufactured is the aggregate of Direct material, Direct manufacturing labour and Manufacturing overhead.

∴ Rs 1878 = Rs 847 + 389 + Manufacturing overhead

∴ Rs 1878 – 847 – 389 = Manufacturing overhead

∴ Rs 642 = Manufacturing overhead

Cost of goods available for sale = Cost of goods manufactured + Opening balance of finished goods.

Rs 1949 = Rs 1878 + Opening balance of finished goods

Rs 1949 – Rs 1878 = Opening balance of finished goods

Rs 71 = Opening balance of finished goods.

Cost of goods sold = Cost of goods manufactured + Opening balance of finished goods – Closing balance of finished goods

Cost of goods sold + Rs 1878 + Rs 71 – Rs 94

Cost of goods sold = Rs 1855

**Cost of goods sold budget for the month of November, 2000**

| | | Rs |
|---|---|---|
| | Direct material used | 847 |
| | Direct manufacturing labour | 389 |
| | Manufacturing overhead | 642 |
| | Cost of goods manufactured | 1878 |
| *Add:* | Opening balance of finished goods | 71 |
| | Cost of goods available for sale | 1949 |
| *Less:* | Closing stock of finished goods | 94 |
| | Cost of goods sold | 1855 |

***Example 19.16***

Nestley Ltd. has prepared the following sales budget for the first five months of 1998:

| | *Sales Budget (Units)* |
|---|---|
| January | 10,800 |
| February | 15,600 |
| March | 12,200 |
| April | 10,400 |
| May | 9,800 |

Inventory of finished goods at the end of every month is to be equal to 25% of sales estimate for the next month. On 1st Jan., 1998, there were 2,700 units of product on hand. There is no work-in-progress at the end of any month.

Every unit of product requires two types of materials in the following quantities:

Material *A*—4 kg

Material *B*—5 kg.

Materials equal to one half of the requirement of next month's production are to be in hand at the end of every month. This requirement was met on 1st Jan., 1998.

Prepare the following budgets for the quarter ending 31st March, 1998:

(a) Production Budget (Quantitative)

(b) Material Purchase Budget (Quantitative). *(B. Com. (Hons), Delhi 1999)*

*Solution*

**Nestley Ltd.**
**Production Budget (In Units)**
*For quarter ending 31st March, 1998*

| *Particulars* | *Jan.* | *Feb.* | *March* |
|---|---|---|---|
| Sales | 10,800 | 15,600 | 12,200 |
| *Add:* Closing Stock | 3,900 | 3,050 | 2,600 |
| | 14,700 | 18,650 | 14,800 |
| *Less:* Opening Stock | 2,700 | 3,900 | 3,050 |
| | 12,000 | 14,750 | 11,750 |

**Materials Requirement Budget**
*For the quarter ending 31st March, 1998*

| *Particulars* | *Jan.* | *Feb.* | *March* |
|---|---|---|---|
| Production (units) | 12,000 | 14,750 | 11,750 |
| *Material A* | *Kg* | *Kg* | *Kg* |
| Required for Production | 48,000 | 59,000 | 47,000 |
| *Add:* Desired Closing Stock | 28,500 | 23,500 | 20,500 |
| | 76,500 | 82,500 | 67,500 |
| *Less:* Opening Stock | 24,000 | 28,500 | 23,500 |
| | 52,500 | 54,000 | 44,000 |

*(contd.)*

| | | | |
|---|---|---|---|
| *Material B* | | | |
| Required for Production | 60,000 | 73,750 | 58,750 |
| *Add:* Desired Closing Stock | 36,875 | 29,375 | 25,625 |
| | 96,875 | 1,03,125 | 84,375 |
| *Less:* Opening Stock | 30,000 | 36,875 | 29,375 |
| | 66,875 | 66,250 | 55,000 |

**Working Notes:**

1. Production for April in Units

| | |
|---|---|
| Sales | 10,400 |
| *Add:* Closing Stock | 2,450 |
| | 12,850 |
| *Less:* Opening Stock | 2,600 |
| | 10,250 |

2. Material required for Production in April
   *A* 10,250 × 4 = 41,000 kg
   *B* 10,250 × 5 = 51,250 kg

***Example 19.17***

The following are the estimated sales of a company for eight months ending 30.11.1998:

| *Months* | | *Estimated Sales (units)* |
|---|---|---|
| April | 1998 | 12,000 |
| May | 1998 | 13,000 |
| June | 1998 | 9,000 |
| July | 1998 | 8,000 |
| August | 1998 | 10,000 |
| September | 1998 | 12,000 |
| October | 1998 | 14,000 |
| November | 1998 | 12,000 |

As a matter of policy, the company maintains the closing balance of finished goods and raw materials as follows:

| Stock item | Closing balance of a month |
|---|---|
| Finished goods | 50% of the estimated sales for the next month |
| Raw materials | Estimated consumption for the next month. |

Every unit of production requires 2 kg of raw material costing Rs 5 per kg.

Prepare Production Budget (in units) and Raw Material Purchase Budget (in units and cost) of the company for the half year ending 30 September, 1998. *(ICWA Inter, June 1999)*

*Solution*

**Production Budget (In Units)**
*(for the half-year ending 30th September, 1998)*

| *Month 1998* | *Sales (in units)* | *Closing Balance 50% of the estimated Sales for the next month* | *Opening balance* | *Production* |
|---|---|---|---|---|
| *1* | *2* | *3* | *4* | *5 = (2) + (3) – (4)* |
| April | 12,000 | 6,500 | 6,000 | 12,500 |
| May | 13,000 | 4,500 | 6,500 | 11,000 |
| June | 9,000 | 4,000 | 4,500 | 8,500 |
| July | 8,000 | 5,000 | 4,000 | 9,000 |
| August | 10,000 | 6,000 | 5,000 | 11,000 |
| September | 12,000 | 7,000 | 6,000 | 13,000 |
| | 64,000 | | | 65,000 |

**Purchase Budget (In Cost and Units)**
*(for the half-year ending 30th September, 1998)*

| *Month 1998* | *Production in units* | *Consumption (2 kg per unit)* | *Closing Balance* | *Opening Balance* | *Purchase in kg* | *Rate Rs* | *Amount Rs* |
|---|---|---|---|---|---|---|---|
| April | 12,500 | 25,000 | 22,000 | 25,000 | 22,000 | 5 | 1,10,000 |
| May | 11,000 | 22,000 | 17,000 | 22,000 | 17,000 | 5 | 85,000 |
| June | 8,500 | 17,000 | 18,000 | 17,000 | 18,000 | 5 | 90,000 |
| July | 9,000 | 18,000 | 22,000 | 18,000 | 22,000 | 5 | 1,10,000 |
| August | 11,000 | 22,000 | 26,000 | 22,000 | 26,000 | 5 | 1,30,000 |
| Sept. | 13,000 | 26,000 | 26,000 | 26,000 | 26,000 | 5 | 1,30,000 |
| | 65,000 | 130,000 | | | | | 6,55,000 |

***Example 19.18 (Production Cost Budget)***

The following are the details of the budgeted and the actual cost in a factory for six months from January to June 2002. From the figures given below you are required to prepare the production cost budget for the period from January to June 2003.

| | *January-June 2002* | |
|---|---|---|
| | *Budget* | *Actual* |
| Production (units) | 20,000 | 18,000 |
| Material cost | Rs 40,00,000 (2000 MT @ Rs 2,000) | 39,90,000 (@ Rs 2,100) |
| Labour cost | Rs 8,00,000 (@ Rs 20 per hour) | Rs 7,99,200 (@ Rs 22 per hour) |
| Variable overheads | Rs 2,40,000 | Rs 2,16,000 |
| Fixed overheads | Rs 4,00,000 | Rs 4,20,000 |

In the first half of 2003, production is budgeted for 25,000 units. Material cost per unit will increase from last year actual by Rs 100 but it is proposed to maintain the consumption efficiency of 2002 budgeted.

Labour efficiency will be lower by another 1% and labour rates will be Rs 22 per hour.

Variable and fixed overheads will go up by 20% over 2002 actuals.

You are required to prepare the production cost budget for the period January-June 2003 giving all the workings.

*Solution*

**Production Cost Budget for the Six Months Ending 30th June, 2003**

| *Production* | *25,000 units* | |
|---|---|---|
| | *Total cost* | *Unit cost* |
| Material cost (see Note 1) | Rs 55,00,000 | Rs 220.00 |
| Labour cost (see Note 2) | 11,22,000 | 44.88 |
| Variable overheads (see Note 3) | 3,60,000 | 14.40 |
| Fixed overheads (see Note 4) | 5,04,000 | 20.16 |
| Total | 74,86,000 | 299.44 |

**Working Notes:**

1. Material cost

   Consumption per unit $\frac{2,000}{20,000} = 0.10$ mt

   Consumption for 25,000 units = 2,500 mt

   Cost of 2,500 mt @ Rs 2,200 per mt = Rs 55,00,000

2. Labour cost

| | Hr |
|---|---|
| 2002: Total budgeted labour hours $\frac{8,00,000}{20}$ | 40,000 |
| Labour hour budgeted for each unit $\frac{40,000}{20,000}$ | 2 |
| Actual time paid for $\frac{7,99,920}{22}$ | 36,360 hrs |
| Less: Standard labour hours for 18,000 units | 36,000 |
| Extra time taken (i.e. 1% extra) 2003 | 360 |
| Time required for 25,000 units | 50,000 |
| *Add:* 2% for lower efficiency | 1,000 |
| | 51,000 |
| 51,000 hr at Rs 22 per hour | Rs 11,22,000 |

3. Variable overheads:

| | |
|---|---|
| Rate per unit in 2002 $\frac{2,40,000}{20,000}$ = Rs 12 | |
| Cost for 25,000 @ 2002 rates | 3,00,000 |
| *Add:* 20% | 60,000 |
| | 3,60,000 |

4. Fixed overheads:

| | |
|---|---|
| Actual in 2002 | 4,20,000 |
| *Add:* 20% | 84,000 |
| | 5,04,000 |

### *Example 19.19 (Sales Overhead Budget)*

You are requested to prepare a sales overhead budget from the estimates given below:

| | |
|---|---|
| Advertisement | Rs 2,500 |
| Sales of the sales department | 5,000 |
| Expenses of sales department | 1,500 |
| Counter salesmen's salaries and dearness allowance | 6,000 |

Commission to counter salesmen at 1% on their sales

Travelling salesmen's commission at 10% on their sales and expenses at 5% on their sales.

The sales during the period were estimated as follows:

| *Counter sales* | *Travelling salesmen* |
|---|---|
| Rs 80,000 | Rs 10,000 |
| 1,20,000 | 15,000 |
| 1,40,000 | 20,000 |

*(B. Com. (Hons), Delhi.)*

*Solution*

**Sales Overhead Budget for the Period Ending**

| | *Estimated sales* | | |
|---|---|---|---|
| | *Rs 90,000* | *Rs 1,35,000* | *Rs 1,60,000* |
| Fixed overheads: | | | |
| Advertisement | 2,500 | 2,500 | 2,500 |
| Salaries of sales department | 5,000 | 5,000 | 2,500 |
| Expenses of sales department | 1,500 | 1,500 | 1,500 |
| Counter salesmen's salaries and DA | 6,000 | 6,000 | 6,000 |
| | 15,000 | 15,000 | 15,000 |
| Variable overheads: | | | |
| Counter salesmen's commission @ 1% on sales | 800 | 1,200 | 1,400 |
| Travelling salesmen's commission @ 10% | 1,000 | 1,500 | 2,000 |
| Expenses @ 5% | 500 | 750 | 1,000 |
| | 2,300 | 3,450 | 4,400 |
| Total sales overheads | 17,300 | 18,450 | 19,400 |

### *Example 19.20 (Cash Receipts Budget)*

A company normally collects cash from credit customers as follows: 50 percent in the month of sale, 30 per cent in the first month after sale, 18 per cent in the second month after sale, and 2 per cent are never collected. Sales, all on credit, are expected to be as follows:

| | *Rs* |
|---|---|
| January | 5,00,000 |
| February | 6,00,000 |
| March | 4,00,000 |
| April | 5,00,000 |

(a) Calculate the amount of cash expected to be received from customers during March.
(b) Calculate the amount of cash expected to be received from customers during April.

*Solution*

| | *Rs* |
|---|---|
| (a) Budgeted cash collection in March: | |
| From January sales (.18 × 5,00,000) | 90,000 |
| From February sales (.30 × 6,00,000) | 1,80,000 |
| From March sales (.50 × 4,00,000) | 2,00,000 |
| Total Budgeted Collections in March | 4,70,000 |
| (b) Budgeted cash collections in April: | |
| From February sales (.18 × 6,00,000) | 1,08,000 |
| From March sales (.30 × 4,00,000) | 1,20,000 |
| From April sales (.50 × 5,00,000) | 2,50,000 |
| Total budgeted collections in April | 4,78,000 |

***Example 19.21 (Cash Budget)***

The January 1 cash balance of the Jay Company is Rs 5,000. Sales for the first four months of the year are expected to be as follows: January, Rs 65,000; February, Rs 54,000; March, Rs 66,000; and April, Rs 63,000. On January 1, uncollected amounts for November and December of the previous year are Rs 13,500 and Rs 39,150, respectively. Collections from customers follow this pattern; 55% in the month of sale, 30% in the month following the sale, 13% in the second month following the sale, and 2% uncollectable.

Materials purchases for December were Rs 10,000. Forecast purchases for the coming year are: Rs 12,500; February, Rs 16,500; March, Rs 13,000; and April, Rs 14,000. Purchases are usually paid by the 10th of the month following the month of purchase. Other cash expenditures of Rs 41,000 are forecasted for each month.

*Calculate:*

(i) Expected cash collection during February
(ii) Expected cash balance, February 1
(iii) Expected cash balance, February 29.

*Solution*

**Cash Budget of Jay Company for Months of January and February**

| | *January (Rs)* | *February (Rs)* |
|---|---|---|
| Opening Balance | 5,000 | 27,550 |
| Receipts—From customers | 73,550 | 60,510 |
| (A) | 78,550 | 88,060 |
| Payments: | | |
| For purchases | 10,000 | 12,500 |
| Other expenditure | 41,000 | 41,000 |
| Total Payments (B) | 51,000 | 53,500 |
| Closing Balance (A) – (B) | 37,550 | 34,560 |

Thus;

(i) Expected cash collections during February = Rs 60,510
(ii) Expected cash balance-February 1 = Rs 27,550
(iii) Expected cash balance-February 29 = Rs 34,560

**Working Note:**

Collections on account of sales

*January*

| | |
|---|---|
| For November arrears 13,500 × 13/15 | = Rs 11,700 |
| For December arrears $\frac{39,150}{45} \times 30$ | = 26,100 |
| For January sales 65,000 × 55/100 | = 35,750 |
| | 73,550 |

*February*

| | |
|---|---|
| For December arrears $\frac{39,150}{45} \times 13$ | = Rs 11,310 |
| For January sales 65,000 × 30/100 | Rs 19,500 |
| For February sales 54,000 × 55/100 | = 29,700 |
| | 60,510 |

***Example 19.22 (Cash Budget)***

ABC Co. wished to arrange overdraft facilities with its bankers during the period April to June 2001 when it will be manufacturing mostly for stock. Prepare a cash budget for the above period from the following data, indicating the extent of the bank facilities the company will require at the end of the each month:

| *(a)* | *Sales* Rs | *Purchases* Rs | *Wages* Rs |
|---|---|---|---|
| February | 1,80,000 | 1,24,800 | 12,000 |
| March | 1,92,000 | 1,44,000 | 14,000 |
| April | 1,08,000 | 2,43,000 | 11,000 |
| May | 1,74,000 | 2,46,000 | 10,000 |
| June | 1,26,000 | 2,68,000 | 15,000 |

(b) 50 per cent of the credit sales are realised in the month following the sales and the remaining 50 per cent in the second month following. Creditors are paid in the month of purchase.

(c) Cash at Bank on 1.4.2001 (estimated) Rs 25,000.

*Solution*

**ABC Co.**

**Cash Budget for April to June 2001**

| | *April* Rs | *May* Rs | *June* Rs |
|---|---|---|---|
| Opening balance (Overdraft) | 25,000 | 56,000 | (47,000) |
| Receipts: | | | |
| Collections from debtors | 1,86,000 | 1,50,000 | 1,41,000 |
| | 2,11,000 | 2,06,000 | 94,000 |
| Payments: | | | |
| Payments to creditors | 1,44,000 | 2,43,000 | 2,46,000 |
| Wages | 11,000 | 10,000 | 15,000 |
| Closing balance (Overdraft) | 56,000 | (47,000) | (1,67,000) |
| | 2,11,000 | 2,06,000 | 94,000 |

The overdraft facilities required by ABC Co. for different months are as under:

| | |
|---|---|
| (i) In May 2001 | Rs 47,000 |
| (ii) In June 2001 | 1,67,000 |

**Working Notes:**

Collections from Debtors

| | *Rs* | |
|---|---|---|
| *April 2001* | | |
| Sales for February | 1,80,000 × 1/2 | 90,000 |
| Sales for March | 1,96,000 × 1/2 | 96,000 |
| | | 1,86,000 |
| *May 2001* | | |
| Sales for March | 1,92,000 × 1/2 | 96,000 |
| Sales for April | 1,08,000 × 1/2 | 54,000 |
| | | 1,50,000 |
| *June 2001* | | |
| Sales for April | 1,08,000 × 1/2 | 54,000 |
| Sales for May | 1,74,000 × 1/2 | 87,000 |
| | | 1,41,000 |

### *Example 19.23*

From the following budget data, forecast the cash position at the end of April, May and June 2002:

| *Month* | *Sales* | *Purchase* | *Wages* | *Miscellaneous expenses* |
|---|---|---|---|---|
| | *Rs* | *Rs* | *Rs* | *Rs* |
| February | 1,20,000 | 84,000 | 10,000 | 7,000 |
| March | 1,30,000 | 1,00,000 | 12,000 | 8,000 |
| April | 80,000 | 1,04,000 | 8,000 | 6,000 |
| May | 1,16,000 | 1,06,000 | 10,000 | 12,000 |
| June | 88,000 | 80,000 | 8,000 | 6,000 |

*Additional information:*

*Sales:* 20% realised in the month of sales, discount allowed 2%. Balance realised equally in two subsequent months.

Purchase: These are paid for in the month following the months of supply.

*Wages:* 25% paid in arrears following month.

Miscellaneous expenses: paid a month in arrears.

*Rent:* Rs 1,000 per month paid quarterly in advance due in April.

*Income Tax:* First instalment of advance tax Rs 25,000 due on or before 15th June.

Income from investments: Rs 5,000 received quarterly, in April, July etc.

*Cash in hand:* Rs 5,000 on 1st April 2002.

*Solution*

**Cash Budget**
**for Three Months Ended 30th June, 2002**

| | *April* | *May* | *June* |
|---|---|---|---|
| Receipts: | *Rs* | *Rs* | *Rs* |
| Opening balance | 5,000 | 5,680 | – |
| Receipt from debtors | 1,15,680 | 1,06,736 | 95,648 |
| Income from investment | 5,000 | – | – |
| | 1,25,680 | 1,12,416 | 95,648 |
| Payments: | | | |
| Creditors | 1,00,000 | 1,04,000 | 1,06,000 |
| Wages | 9,000 | 9,500 | 8,500 |
| Rent | 3,000 | – | – |
| Miscellaneous expenses | 8,000 | 6,000 | 12,000 |
| Income tax | – | – | 25,000 |
| Opening balance | – | – | (–) 7,084 |
| | 1,20,000 | 1,19,500 | 1,58,684 |
| Closing balance | 5,680 | (–) 7,084 | (–) 62,936 |
| *Notes:* | | | |
| Collection from debtors | | Wages | |
| April: | Rs | Rs | Rs |
| 20% of 80,000 | 16,000 | 25% of 12,000 | 3,000 |
| Less 2% discount | 320 | *Add* 75% of 8,000 | 6,000 |
| | 15,680 | | 9,000 |
| *Add:* 40% of 1,20,000 + 1,30,000 | 1,00,000 | | |
| | 1,15,680 | | |
| May: | | | |
| 20% of 1,16,000 | 23,200 | 20% of 8,000 | 2,000 |
| Less 2% of 1,16,000 | 464 | *Add:* 75% of 10,000 | 7,500 |
| | 22,736 | | 9,500 |
| Add: 40% of 1,30,000 + 80,000 | 84,000 | | |
| | 1,06,736 | | |
| June: | | | |
| 20% of 88,000 | 17,600 | 25% of 10,000 | 2,500 |
| *Less* 2% discount | 352 | *Add*: 75% of 8,000 | 6,000 |
| | 17,248 | | 8,500 |
| *Add:* 40% of 80,000 + 1,16,000 | | | |
| | 78,400 | | |
| | 95,648 | | |

***Example 19.24***

In this budget for the period ahead, 'X' Limited is considering two possible sales forecasts for three products as allows:

| *Forecast* | *Product* | | |
|---|---|---|---|
| | *A* | *B* | *C* |
| Sales (units) | 22,000 | 40,000 | 6,000 |
| Selling price per unit | Rs 10 | Rs 6 | Rs 7.50 |
| Sales (units) | 30,000 | 50,000 | 7,000 |
| Selling price per unit | Rs 9 | Rs 5.50 | Rs 7.50 |

Variable costs per unit are expected to be the same at the different levels of possible sales. The variable costs per unit are as follows:

| | *A* | *B* | *C* |
|---|---|---|---|
| | Rs | Rs | Rs |
| Direct materials | 3.00 | 2.00 | 4.00 |
| Direst labour | 2.00 | 1.50 | 1.00 |
| Variable overheads | 1.00 | 0.50 | 1.00 |

Fixed overheads are expected to total Rs 1,00,000. These are expected to be unaffected by the possible changes in activity which are being considered. Due to recent high labour turnover problems, direct labour will be restricted to the maximum of Rs 1,30,000 in the period. It can be assumed that all labour is of the same grade and is freely transferable between products. Other resources are expected to be generally available.

You are required to:

Taking each of the possible sales forecasts in turn

(i) Say what the principal budget factor is for each of the forecasts.

(ii) For each forecast calculate the sales budget that you would recommend to maximise profits.

(iii) What profit would you expect from each sales budget?

Assume that the products will be sold according to the selling price estimated as per he forecast and no interchange of the forecast is allowed. *(CA Inter)*

*Solution*

(i) Forecast 1

| | *Products* | | | *Total* |
|---|---|---|---|---|
| | *A* | *B* | *C* | *Rs* |
| Sales quantity (units) | 22,000 | 40,000 | 6,000 | |
| Labour cost per unit (Rs) | 2 | 1.50 | 1 | |
| Total labour cost (Rs) | 44,000 | 60,000 | 6,000 | 1,10,000 |
| Labour available (Rs) | | | | 1,30,000 |

Sales is the principal budget factor in case of Forecast I

*Forecast II*

| | *Products* | | | *Total* |
|---|---|---|---|---|
| | *A* | *B* | *C* | *Rs* |
| Sales quantity (units) | 30,000 | 50,000 | 7,000 | |
| Labour cost per unit (Rs) | 2 | 1.50 | 1 | |
| Total labour cost (Rs) | 60,000 | 75,000 | 7,000 | 1,42,000 |
| Labour available (Rs) | | | | 1,30,000 |

Labour is the principal budget factor for Forecast II

**(ii) Sales Budget**

| Products | *Forecast I (Sales being the principal budget factory)* | | | *Forecast II (Labour being the principal budget factor)* | | |
|---|---|---|---|---|---|---|
| | *Units to be sold* | *S.P. per units* Rs | *Amount* Rs | *Units to be sold (See W. Note 2)* | *S.P. per unit* Rs | *Total Amount* Rs |
| *A* | 22,000 | 10 | 2,20,000 | 30,000 | 9 | 2,70,000 |
| *B* | 40,000 | 6 | 2,40,000 | 42,000 | 5.50 | 2,31,000 |
| *C* | 6,000 | 7.50 | 45,000 | 7,000 | 7.50 | 52,500 |
| | | | 5,05,000 | | | 5,53,500 |

**(iii) Expected Profit from Each Sales Budget**

| *Forecast I* | *Products* *A* | *B* | *C* | *Total* Rs |
|---|---|---|---|---|
| Selling price per unit (Rs) | 10 | 6 | 7.50 | |
| Variable cost per unit (Rs) | 6 | 4 | 6 | |
| Contribution per unit (Rs) | 4 | 2 | 1.50 | |
| Sales (units) | 22,000 | 40,000 | 6,000 | |
| Total contribution (Rs) | 88,000 | 80,000 | 9,000 | 1,77,000 |
| Less: Fixed cost (Rs) | | | | 1,00,000 |
| Profit (Rs) | | | | 77,000 |
| *Forecast II* | | *Product* | | *Total* |
| | *A* | *B* | *C* | Rs |
| Selling price unit (Rs) | 9 | 5.50 | 7.50 | |
| Variable cost per unit (Rs) | 6 | 4 | 6 | |
| Contribution per unit (Rs) | 3 | 1.50 | 1.60 | |
| Sales (units) | 30,000 | 42,000 | 7,000 | |
| Total contribution (Rs) | 90,000 | 63,000 | 1,63,500 | 1,63,500 |
| *Less:* Fixed cost (Rs) | | | | 1,00,000 |
| Profit | | | | 63,500 |

**Working Notes:**

1. Ranking of products when labour is the limiting factor

| *Products* | *A* Rs | *B* Rs | *C* Rs |
|---|---|---|---|
| (i) Selling price per unit | 9 | 5.50 | 7.50 |
| (ii) Variable costs per unit: | | | |
| Direct material per unit | 3 | 2 | 4 |
| Direct labour per unit | 2 | 1.50 | 1 |
| Variable overheads per unit | 1 | 0.50 | 1 |
| | 6 | 4.00 | 6 |
| Contribution per unit (i) – (ii) | 3 | 1.50 | 1.50 |
| Ranking | 1 | 2 | 1 |

2. The above ranking shows that product B is the least profitable. Hence, 30,000 units of product A and 7,000 units of product C (as per Forecast II) would be manufactured by utilising labour cost worth Rs 67,000 (30,000 × Rs 2 + 7,000 Rs 1). Since the total available labour cost is Rs 130,000, hence, the remaining labour cost of Rs 63,000 (Rs 1,30,000—Rs 67,000) will be utilised for manufacturing 42,000 units (Rs 63,000/Rs 1.50) of product B.

## ZERO BASE BUDGETING (ZBB)

Zero base budgeting (ZBB) is a method of budgeting whereby all activities are revaluated each time budget is formulated and every item of expenditure in the budget is fully justified. That is, ZBB involves starting from scratch or zero.

In traditional budgeting, departmental managers need justify only increases over the prior year's budget known as incremental budgeting. This implies that what is already being spent is automatically sanctioned. Under the ZBB concept, each department's functions are reviewed completely and all expenditures, rather than only the increases, must be approved.

Also in some departments ascertainment of budgeted costs is easier than other departments. For example, in production departments, it is easier to determine costs of inputs to achieve a level of budgeted output. But, in other departments such as accounts, personnel, research and development, it is difficult to even identify the output, and therefore equally greater difficult to determine the cost of input to sustain (unidentifiable) output. Consequently, the budgets of previous year tend to be subjectively increased as the next year budgeted expenditure. However, the previous year's budgets may be inefficient and adjusting merely new year's budgets to the previous year's budget may result in wastage. ZBB overcomes this problem, to a certain extent, ZBB rejects the traditional view of annual budgeting as an incremental process which takes into account current expenditure plus an estimate of next year's expenditure to arrive at the next budget. Instead the projected expenditure for existing programmes should start from base zero with each year's budgets being compiled as if the programmes were being launched for the first time.

## APPLICATION OF ZBB

ZBB involves the following stages (steps):

(1) Each separate activity of the organisation is identified and called a decision package. A decision package is a document that identifies and describes a specific activity in such a manner that management can (i) evaluate it and rank it against other activities competing for limited resources and (ii) decide whether to approve or disapprove it.

(2) Each decision package must be justified, i.e. it should be enquired into whether a decision package promotes the goals of an enterprise.

(3) If justified, then the cost of minimum efforts needed to sustain each decision package is determined.

(4) Alternatives for each decision package are considered in order to select better and cheaper options for the package.

(5) Incremental decision packages are also justified and costed in the above manner. These incremental packages describe the costs and benefits of additional work that would be done above that required by the base package for the minimum amount of work needed to carry out the activity.

(6) Managers rank their decision packages in order of priority for resource allocation.
(7) Resources are allocated to the packages.

## ADVANTAGES OF ZBB

(1) It represents a move towards allocation of resources by need and benefit and thus results in more efficient collection of resources.
(2) It identifies and eliminates wastage and obsolete operations.
(3) It ensures that the best possible methods of performing jobs are used and that new ideas emerge.
(4) It creates a questioning attitude rather than one which accepts that current practices represent value for money.
(5) It leads to increased staff involvement which may lead to improved motivation and greater interest in the job.
(6) It increases communication and coordination within the orgnisation.
(7) Managers become more away of the costs of inputs which helps them to identify priorities.
(8) The documentation of decision packages provides management with a deep, coordinated knowledge of all the organisation's activities.
(9) It is useful especially for service departments where it can be difficult to identify output.

## DISADVANTAGES OF ZBB

(1) The cross involved in preparing a vast number of decision packages in a large firm are very high.
(2) It is very time-consuming and a large amount of additional paper work is involved.
(3) Managers develop fear and feel threatened by ZBB and therefore may oppose new ideas and changes.
(4) The ranking of decision packages and allocation of resources is subjective to a certain degree, which can result in departmental conflict.
(5) Administration and communication of ZBB process may become critical problems because more managers become involved in this process than in most budgeting and planning procedures and these problems are further compounded in large organisations.

## PLANNING, PROGRAMMING AND BUDGETING SYSTEM (PPBS)

Planning, Programming and Budgeting System (PPBS) is used in non-profit or non-commercial organisations to enable them to make more informed decisions about resources allocation. PPBS differs from traditional non-profit and non-manufacturing budgets in the sense that the latter are prepared as line item budgets whereas the former (PPBS) are prepared on the basis of programmes, i.e. planned activities that have specified objectives. In PPBS, budgets for line/functional items for whole department are not presented. Instead, the expenses associated with specific programmes are detailed. For instance, a railway authority may have the programmes of total computerisation of its booking system, a municipal authority may have programmes of providing drinking water or providing health facilities in the city. Such programmes require greater coordination among several departments to make a specific programme successful.

PPBS is taken by extending the planning period beyond the one-year budget period. PPBS is the counterpart of the long term planning process which is operated in profit oriented organisations. PPBS is based on a rational model of decision making and involves the following stages:

(1) Identify and define the objectives of programme.
(2) Select performance or output measures to assess the effectiveness of the programme.
(3) Identify and evaluate alternative methods of achieving the objectives laid down for each specific programme. For this, costs and benefits associated with each alternative course of action should be detailed.
(4) Select the appropriate programmes on the basis of cost benefit analysis as done in (3).
(5) Implement the selected alternative and monitor its performance to ensure that the objectives of the programmes are achieved given the resources allocated to those programmes.

PPBS has certain advantages compared to traditional department/functional budgets:

(1) PPBS leads to a more effective allocation of resources by cutting across departmental barriers, providing to managers specific information related to the activities and by coordinating scarce resources and skilled personnel located indifferent departments on a particular programme or project.
(2) PPBS compels management to identify and evaluate the activities, functions or programmes which are carried out in terms of their objectives, efficiency and effectiveness.
(3) Programme budgeting provides adequate information which will enable management to assess the effectiveness of its plans and to focus on the organisation's outputs (the objectives to be achieved).
(4) PPBS enables management to have long term perspective and commitments in certain programmes while preparing the annual budget. For instance, an education programme may involve capital expenditure for a ten-year period. In this situation, the decision markers will have to keep in mind future commitments and resources availability while constructing the annual programme budget. In this way, the annual budget is placed in the long term context and becomes a part of long term programme.

## PERFORMANCE BUDGETING

The concept of performance budgeting is used extensively in the Government and Public sector undertakings. A performance budget is essentially a projection of the Government activities and expenditure thereon for the budget period. It shows budgeted expenses classified by functions and activities and wherever practical, units cost also. In comparison to other budget forms, the objectives of performance budgeting are to provide a closer linkage between planning and action and to provide a more common basis for review, control and reporting.

The basic issues involved in the preparation of performance budgets are that of developing work programmes and performance expectations by assigning responsibilities necessary for the attainment of the goals of objectives of the enterprise. It also involves establishment of well defined centres of responsibility, establishment of targets for each responsibility centre in terms of physical units so that actual performance can be measured against the same, forecasting the amount of expenditure required to meet physical plan laid down and evaluation of actual with both physical targets and monetary targets performance.

## THEORY QUESTIONS

1. Define "budget" and "budgetary control". Give a description of two important budgets. *(B. Com. (Hons), Delhi)*
2. (a) Define budgetary control and explain its objectives.
   (b) Define how functional budgets are built up, taking any one specific example. *(CA Inter)*
3. Explain the meaning of a business budget. How does it serve as an instrument of control? *(B. Com. (Hons))*
4. Discuss the mode of operation of systems of budgets and budgetary control. *(B. Com. (Hons), Delhi)*
5. What do you understand by budgetary control? Explain the mechanism that would lead to effective control. *(ICWA Inter)*
6. What are the advantages arising out of the budgetary control system? What do you think are the essentials of an effective budgetary control system? *(ICWA, Final)*
7. Discuss the objectives and limitations of budgetary control. *(B. Com. (Hons), Delhi)*
8. Define budgetary control and discuss the objectives of introducing a budgetary control system in an organisation. *(CA Inter)*
9. Discuss the cardinal features and objectives of budgetary control.
10. Explain the difference between a forecast and a budget. Give examples to illustrate the differences between;
    (a) Fixed budget,
    (b) Flexible budget, and
    (c) Functional budget.
11. What are functional budgets. Which functional budgets are most commonly used by management? *(CA Inter)*
12. Define budgetary control and distinguish it from standard costing. Discuss the inter-relationship between budgetary control and the standard costing system. *(CA Inter)*
13. Discuss briefly the procedure for the preparation of a sales budget. *(ICWA Inter)*
14. What do you understand by a "flexible budget"? *(B. Com. (Hons), Delhi)*
15. What is a sales budget? How is it prepared? *(B. Com. (Hons), Delhi)*
16. Describe briefly the fundamental functions of business budgets. *(B. Com. (Hons), Delhi)*
17. Explain the concept of a flexible budget. How is it prepared? *(B. Com. (Hons), Delhi)*
18. What is flexible budget? How does the sales forecast differ from the sales budget? *(B Com, Delhi)*
19. What do you understand by 'Flexible Budget'? How is it prepared? Distinguish between fixed budgeting and flexible budgeting. *(B Com (Hons), Delhi)*
20. Explain the following:
    (a) Zero Base Budgeting (b) Master Budget *(B. Com (Hons) Delhi 1999)*
21. List the important functional budgets prepared by a business. *(B. Com (Hons), Delhi 2000)*
22. Distinguish between budget and forecast. What is a cash budget? What are its uses: *(B. Com. (Hons), Delhi 2000)*
23. Explain three control ratios used for performance evaluation. *(B. Com. (Hons), Delhi, 2001)*
24. State the important features of zero base Budgeting. *(B. Com. Hons, Delhi, 2001)*
25. Distinguish between fixed and flexible budget. *(B. Com. (Hons) Delhi, 2001)*

## SELF-EVALUATION QUESTIONS

Choose the correct answer for the following multiple choice questions:

(i) Information to prepare a flexible budget includes
  (a) Total fixed costs, total variable cost
  (b) Total fixed costs, total variable costs and capacity base
  (c) Unit fixed costs and unit variable costs
  (d) Total fixed costs, variable costs per unit, several levels of activity.

(ii) The scarce factor of production is known as
  (a) Key factor
  (b) Linking factor
  (c) Critical factor
  (d) All of the above

(iii) Which of the following is a budget designated to furnish budgeted costs for any level of activity actually attained.
  (a) Fixed budget
  (b) Flexible budget
  (c) Master budget
  (d) Production budget

(iv) Flexible budgets are useful for
  (a) Planning purposes only
  (b) Planning, performance evaluation and feedback control
  (c) Control of performance only
  (d) Nothing at all

## PROBLEMS

1. A factory engaged in manufacturing plastic toys is working at 40% capacity and produces 10000 toys per month. The present cost breakup for one toy is as under;

| | |
|---|---|
| Material | Rs 10 |
| Labour | Rs 3 |
| Overhead | Rs 5 (60% fixed) |

The selling price is Rs 20 per toy. If it is decided to work the factory at 50% capacity, the selling price falls by 3%. At 90% capacity the selling price falls by 5% accompanied by a similar fall in the price of material. You are required to prepare a statement showing profit at 50% and 90% capacities.

*(B. Com. (Hons), Delhi)*

*Ans.* Profit 40% capacity Rs 20,000, 50% capacity Rs 25,000, 90% capacity Rs 71,250.

2. Prepare a flexible budget for overheads on the basis of data given below. Ascertain the overhead rates at 50, 60 and 70 per cents capacity.

| | *At 50% capacity Rs* | *At 60% capacity Rs* | *At 70% capacity Rs* |
|---|---|---|---|
| Variable overheads: | | | |
| Indirect material | | 6,000 | |
| Indirect labour | | 18,000 | |
| Semi-variable overheads: | | | |
| Electricity (40% fixed, 60% variable) | | 30,000 | |
| Repairs and maintenance (80% fixed 20% variable) | | 3,000 | |

*(contd.)*

| | *At 50% capacity Rs* | *At 60% capacity Rs* | *At 70% capacity Rs* |
|---|---|---|---|
| Fixed overheads: | | | |
| Depreciation | | 16,500 | |
| Insurance | | 4,500 | |
| Salaries | | 15,000 | |
| Total overheads | | 93,000 | |

Estimated direct labour hours — 1,86,000 *(B. Com.)*

*Ans.* Overhead rates

Capacity level 50% = Rs 0.55

Capacity level 60% = Re 0.50

Capacity level 70% = Re 0.46

3. The budgeted cost of a factory specialising in the production of a single product at the optimum capacity of 6,400 units per annum amounts Rs 1,76,048 as detailed below:

| | | |
|---|---|---|
| Fixed cost | Rs 20,688 | |
| Variable costs: | | |
| Power | Rs 1,440 | |
| Repairs etc. | 1,700 | |
| Miscellaneous | 540 | |
| Direct material | 49,280 | |
| Direct labour | 1,02,400 | 1,55,360 |
| | | 1,76,048 |

Having regard to possible impact on sales turnover by market trends the company decided to have a flexible budget with a production target of 3,200 and 4,800 units (the actual quantity proposed to be produced being left to a later date before commencement of the budget period). Prepare a flexible budget for production levels at 50% and 75% capacity.

Assume selling price per unit is maintained at Rs 40 as at present, indicate the effect on net profit.

Administration, selling and distribution expenses continue at Rs 3,600.

*Ans:* Net profit

(a) 100%, Rs 75352

(b) 75% Rs 51,192

(c) 50% Rs 26032

4. Draw up a flexible budget for overhead expenses on the basis of the following data and determine the overhead rates at 70%, 80% and 90% plant capacity levels.

| | At 80% capacity *Rs* |
|---|---|
| Variable overheads: | |
| Indirect labour | 12,000 |
| Indirect material | 4,000 |
| Semi-variable overheads: | |
| Power (30% fixed, 70% variable) | 20,000 |
| Repairs & maintenance (60% fixed, 40% variable) | 2,000 |

| | |
|---|---|
| Fixed overheads: | |
| Depreciation | 11,000 |
| Insurance | 3,000 |
| Others | 10,000 |
| Total overheads | 62,000 |
| Estimated direct labour hours | 1,24,000 hrs. |

*(ICWA Inter)*

*Ans:* Overhead rate per direct labour hour
(a) 70% – Re 0.5359
(b) 80% – Re 0.5000
(c) 90% – Re 0.4720

5. Draw a material procurement budget (quantitative) from the following information:
Estimated sales of a product 40,000 units. Each unit of the product requires 3 units of material A and 5 units of material B.

| | |
|---|---|
| Estimated opening balances at the commencement of the next year: | |
| Finished product | 5,000 units |
| Material A | 12,000 units |
| Material B | 20,000 units |
| Marterials on order: | |
| Material A | 7,000 Units |
| Material B | 11,000 units |
| The desirable closing balances at the end of the next year: | |
| Finished product | 7,000 units |
| Material A | 15,000 units |
| Material B | 25,000 units |
| Marterial on order: | |
| Material A | 8,000 units |
| Material B | 10,000 units |

*Ans:* Units to be procured A 1,30,000 B 2,14,000

6. From the following information relating to 2000 and conditions expected to prevail in 2001, prepare a budget for 2001. State the assumptions you have made.

| | *2000 Actuals* | | |
|---|---|---|---|
| | | *Rs* | |
| Sales | | 1,00,000 | (40,000 units) |
| Raw materials | | 53,000 | |
| Wages | | 11,000 | |
| Variable overheads | | 16,000 | |
| Fixed overheads | | 10,000 | |
| | *2001 prospects* | | |
| Sales | 1,50,000 | | (60000 units) |
| Raw materials | 5% | Price increase | |
| Wages | 10% | Increase in wage rate | |
| Additional plant | 5% | Increase in productivity | |
| | | One lathe, Rs 25,000 | |
| | | One drill, Rs 12,000 | |

*Ans:* Budget for 2001—Rs 11,539

7. Prepare a production budget for each month and a summarised production cost budget for the six-month period ending 31st December, 2002 from the following data of product X.
   (i) The units to be sold for different months are as follows:

| | |
|---|---|
| July 2002 | 1,100 |
| August | 1,100 |
| September | 1,700 |
| October | 1,900 |
| November | 2,500 |
| December | 2,300 |
| January 2003 | 2,000 |

   (ii) There will be no work-in-progress at the end of any month.
   (iii) Finished units equal to half the sales for the next month will be in stock at the end of each month (including June 2002)
   (iv) Budgeted production and production cost for the year ending 31st December, 2002 are as follows:

| | |
|---|---|
| Production (units) | 22,000 |
| Direct material per unit | 10.00 |
| Direct wages per unit | 4.00 |
| Total factory overhead apportioned to product | 88,000 |

*(B. Com. (Hons), Delhi)*

*Ans:* Total production cost Rs 1,98,900

8. A company is drawing its production plan for the year 1997—98 in respect of two of its products 'Gamma' and 'Delta'. The company's policy is not to carry any closing *WIP* at the end of any month. However, its policy is to hold a closing stock of finished goods at 50% of the anticipated quantity of sales of the succeeding month. For the year 1997—98 the company's budgeted production is 20,000 units of 'Gamma' and 25,000 units of 'Delta'. The following is the estimated cost data:

| *Particulars* | *Gamma* Rs | *Delta* Rs |
|---|---|---|
| Direct Materials per unit | 50 | 80 |
| Direct Labour per unit | 20 | 30 |
| Other Manufacturing Expenses apportionable to each type of product based on production | 2,00,000 | 3,75,000 |

The estimated units to be sold in the first 7 months of the year 1997—98 are as under:

| *Particulars* | *April* | *May* | *June* | *July* | *Aug.* | *Sept.* | *Oct.* |
|---|---|---|---|---|---|---|---|
| Gamma | 900 | 1,100 | 1,400 | 1,800 | 2,200 | 2,200 | 1,800 |
| Delta | 2,900 | 2,900 | 2,500 | 2,100 | 1,700 | 1,700 | 1,900 |

You are required to
   (a) prepare a production budget showing month-wise number of units to be manufactured:
   (b) present a summarised production cost budget for the half-year ending 30.9.97.

*(ICWA Inter Dec. 1996)*

*Ans:* Budgeted production Gamma total 10050 units Delta total 13300 units, total production cost Gamma Rs 8,04,000 Delta Rs 16,62,500.

9. From the information given below, prepare a cash budget of the Jaipur Refrigerators (P) Ltd. for the quarter January–March 2002.

| | Dec. 2001 | Jan. 2002 | Feb. 2002 | March 2002 | April 2002 |
|---|---|---|---|---|---|
| (a) Sales budget units | 60 | 60 | 65 | 75 | 80 |
| (b) Selling price per unit Rs | 1,000 | 1,000 | 1,000 | 1,000 | 1,000 |
| (c) Off-season discount | 20% | 20% | 10% | — | — |
| (d) End of month Inventory units | 10 | 12 | 15 | 25 | 25 |

(e) Half the sales proceeds are collected in the month of sale and the other half in the month following.
(f) Materials amounting to Rs 300 per unit manufactured are purchased one month in advance of manufacture and paid for in cash, earning 5% cash discount on half of the material purchased.
(g) Direct labour budget was Rs 50 per unit and variable overheads Rs 100 per unit.
(h) Indirect labour budget was Rs 6,000 per month.
(i) Depreciation was provided uniformly at Rs 3,000 per month.
(j) The fixed overheads budget was Rs 6,000 per month during off season and Rs 7,000 during the season. Out of this, the quarterly premium for fire insurance amounting to Rs 600 was payable in the first month of each quarter.
(k) Dividends for the year 2001 amounting to Rs 20,000 were expected to be declared in March 2002 and payments were to be made between March and April.
(l) A machine was sold for Rs 10,000 in December 2001 on 3 months credit.
(m) The company had overdraft arrangements with the State Bank of Jaipur and Bikaner up to Rs 50,000.

*Ans:* Balance January Rs 6,410
February Rs 12,797.50
March Rs 30,597.50

10. On 31st December 2002 the summary balance sheet of Vinayak Ltd. A leading bookseller was a follows:

| *Liabilities* | *Rs* | *Assets* | *Rs* |
|---|---|---|---|
| Capital | 10000 | Shop equipment | 3750 |
| Creditors | 5000 | Stock of books | 6000 |
| Proposed dividends | 750 | Debtors | 3750 |
| | | Cash in Bank | 2250 |
| | 15750 | | 15750 |

To following transactions are anticipated for the next thee months:

| | *Credit sales* *Rs* | *Cash sales* *Rs* | *Credit purchases* *Rs* | *Cash purchase* *Rs* |
|---|---|---|---|---|
| January: | 3750 | 3500 | 6000 | 500 |
| February: | 4500 | 1250 | 5750 | 250 |
| March: | 5000 | 3000 | 6750 | 250 |

Additional information are the following:

1. Wages paid will be Rs 250 per month.
2. Postage and packing is to be 20% of credit sales and paid in the month of sale.
3. Debtors normally pay one month after books are sold to them.
4. Creditors are paid one month after receipt of books.
5. Shop equipment will be replaced on January 1. The new equipment will cost Rs 6000 and payment will be made in equal instalments in February, March and April. The old equipment will realise Rs 2000 in February.

6. Depreciation of new equipment will be 10% p.a. and charged to accounts monthly.
7. Half the dividends proposed will be paid in March, half in July next.
8. The company expects a gross profit of 1/3 on selling price.

*Required:*

(i) A cash budget for three separate months ending March 31.
(ii) A forecast trading and profit and loss account for the same three months in total only.
(iii) A forecast balance sheet as on March 31.

*Ans:*

(i) Cash Budget-closing balances, January Rs 3000, February Rs 6000, March Rs 1525 deficit.

(ii) Forecast Trading and profit and loss A/c for three months ending March 31, 2003.

| | | Rs | Rs |
|---|---|---|---|
| Sales (Credit Rs 13250 + Cash Rs 7750) | | | 21000 |
| *Less:* | Cost of goods sold: | | |
| | Opening stock | 6,000 | |
| *Add:* | Purchases (18500 + 1000) | 19,500 | |
| | | 25,500 | |
| *Less:* | Closing stock | 11,500 | 14,000 |
| | Gross profit (33.3% on sales) | | 7,000 |
| *Less:* | Wages | 750 | |
| | Postage & Packing | 2650 | |
| | Loss on sale of equipment | 1750 | |
| | Depreciation | 150 | 5300 |
| | Net profit | | 1700 |

(iii) Forecast Balance Sheet as at 31st March, 2003

| *Liabilities* | *Rs* | *Assets* | | *Rs* |
|---|---|---|---|---|
| Capital | 10,000 | Debtors | | 5,000 |
| Net profit | 1,700 | Stock | | 11,500 |
| Current Liabilities: | | Equipment | 6000 | |
| Creditors | 8,750 | *Less:* Dep. | 150 | 5,850 |
| Bank overdraft | 1,525 | | | |
| Dividends due | 375 | | | |
| Total | 22,350 | Total | | 22,350 |



# Pricing Decisions

The chapter on 'Alternative Choices Decisions' has discussed how cost analysis and relevant cost information help management in making various alternative choices decisions such as maker or buy, add or drop product, product mix, sell or process further, operate or shutdown, replace or retain, buy or lease, special order, export proposals, etc. The present chapter discusses 'pricing decisions' which is one of the most crucial and difficult decisions which a business firm has to make, and determine how cost information can be useful to management in framing suitable pricing policy.

## FACTORS INFLUENCING PRICING DECISIONS

Pricing of a product or service refers to the assignment of a selling price to a product or service provided by the firm. The pricing decisions are influenced by internal and external factors both. Some such factors (determinants) are as follows:

1. Cost data of the product which may be actual, replacement, standard or any other cost base.
2. Firm's profit and other objectives.
3. Demand for the product or service and its elasticity.
4. Nature of product and its life expectancy.
5. Pricing decision as a long-run decision or short term decision or a one-time spare capacity decision.
6. Type of competition for the product or service and availability of close substitutes.
7. Number of suppliers in the market.
8. Economic and political climate and trends and likely change in them in future.
9. Type of industry to which the product belongs and future outlook of the industry.
10. Government guidelines, if any.

## DIFFERENT METHODS OF PRICING

The different methods of pricing are generally the following:

### 1. Total Cost-Plus or Full Cost-Plus Pricing

Total cost-plus or full cost-plus pricing involves all costs plus a profit margin. It includes not only the product's direct costs but also the indirect costs incurred by the overall company which have to be allocated to different products in case different products are manufactured. An example of price calculation using full cost-plus method is as follows:

| | (Rs) | (Rs) |
|---|---|---|
| Direct material | | 10 |
| Direct labour | | 20 |
| Factory overheads: | | |
| Fixed | 15 | |
| Variable | 5 | 20 |
| Total manufacturing cost | | 50 |
| Non-manufacturing overheads: | | |
| Fixed | 10 | |
| Variable | 0 | 10 |
| Total cost | | 60 |
| *Add:* Profit margin (25% on total cost) | | 15 |
| Selling price | | 75 |

Full cost-plus method has the following advantages:

1. It is simple to operate if cost structures of products are known.
2. The pricing decision under full cost approach becomes standardised and such decisions can easily be delegated to lower management.
3. It ensures recovery of total costs and also provides a reasonable rate of returns to the firm.
4. It helps a business firm to predict the selling prices of other competitive firms, specially of those firms who are having similar cost structures.
5. This pricing method is important in contracting industries where price of the contracts needs to be determined considering fixed costs also.
6. This brings stability in the pricing policy and selling price can be justified to customers.
7. Full cost pricing is consistent with absorption costing system.

Full cost-plus method has the following disadvantages too:

1. It ignores demand and competition and may result into underpricing or overpricing of products.
2. Fixed costs are likely to be distributed on some arbitrary basis as there are different methods of apportionment and thus total costs of different products will be different depending on which apportionment method is used.
3. In full cost pricing, the choices of volume or capacity base is very important. Different unit products costs will emerge under different concepts of capacity.
4. This method does not distinguish between relevant costs (e.g. variable costs and incremental fixed costs) and irrelevant costs (fixed costs).
5. This method cannot always shield the firm from a loss. If sales demand falls below the volume level used to calculate the fixed cost per unit, the total sales revenue will be inadequate to cover the total costs.

Within full cost-plus method, some other cost bases can be based for determining the selling price such as manufacturing cost plus or conversion cost plus.

Manufacturing cost (or product cost) plus pricing includes cost incurred specifically for manufacturing the product plus a profit margin. The profit margin added to this cost must cover all operating expenses and generate a satisfactory level of profit. Using the information given in the earlier example, a cost of Rs 50 will be used. To this cost a higher profit margin needs to be added to cover non-manufacturing overheads as well as to provide a satisfactory level of profit to the firm. For example, selling price calculation may be as follows:

| | |
|---|---|
| Total manufacturing costs | Rs 50 |
| *Add:* Profit margin (50% on manufacturing cost) | Rs 25 |
| Selling price | Rs 75 |

Conversion cost plus pricing uses conversion cost for determining the selling price and to this cost a profit margin is added. This pricing method is generally followed when the customer provides the materials. This method depends on the assumption that greater profits can be realised if efforts are directed to products requiring less labour and overhead because more units can be produced and sold.

### 2. Marginal Cost-Plus Pricing

This method, also known as contribution approach, uses only variable costs as the basis for pricing. Fixed costs are not added to the product, service or contract. However, fixed costs should be taken into account in determining the profit margin to be added to variable costs to arrive at the selling price.

Marginal cost approach helps a business firm to enter into new markets easily, to increase its competitive position in the existing markets, to survive during trade depressions, to utilise spare available capacity, to dispose off surplus or obsolete stock.

Marginal cost-plus pricing brings some disadvantages to the firm as well. For instance, recovery of fixed costs may be doubted. There is likely to be undesirable competition for cutting prices to a lower level. In case management decides to increase lower marginal cost pricing, it may face dissatisfaction from the consumers.

Using the information given in the earlier example, marginal costs of Rs 35 can be used to set the selling price. Obviously, it indicates the cost below which the price should not fall, otherwise the company would have losses. Also, a higher profit margin can be added to marginal cost which may work as a long term selling price even for normal sales. For instance, if the profit margin of 100% is added to marginal costs of Rs 35, the selling price will be Rs 70.

### 3. Differential Cost-Plus Pricing

This method involves adding a mark up on differential cost which is the increase in total cost resulting from the production of additional units. Differential cost pricing differs from variable cost pricing in which a mark up on variable cost is added, whereas both variable costs and fixed costs are included in the differential costs on which a mark up is determined. This method can be applied where some revenue above differential cost may be received rather than no revenue at all. Such additional revenue makes some contribution towards the recovery of fixed costs which are already incurred.

### 4. Standard Costs

Standard costs represent the costs that should be attained under efficient operating conditions at a normal capacity. The cost-based methods discussed earlier have some adverse implications and include costs due to inefficient manufacturing, wasteful operations, etc. That is, it is likely that unnecessary

costs may be assigned to the product. On the other hand, standard costs use costs from efficient operations plus the agreed profit. Also, pricing can be done more quickly.

***Example 20.1 (Using Price Elasticity of Demand in Selling Price)***

A company decides to manufacture 1,00,000 units of its product. The variable cost per unit is Rs 10 and fixed costs amount to Rs 6,00,000. In Board meeting the finance manager suggests that the full-cost method should be used in fixing selling price for the company's product. He has also suggested a profit margin of 25% on total costs. The marketing manager while disagreeing with the finance manager's proposal presents the following information regarding possible demand of product at different prices:

| *Price per unit (Rs)* | *Demand (units)* |
|---|---|
| 18 | 84,000 |
| 20 | 76,000 |
| 22 | 70,000 |
| 24 | 64,000 |
| 26 | 54,000 |

Which proposal (Finance Manager's or Marketing Manager's) will be useful for the company?

*Solution*

(A) Finance manger's proposal

| | (Rs) |
|---|---|
| Variable cost | 10 |
| Fixed cost | 6 |
| Total cost | 16 |
| Profit margin (25%) | 4 |
| Selling price | 20 |

No. of units to be sold at a price of Rs 20 per unit (as given in the marketing manager's proposal) = 76,000 units

| | |
|---|---|
| Total contribution = 76,000 units × Rs 10 = | 7,60,000 |
| *Less:* Fixed Costs | 6,00,000 |
| Net Profit | Rs. 1,60,000 |

(B) Before evaluating marketing manager's proposal, a profitability statement at different selling price needs to be prepared.

**Profitability Statement**

| *Selling price per unit (Rs)* | *Units demanded* | *Contribution per units (Rs)* | *Total contribution (Rs)* | *Fixed cost (Rs)* | *Net profit (Rs)* |
|---|---|---|---|---|---|
| 18 | 84,000 | 8 | 6,72,000 | (6,00,000) | 72,000 |
| 20 | 76,000 | 10 | 7,60,000 | (6,00,000) | 1,60,000 |
| 22 | 70,000 | 12 | 8,40,000 | (6,00,000) | 2,40,000 |
| 24 | 64,000 | 14 | 8,96,000 | (6,00,000) | 2,96,000 |
| 26 | 54,000 | 16 | 8,64,000 | (6,00,000) | 2,64,000 |

It can be found that at a selling price of Rs 20 (Finance manager's proposal), the net profit is Rs 1,60,000. But if the company fixes a selling price of Rs 24 per unit, the maximum profit of

Rs 2,96,000 will be earned. Therefore the finance manager's proposal is rejected and marketing manager's proposal is recommended. In fact while making the proposal the finance manager has not considered the price elasticity of demand of company product which can be an important factor in fixing the selling price.

### *Example 20.2 (Considering Opportunity Costs in Selling Price)*

V Ltd. Manufactures desks. The following information is provided:

| | *Per unit* (Rs) |
|---|---|
| Material (3 kg @ Rs 2 per kg) | 6 |
| Labour | 5 |
| Variable overheads | 4 |
| Allocated fixed overheads | 2 |

Material is currently used to make chairs which provide contribution of Rs 5 per unit, 2 kg of material are required for each chair. What is the minimum price per desk if

(i) material is plentiful
(ii) material is scarce

*Solution*

The minimum price of product is determined in different manners depending on different situations as listed below:

(i) When the product has been made—The minimum price will be whatever is recoverable subject to recovering any disposal costs. All costs incurred in manufacturing the product are sunk costs and therefore not relevant in pricing decisions.

(ii) When the product is to be made and there are no scare resources—In this case, the minimum price will be equal to incremental costs of making the product.

(iii) When the product is to be made and there are scares resources—In this case, the minimum price is calculated as follows:

Minimum price = Incremental costs of making product (external opportunity costs) + Opportunity costs of scare resources (internal opportunity cost)

Using the above guidelines, the minimum price per desk will be as follows:

(i) *Material is plentiful*

Minimum price = Incremental cost of making desks

= 6 + 5 + 4 = Rs 15 per desk.

(iii) *Material is scarce*

Minimum price = Incremental costs + Internal opportunity costs of scares resources

$$= 15 + \left( \frac{\text{Contribution}}{\text{kg of material}} = \frac{\text{Rs } 5}{2 \text{ kg}} \times 3 \text{ kg} \right)$$

= 15 + 7.50

= Rs 22.50 per desk

## THEORY QUESTIONS

1. "In the long run, selling price will tend to equal costs plus reasonable profits." Discuss.

*(ICWA)*

2. List the factors taken into consideration in fixing the selling price by a business firm.
3. Discuss full cost-plus and marginal cost-plus methods of pricing. Which pricing method can be useful to a firm and under what situations.

## PROBLEMS

1. An Electronics Company has the following cost structure for an electronic product.

| | Rs |
|---|---|
| Direct material | 50 |
| Direct labour | 75 |
| Variable overheads | 30 |
| Fixed overheads | 45 |
| Total unit cost | 200 |

Fixed selling and administrative costs Rs 6,00,000.
Additional information:
(i) Budgeted production and sale for the next year is 20,000 units.
(ii) The management feels that a minimum return of 20% is required on equity investments of Rs 20,00,000. What price should it charge for one unit of its output.

*Ans.* Rs 250.

2. A manufacturer produces a single product and has prepared its master budget for 2001 as follows:

| | (000) Rs | (000) Rs |
|---|---|---|
| Sales | | 6600 |
| Direct materials | 1600 | |
| Direct labour | 800 | |
| Variable overheads | 600 | |
| Total direct costs | 3000 | |
| Factory overheads | 1000 | |
| Factory cost | 4000 | |
| Administration overheads | 400 | |
| Total cost | | 4400 |
| Profit | | 2200 |

Towards the end of 2001 an enquiry is received from a potential customer. Direct costs have been estimated as follows:

| | |
|---|---|
| Direct material | Rs 26,000 |
| Direct labour | 14,000 |
| Variable overheads | 8,000 |

Assume (i) the recovery of factory overheads and administration overheads in the same percentages as given in the 2001 budget and (ii) maintaining the 2001 profit margin percentage. Find out what price should it quote to the customer?

*Ans:* Selling price Rs 1,05,600

3. The following is the summarized income statement of a company for the year 2001.

| | | Rs |
|---|---|---|
| | Sales (10,00,000 units at Rs 2.50) | 25,00,000 |
| *Less:* | Variable costs | 16,00,000 |
| | Contribution | 9,00,000 |
| *Less:* | Fixed costs | 9,20,000 |
| | Loss | (20,000) |

A customer approaches the company which has spare capacity and offers to purchase 2,00,000 units from the company. If the company accepts this order, it will save Re 0.25 per unit in sales commission. Existing sales will continue as above. What is the price per unit on the order that the company must charge in order that an overall profit of Rs 50,000 can be earned on total sales?

*Ans:* Selling price Rs 1.70 per unit

New variable cost per unit Rs 1.60 – 0.25 = Rs 1.35 per unit

Required contribution on the order is Rs 70,000 in order to make overall profit of Rs 50,000.

21

# Responsibility Accounting and Divisional Performance Measurement

## NEED OF DECENTRALISATION/DIVISIONALISATION

In small organisations, decision making and management of the business are often done by a single individual. However, in large organisations, especially organisations engaged in manufacturing/undertaking multiple products and activities, successful management of it by the top management becomes more difficult. In order to overcome this difficulty, the large organisation may be decentralised or divisionalised, i.e. different responsibility centres may be created where individual managers have the authority over a given area of operation and freedom to make their own decisions. The process of delegating decision authority and responsibility in an organisation is known as decentralisation. Also, the term decentralisation or divisionalisation refers to those situations where individual managers of decentralised subunits are given responsibility for profit and not just costs or revenues.

## TYPES OF RESPONSIBILITY CENTRES

A responsibility centre may be defined as an area of responsibility which is controlled by an individual. Generally, the following types of responsibility centres are found:

### Cost Centre

A cost or expense centre is a segment of an organisation in which the managers are held responsible for the costs incurred in that segment. Responsibility in a cost centre is restricted to cost. Performance evaluation of a cost centre is guided by a cost variance equal to the difference between the actual and budgeted costs for a given period. Cost centre managers have control over some or all of the costs in their segment of business, but not over revenues. Cost centres are widely used forms of responsibility centres. In manufacturing organisations, the production and service departments are classified as cost centres. Also, a marketing department, a sales region or a single sales representative can be defined as a

cost centre. Cost centre managers are responsible for the costs that are controllable by them and their subordinates. However, which costs should be charged to cost centres, is an important question in evaluating cost centre managers.

### Revenue Centre

A revenue centre is a segment of the organisation which is primarily responsible for generating sales revenue. A revenue centre manager does not possess control over cost, investment in assets, but usually has control over some of the expenses of the marketing department. The performance of a revenue centre is evaluated by comparing the actual revenue with budgeted revenue. The Marketing Manager of a product line, or an individual sales representative are examples of revenue centres.

### Profit Centre

A profit centre is a segment of organsiation for which both revenue and costs are accumulated. The main purpose of profit centre is to earn profit. Profit centre managers aim at both the production and marketing of a product. The performance of the profit centre is evaluated in terms of whether the centre has achieved its budgeted profit. A division of the company which produces and markets the products may be called a profit centre. Such a divisional manager determines the selling price, marketing programmes and production policies. Profit centres make managers more concerned with finding ways to increase the centre's revenue by increasing production or improving distribution methods.

### Investment Centre

As investment centre is responsible for both profits and investments. The investment centre manager has control over revenues, expenses and the amounts invested in the centre's assets. He also formulates the credit policy which has a direct influence on debt collection, and the inventory policy which determines the investment in inventory.

### Meaning of Responsibility Accounting

The term 'responsibility accounting' refers to the accounting process that reports how well managers (of responsibility centres) have fulfilled their responsibility. Also known as activity or profitability accounting, it is an information system that personalises control reports by accumulating and reporting cost and revenue information according to defined responsibility areas within a company. According to Horngreen*, the responsibility accounting system recognises various division centres throughout an organisation and traces costs (as well as revenue, assets, and liabilities, where relevant) to the individual managers who are primarily responsible for making decisions about these variables. The responsibility accounting system makes the following important assumptions:

1. The areas of responsibility are defined for which managers should be held responsible.
2. Managers are only charged with the items and responsibility over which they can exercise a significant degree of direct control.
3. Managers should actively participate in establishing the goals or budgets against which their performance is measured.

* Charles T. Horngreen, *Cost Accounting, A Managerial Emphasis*, Prentice Hall of India.

4. Goals defined for each area of responsibility should be attainable with efficient and effective performance.
5. Control (performance) reports should contain significant information related to each area of responsibility.
6. Responsibility centre managers should try to accomplish the budgets and objectives established for their respective areas of responsibility.

## MEASURING DIVISIONAL PERFORMANCE

Performance measurement is aimed in respect of all responsibility divisions. The following techniques can be used to measure the performance of a division.

*1. Variance Analysis* In this technique standard costs and budgets are set in order to provide a basis for comparison with actual performance. Any variance between the two requires that corrective actions should be taken. The performance of cost centre and revenue centre is measured in terms of standard costs and budgets determined for the respective centres. On measuring the performance, attempts are made to minimise the costs of cost centre and increase the revenue of the revenue centre.

*2. Profit* The measure can be used to judge the performance of a profit centre. Besides, budgetary control and contribution to sales (c/s ratio) can be applied for measuring profit centre's performance. However there is difficulty in measuring profit of a division as net profit is equal to divisional revenue minus total costs. Total costs include direct divisional costs plus allocated fixed costs and this raises the question of finding a suitable cost allocation method. Hence the determination of divisional profit, that is, its performance, can itself be unreliable if it includes a part of indirect cost.

It is suggested that while measuring the performance of a profit division, it is better to use a measure of divisional revenue less divisional costs and a divisional revenue less divisional controllable costs should be used to measure the performance of divisional manager. Controllable profit (divisional revenue-divisional controllable costs) is a much better measure of divisional manager's performance as it considers all costs—fixed or variable—which are within his control. The full cost can be suitable to measure a division's performance but not the performance of a divisional manager because then he is held responsible for some costs (allocated fixed costs) which is not controllable by him and which he cannot influence directly or indirectly.

*3. Return on investment (ROI)* This measure expresses divisional profit as a percentage of the firm's investment in the division and is similar to widely accepted 'return on capital employed' method. This is calculated as:

$$\text{ROI} = \frac{\text{Divisional Profit}}{\text{Divisional Investment}}$$

The ROI ratio can be divided into other ratios such as net profit margin and the asset turnover. The net profit margin is the result of firm's pricing policy and its cost control. The asset turnover shows the amount of sales generated by the capital available and whether a firm has over- or under-utilised its assets.

$$\text{ROI} = \underbrace{\frac{\text{Net profit}}{\text{Sales}} \times 100}_{\text{(Net profit margin)}} \times \underbrace{\frac{\text{Sales}}{\text{Capital employed}}}_{\text{(Asset turnover)}}$$

The ROI formula recognises that the absolute size of divisional operating profit alone does not provide a basis for measuring its performance, but rather the relation between the division's net income and the assets used in the generation of that income. For example, the fact that division A has net income of Rs 50,000 does not necessarily mean that it was more successful than Division B which has profit of Rs 40,000. The difference between these profit levels could be attributable entirely to a difference in the investment size of divisions. In such a situation, ROI proves to be a good measure of performance of a division. For example, assuming that the investments in division A and B are Rs 2,00,000 and Rs 1,00,000 respectively, the ROI can better indicate their comparative performances.

$$\text{ROI} = \frac{\text{Divisional Profit}}{\text{Divisional Investment}}$$

$$\text{Division A} = \frac{\text{Rs } 50{,}000}{2{,}00{,}000} = 25\%$$

$$\text{Division B} = \frac{\text{Rs } 40{,}000}{1{,}00{,}000} = 40\%$$

Thus, using ROI, it is proved that Division B is more efficient and has made more profit than Division A. ROI can be increased by any of the following actions, all other factors remaining constant.

1. An increase in sales price or sales volume.
2. A decrease in operating costs (fixed or variable).
3. A reduction in divisional investment.

ROI has the following advantages:

1. It relates net income to investments made in a division giving a better measure of divisional profitability.
2. It can be used as a basis for other ratios which are useful for analytical purposes.
3. It is easy to understand as it is based on financial accounting measurements.
4. It may be used for interfirm comparisons, provided that the firms whose results are being compared are of comparable size and of the same industry.

ROI has the following limitations:

1. Satisfactory definition of profit and investment are difficult to find. Profit has many concepts such as profit before interest and tax, profit after interest and tax, controllable profit, profit after deducting all allocated fixed costs. Similarly, the term investment may have many connotations such as gross book value, net book value, historical cost of assets, current cost of assets, assets including or excluding intangible assets.
2. While comparing ROI of different companies it is necessary that the companies use similar accounting policies and methods in respect of valuation of stocks, valuation of fixed assets; apportionment of overheads, treatment of research and development expenditure etc.
3. ROI may influence a divisional manager to select investments with high rates of return (i.e. rates which are in line or above his target ROI). Other investments that would reduce the division's ROI but could increase the value of the business may be rejected by the divisional manager. These types of decision are sub-optimal and can distort an enterprise's overall allocation of resources and may motivate a manager for under investing in order to preserve his ROI.

Suppose a division's ROI is 25% as shown below.

$$ROI = \frac{\text{Profit Rs } 1,00,000}{\text{Investment Rs } 4,00,000} \times 100 = 25\%$$

Suppose there is an opportunity to make additional investment of Rs 2,00,000 which will give 20% ROI. This investment is acceptable to the company because the company requires a minimum 15% ROI for this type of investment. This investment lowers the division's ROI to 23.3% calculated as follows:

Old investment + New investment

$$\text{New} \quad ROI = \frac{\text{Rs } 1,00,000 + \text{Rs } 40,000}{\text{Rs } 4,00,000 + \text{Rs } 2,00,000} \times 100 = 23.3\%$$

A comparison of old ROI (25%) with the new ROI (23.3%) would imply that performance has declined. Consequently, a divisional manager might decide not to make such an investment.

4. *Residual income (RI)* Residual income can be defined as the net income of a division, less the 'imputed' capital charge on the assets used by the division. The capital charge is the minimum acceptable rate of return and is calculated by applying this required (or target) rate of return to the division's investment base. Theoretically, rate of return should be the division's cost of capital. in most cases, however it is a cut-off rate based on the firm's objectives and strategies. RI is calculated as:

$$RI = \text{Divisional profit} - (\text{Percent capital charge} \times \text{Divisional investment})$$

The 'divisional profit' and 'divisional investment' are as they are defined in ROI. Using the data given in the above example, i.e. divisional profit Rs 1,00,000, investment Rs 4,00,000 and further assuming capital charge of 15%, the RI will be Rs 40,000, calculated as follows:

$$RI = \text{Rs } 1,00,000 - (15\% \times \text{Rs } 4,00,000)$$
$$= 1,00,000 - 60,000$$
$$= \text{Rs } 40,000$$

Residual income from the additional investment of Rs 2,00,000 will be

$$RI = \text{Rs } 40,000 - (15\% \times \text{Rs } 2,00,000)$$
$$= \text{Rs } 10,000$$

Therefore, after making additional investment, the total residual income of the division will be Rs 50,000, i.e.

$$RI = \text{Profits } 1,00,000 + 40,000 - (15\% \times \text{Rs } 4,00,000 + 2,00,000)$$
$$= 1,40,000 - 90,000$$
$$= \text{Rs } 50,000$$

Thus, the additional investment increases residual income, appropriately improving the measure of performance, whereas the use of ROI has worsened the measure of performance as it gives an overall lower ROI.

RI has following advantages:

1. It avoids sub optimal decisions as investment are not rejected merely because they lower the divisional manager's ROI.
2. It maximises growth of the company and increases shareholders, wealth by accepting opportunities which earn a rate of return in excess of the cost of capital.

3. The cost of capital charge on divisional investments ensures that divisional managers are aware of the opportunity cost of funds.
4. Charging each division with the company's cost of capital ensures that decisions taken by different divisions are compatible with the interests of organisation as a whole.

The following are the weaknesses of RI:

1. Like ROI, it is difficult to have satisfactory definition of 'divisional profit' and 'divisional investment'.
2. It may be difficult to calculate an accurate cost of capital.
3. Identifying controllable and uncontrollable factors at divisional level may be difficult.

***Example 21.1***

Division A and B are both considering an outlay on new investment projects.

| | *Division A* | *Division B* |
|---|---|---|
| Investment outlay | Rs 1,00,000 | Rs 1,00,000 |
| Net return on the new investment | Rs 16,000 | Rs 11,000 |
| Current ROI | 18% | 11% |

The company's cost of capital is 13%. Should the project be accepted or rejected?

*Solution*

(i) Using ROI

$$\text{ROI on New investment} = \frac{\text{Net return}}{\text{New investment}}$$

$$\text{Division A} = \frac{\text{Rs } 16{,}000}{\text{Rs } 1{,}00{,}000} \times 100 = 16\%$$

$$\text{Division B} = \frac{\text{Rs } 11{,}000}{\text{Rs } 1{,}00{,}000} \times 100 = 11\%$$

Division A should reject the new investment as its ROI is 16% which is less than the current ROI of 18%. Division B can accept the investment as its current ROI of 11% is equal to new ROI on new investments.

(ii) Using RI

| | *Division A* | *Division B* |
|---|---|---|
| Investment | Rs 1,00,000 | Rs 1,00,000 |
| Net income on new investment | 16,000 | 11,000 |
| *Less:* Imputed cost of capital 13% | 13,000 | 13,000 |
| Residual Income | 3000 | (2000) |

Division A should accept the investment as it will make RI of Rs 3000 and Division B should reject it because it will give a loss of Rs 2000.

***Example 21.2***

The following information relates to budgeted operations of Division X of a manufacturing company.

| | (Rs) |
|---|---|
| Sales (50,000 units at Rs 8) | 4,00,000 |

| | |
|---|---|
| *Less:* Variable costs @ Rs 6 per unit | 3,00,000 |
| Contribution margin | 1,00,000 |
| *Less:* Fixed costs | 75,000 |
| Divisional profit | 25,000 |

The amount of divisional investment is Rs 1,50,000 and the minimum desired rate of return on the investment is the cost of capital of 20%.

*Required:*

(i) Calculate divisional expected ROI

(ii) Calculate divisional expected RI

(iii) Comment on the result of (i) and (ii)

(iv) The divisional manager has the opportunity to sell 10,000 units at Rs 7.50 per unit. Variable cost per unit would be the same as budgeted, but fixed costs would increase by Rs 5000. Additional investment of Rs 20,000 would also be required. If the manager accepts the special order, by how much and in what direction would his residual income change?

*Solution*

(i) $\text{ROI} = \frac{\text{Rs } 25,000}{\text{Rs } 1,50,000} \times 100 = 16.7\%$

(ii) RI = Divisional profit – Minimum desired rate of return
= Rs 25,000 – (20% × Rs 1,50,000)
= 25,000 – 30,000
RI = (Rs 5,000)

(iii) The desired rate of return is 20% but the division X is expecting to achieve an ROI of 16.7%. The expected profit of Rs 25,000 is less than the Rs 30,000 minimum return required, resulting in the negative of Rs 5,000 residual income.

(iv) Opportunity to sell additional 10,000 units

| | *Original budget (Rs)* | *Additional budget (Rs)* | *Total (Rs)* |
|---|---|---|---|
| Sales | 4,00,000 | 75,000 | 4,75,000 |
| *Less:* Variable costs | 3,00,000 | 60,000 | 3,60,000 |
| Contribution | 1,00,000 | 15,000 | 1,15,000 |
| *Less:* Fixed costs | 75,000 | 5,000 | 80,000 |
| Divisional profit | 25,000 | 10,000 | 35,000 |
| *Less:* Cost of capital (20%) | 30,000 | 4,000 | 34,000 |
| Residual Income | (5000) | 6000 | 1000 |

The target residual income changes from a negative balance of Rs 5,000 to a positive one of Rs 1,000 as a result of the new opportunity to sell 10000 units. This is due to the fact that Rs 10,000 expected profit from additional order is offset by a further Rs 4,000 cost of capital, thereby increasing residual income by Rs 6,000.

## TRANSFER PRICING

In divisionalised companies, where profit or investment centres are created, there is likely to be inter-divisional transfer of goods or services and this internal transfer create the problem of transfer pricing.

A transfer price is that national value at which goods and services are transferred between divisions in a decentralised organisation. Transfer prices are normally set for intermediate products which are goods and services that are supplied by the selling division to the buying division. The goods that are produced by the buying division and sold to the outside world are known as final products.

A question arises as to how the transfer of goods and services between divisions should be priced. The transfer prices can have impact on the evaluation of each division's performance and measures applied for such measurements of performance. While determining transfer prices a number of criteria should be carefully considered:

(i) Transfer prices should help in the accurate measurement of divisional performance (profitability) measurement.
(ii) Transfer prices should motivate the divisional managers into maximising the profitability of their divisions and making decisions that are in the best interests of the organisation as a whole.
(iii) Transfer prices should ensure that divisional autonomy and authority is preserved.
(iv) Transfer prices should allow goal congruence to take place, which in effect means that the objectives of divisional managers are compatible with the objectives of overall company.

## METHODS OF TRANSFER PRICING

Broadly, there are three bases available for determining transfer prices, but many options are also available within each base. These methods are:

### 1. Cost-based Prices

(a) Variable cost
(b) Actual full cost
(c) Full cost plus profit margin
(d) Standard full cost
(e) Opportunity cost.

### 2. Market-based Prices

(a) Open market price
(b) Market price less cost savings on inter-group sale
(c) Variable cost plus proportion of contribution earned on final sale.

### 3. Negotiated Prices

Negotiated prices are those transfer prices determined through the negotiations betweeen the divisional managers concerned or with the assistance of top management or a group manager who may impose a settlement in the absence of agreement.

The above methods of transfer pricing have advantages and disadvantages too. For example, transfer pricing based on full cost with profit margin may appeal to the selling division. But this may lead to too high prices when fixed costs are apportioned to a low level of activity. In this situation, it would be advisable to fix the transfer price on a full standard cost basis. Market price puts the selling and buying divisions on equal footing and works well in a competitive external market situation. From a company

wide perspective, market price is optimal as long as the selling division is operating at capacity. Use of market price also helps assure profit independence of the divisions. Any inefficiency in the form of excessive costs of the selling division do not get passed on to the buying division. However, suitable market prices may not be found; market prices can fluctuate widely and in the external market, perfect competition may not exist due to which the market prices prevailing in the open market can itself be doubted.

A better approach could be to follow negotiated prices where the divisional managers involved act much the same as the managers of independent companies. If both divisions are of equal bargaining power, are free to deal either with each other or in the external market, the negotiated price will likely be closer to the external market price. A negotiated transfer price can be considered suitable because of the fact that internal transfers are less costly than external sales because of less advertising, lower transport costs, no bad debts etc. In negotiated prices, however, a great deal of management effort and time may be consumed in the negotiating process.

### *Example 21.3*

A company has two divisions, A and B. Division A manufactures a component which is used by Division B to produce a finished product. For the next period, output and costs have been budgeted as follows:

| | *Division A* | *Division B* |
|---|---|---|
| Component units | 50,000 | |
| Finished units | — | 50,000 |
| Total variable costs | Rs 2,50,000 | 6,00,000 |
| Fixed costs | Rs 1,50,000 | 2,00,000 |

The fixed costs are separable for each division. You are required to advise on the transfer price to be fixed for Division A's component under the following circumstances.

1. Division A can sell the component in a competitive market for Rs 10 per unit. Division B can also purchase the component from the open market at that price.
2. As per the situation described in (i) above, and further assume that Division B currently buys the component from an external supplier at the market price of Rs 10 and there is reciprocal agreement between the external supplier and another Division C, within the group. Under this agreement the external supplier agrees to buy one product unit from Division C, at a profit of Rs 4 per unit to that division, for every component which Division B buys from the supplier.

*Solution*

1. Transfer Price = Incremental (marginal) cost + Opportunity costs of the company due to not being able to use the components in the next most profitable way.
   = Rs 5 + Rs 5 (Contribution foregone by transferring internally as opposed to selling in the open market)
   = Rs 10

   The transfer price of Rs 10 is equal to the market price of the component which is also Rs 10.
2. Transfer Price = Marginal cost + Contribution + Profit foregone by Division C as Division B will acquire its units from Division A in place of external supplier.
   = Rs 5 + Rs 5 + 4
   = Rs 5 + Rs 9 (Rs 9 is the opportunity cost to the whole company)
   = Rs 14

The transfer price of Rs 14 should result in the Manager of Division B continuing to buy from the external supplier at the market price of Rs 10. However, the transfer price of Rs 14 is appropriate from the viewpoint of the organisation as a whole, since, if the component is transferred internally not only will Division A forgo an external profit of Rs 5, but Division C will also forego an external profit of Rs 4. It is assumed that Division C could not achieve the same profit by selling elsewhere.

### *Example 21.4*

A company fixes the inter-divisional transfer prices for its products on the basis of cost plus an estimated return on investment in its divisions. The relevant portion of the budget for the Division A for the year 1991-92 is given below:

| | |
|---|---|
| Fixed Assets | Rs. 5,00,000 |
| Current assets (other than debtors) | 3,00,000 |
| Debtors | 2,00,000 |
| Annual Fixed Cost of the division | 8,00,000 |
| Variable cost per unit of product | 10 |
| Budgeted Volume of Production per year (units) | 4,00,000 |
| Desired Return on Investment | 28% |

You are required to determine the transfer price for the Division A.

*(ICWA Inter)*

*Solution*

*Basic Calculations:*

1. Computation of Investment in Division A.

| | |
|---|---|
| Fixed Assets | Rs 5,00,000 |
| Current Assets (Debtors + Other Current Assets) | 5,00,000 |
| | Rs 10,00,000 |

2. Return on Investment

| | | |
|---|---|---|
| Desired Return 28% on Rs 10,00,000 | Rs 2,80,000 | |
| Budgeted Volume of Production p.a. | 4,00,000 | units |
| Profit Margin per unit $\frac{2,80,000}{4,00,000}$ = | Re. 0.70 | |

**Computation of Transfer Price for Division A**

| | |
|---|---|
| Variable Cost per Unit | Rs 10.00 |
| Fixed Cost per unit 8,00,000/4,00,000 | 2.00 |
| Profit Margin per unit | .70 |
| Transfer Price per unit | Rs 12.70 |

## THEORY QUESTIONS

1. Explain the concept of responsibility accounting. What are the different types of responsibility centres.
2. Discuss the essential of responsibility performance reporting.
3. How will you measure the performance of cost and revenue division?

4. Describe and compare the main performance measures that have been suggested to measure the divisional performance.
5. Profit, return on investment and residual income have stood the test of time and are widely used for measuring the performance of a division. Describe the strengths and weaknesses of these measures of performance.
6. Outline problem in defining and measuring capital employed in a division.
7. Explain the rationale of using an interest charge while measuring the performance of a division.
8. "In ROI, there is lack of consensus on the definition of numerator and denominator both." Explain the statement.
9. Explain the essential ingredients of a system of 'Responsibility Accounting'.

*(B. Com. (Hons), Delhi, 1998)*

10 Outline the basic principles of 'Responsibility Accounting'. *(B. Com. (Hons), Delhi, 2001)*

## PROBLEMS

1. A company has two division, X and Y, and evaluates its managers on the ROI criterion. Budgets for the next year are as follows:

| | *X(Rs)* | *Y(Rs)* | *Total (Rs)* |
|---|---|---|---|
| Investment | 12,00,000 | 10,00,000 | 22,00,000 |
| Revenue | 6,00,000 | 3,00,000 | 9,00,000 |
| Operating expenses | (3,00,000) | (2,00,000) | (5,00,000) |
| Profit | 3,00,000 | 1,00,000 | 4,00,000 |

A new investment opportunity has arisen and could be adopted by either division. It requires an investment of Rs 2,00,000 and promises annual operating profit of Rs 40,000.

*Required:*

(i) Which division (X or Y) would accept the new project? Why?

(ii) It an RI criterion with minimum ROI of 18% were in use, which division (X or Y) would accept the new project? Why?

(iii) With minimum ROI of 18% should the new project be accepted from the viewpoint of the company as a whole? Why?

22

# Activity-based Costing (ABC)

## MEANING OF ACTIVITY-BASED COSTING (ABC)

Activity-based Costing (ABC) is that costing in which costs are first traced to activities and then to products. The ABC is a costing system which focuses on activities performed to produce products. Activities become the focal points for cost accumulation. This costing system assumes that activities are responsible for the incurrence of costs and products create the demands for activities. Costs are charged to products based on individual product's use of each activity. In traditional product costing system, costs are, first, traced not to activities but to an organisational unit, such as department or plant and then to products. It means under both ABC and traditional costing system, the second and final stage consists of tracing costs to the product. By emphasing activities, ABC tries to ascertain the factors that cause each major activity, cost of such activities and the relationship between activities and products produced. The relationship between activities and products has been shown in the Figure 22.1.




Fig. 22.1 ABC Process

## STAGES AND FLOW OF COSTS IN ABC

As stated earlier, there are two primary stages in ABC—first, tracing costs to activities; second, tracing activities to products. The different steps in the two stages of ABC are explained below:

First, activities are identified and then classified into different categories that have relationship with the different parts of the production process. Examples of some such activities are direct labour related activities, machine related activities (machine cost centres) and various support activities, such as ordering, receiving, materials handling, production scheduling, packing and despatching.

Second, factory overhead costs of the activities are determined and classified into homogeneous cost pools. A homogeneous cost pool is a collection of overhead costs that are logically related to the tasks being performed. A cost pool should be created for each activity. Cost pool is like a cost centre or activity centre around which costs are accumulated.

Third, the factors that influence the cost of a particular activity should be identified. They are known as cost drivers. It should be understood that direct costs do not need cost drivers as they can be traced directly to a product. Direct costs are themselves cost drivers. However, all other factory or manufacturing costs need cost drivers. Cost drivers signify factors, forces or events that determine the costs of activities. Cost drivers are the links and they can link a pool of costs in an activity centre to the product. ABC is based on the assumption that cost behaviour is influenced by cost drivers. Therefore, in order to trace overhead costs to products, appropriate cost drivers should be identified. Fig. 22.2 gives examples of some cost drivers in activity based costing system.

| Cost Drivers |
|---|
| 1. Number of receiving orders for the receiving department. |
| 2. Number of purchase orders for the cost of operating the purchase department. |
| 3. Number of despatch orders for the despatch department. |
| 4. Number of units. |
| 5. Number of setups. |
| 6. Amount of labour cost incurred. |
| 7. Value of materials in a product. |
| 8. Number of materials handling hours. |
| 9. Number of inspections. |
| 10. Number of schedule changes. |
| 11. Number of parts received per month. |
| 12. Number of machine hours used on a product. |
| 13. Number of set up hours. |
| 14. Number of direct labour hours. |
| 15. Number of sub-assemblies. |
| 16. Number of vendors. |
| 17. Number of purchasing and ordering hours. |
| 18. Number of units scrapped. |
| 19. Number of labour transactions. |
| 20. Number of parts. |
| 21. Number of customer orders processed. |
| 22. Number of employees. |

**Fig. 22.2** Cost Drivers

In traditional product costing, the number of cost drivers used are few such as direct labour hours, machine hours, direct labour cost, units produced. But ABC may use a multitude of cost drivers that relate costs more closely to the resources consumed and activities occurring.

Fourth, after cost pool is defined and cost drivers identified, the cost per unit of the cost driver is computed for that pool. This is called the pool rate. This pool rate links costs and cost drivers with the resource use. This pool rate can be based on either planned or actual activity levels.

Finally, the cost of each overhead pool are traced to products who are the users of the resources. Thus, at the final stage, the cost pool, cost driver and the pool rate combine to determine how much cost should be assigned to each product. The pool rate measure is simply the quantity of cost driver used by each product.

## CLASSIFICATION OF ACTIVITIES

As stated earlier, activities are identified and classified into different categories or segments of the production process. The grouping of activities is preferably done using the different levels at which activities are performed. Broadly, activities are classified into one of four activity categories:

1. Unit level Activities.
2. Batch level Activities.
3. Product level Activities.
4. Facility-level Activities.

Unit level activities are those activities which are performed each time a unit is produced. They are repetitive activities. For example, direct labour hours, machine hours, power are used each time a unit is produced. Direct materials and direct labour activities are also unit level activities, although they are not overhead costs. Costs of unit level activities vary with the number of units produced.

Batch level activities are those activities which are performed each time a batch of goods or products is produced. The costs of batch level activities vary with the number of batches but are fixed with respect to the number of units in each batch. Machine setups, inspections, production scheduling, materials handling are examples of batch level activities which are related to batches but not to individual products.

Product level activities are those activities which are performed to support the production of each different type of product. Maintenance of equipment, engineering charges, testing routines, maintaining bills of materials, handling materials are some examples of batch-level activities.

Facility-level activities are those which are needed to sustain a factory's general manufacturing process. These activities are common to a variety of products and are most difficult to link to product specific activities. Examples of facility level activities are factory management, maintenance, security, plant depreciation.

In ABC system, facility level activities and costs are treated as period cost as they are found difficult to assign to different products. The costs associated with the first three categories—unit level, batch level, product level—are assigned to products, using cost drivers that reflect the cause and effect relationship between activity consumption and cost.

## COMPARING ABC WITH CONVENTIONAL COSTING SYSTEM

In traditional costing system, overhead costs are assumed to be influenced by only units produced. It means, in traditional costing system, costs of batch level, product level and facility level activities are fixed costs, that is, costs of these do not vary as production volume changes. Unit-based cost systems apportion fixed overhead to individual products and variable overhead are directly assigned to products using the base of number of units produced.

In ABC, variable overhead is appropriately traced to individual products. The costs incurred as the units are produced have been traditionally treated as variable overhead. But when fixed overheads are apportioned on the basis of units made, as in traditional costing, such apportionment is likely to be arbitrary and also may not reflect activities and cost actually consumed by the products. ABC improves product costing procedure (as compared to traditional costing) because it recognises that many so-called fixed overhead costs vary in proportion to changes other than production units. It means, under ABC, the

other two level activities—batch level and product level—are assumed to influence fixed overhead costs and batch level and product level, thus, are accepted as nonunit-based cost drivers. By establishing the link between these cost drivers and fixed overhead costs, they are finally traced to individual products. Figure 22.3 presents an overview of product cost determination under traditional costing and ABC system. It can be observed that both the costing systems follow a two stage allocation procedure. In traditional costing, in the first stage, overhead costs are allocated to production departments. But in ABC, in the first stage, overhead costs are assigned to each major activity and not to departments. In traditional costing, overheads are pooled/collected department-wise. But, in ABC, many activity-based cost pools or cost centres are created. In traditional costing, overhead costs of service departments are allocated/reapportioned to production departments and therefore in this costing system finally only fewer cost pools exist. But ABC creates separate cost pools for service activities as well and overhead costs of these service activities (service departments) are assigned directly to specific products through applying cost driver rates. Thus, in ABC, there is no need to allocate/reapportion overheads of service departments.

## ADVANTAGE OF ABC

ABC brings accuracy and reliability in product cost determination by focussing on cause-and-effect-relationship in the cost incurrence. Further, ABC improves greatly the manager's decision-making as they can use more reliable product cost data. ABC also enables managers to control many fixed overhead costs by exercising more control over the activities which have caused these fixed overhead costs. This is possible since behaviour of many fixed overhead costs in relation to activities now become more visible and clear. The traditional costing does not pay attention to the cause and effect relationships between resources used and production activities. Also, the traditional costing uses more arbitrary bases for apportionment of overhead costs than the ABC system. The traditional costing rolls many overhead costs into the total overhead and does not trace them directly to specific products. On the other hand, ABC does allocate directly a large part of such overhead costs to specific products. ABC helps usefully in fixing selling prices of products as more correct data of product cost is now readily available.

The decision to use ABC is comparing costs and benefits relating to this system. The advantages to a company of ABC system depends on many factors such as level of competition, number of products manufactured and product diversity. It can be claimed that those companies who operate in a more competitive environment, are in dire need of correct product cost data for taking sound decisions with regard to determination of selling prices and taking better cost management measures. The complexity of product mix plays a vital role in determining whether the cost of two or more activities can be combined and traced to a product by means of a single cost driver and still these costs can be assigned to products accurately. There is need to increase the number of activity centres, cost pools and cost drivers in order to achieve the goal of more accurate product costs.

### *Example 22.1*

ABC manufacturing Co. has been using a cost system that allocates all factory overhead costs to products based on 350 per cent of direct labour cost. The company has just decided to use Activity-Based Cost System (ABC) that traces indirect costs to products based on consumption of major activities as indicated below.

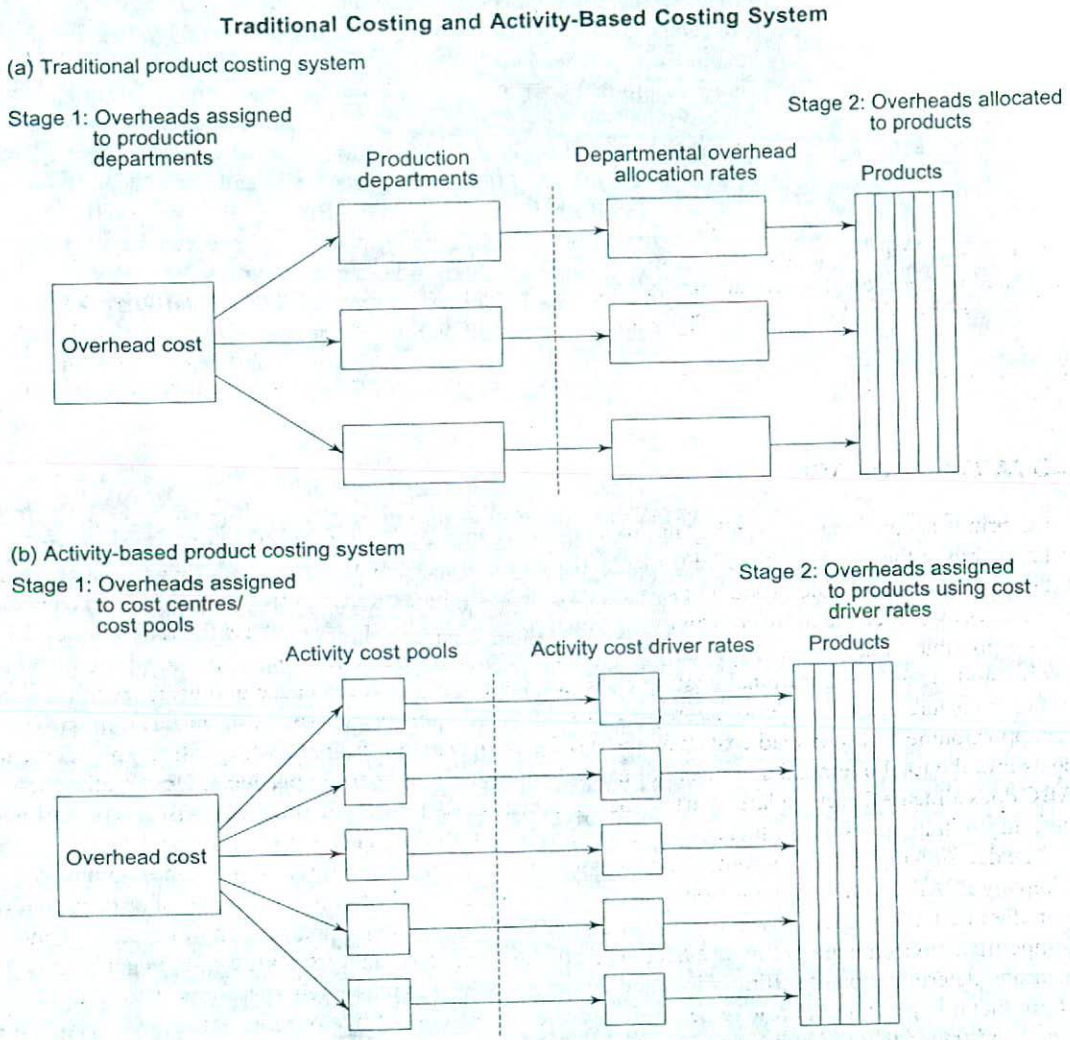



**Fig. 22.3** Comparison of Traditional and Activity-Based Costing Systems

*Source:* J. Innes and F. Mitchell, *Activity-Based Costing: A Review with Case Studies*, 1990, CIMA, U.K.

| *Activity* | *Annual cost driver quantity* | *Cost (Rs)* | *Product' cost Driver consumption* |
|---|---|---|---|
| Labour | Rs 3,00,000 | 30,000 | Rs 10,000 |
| Machining | 20,000 hours | 5,00,000 | 800 hours |
| Setup | 10,000 hours | 1,00,000 | 100 hours |
| Production order | 2000 orders | 2,00,000 | 12 orders |

| | | | |
|---|---|---|---|
| Material handling | 1000 requisitions | 20,000 | 5 requisitions |
| Portadministration | 12,000 parts | 4,80,000 | 18 parts |

*Required:*

Compare the total annual costs of the product using both the traditional volume-based and new ABC system.

*Solution*

| *Cost system* | *Pool rate* | *Cost driver Consumption* | *Cost Assignment (Rs)* |
|---|---|---|---|
| *Traditional cost system* | *350%* | *Rs 10,000* | *Rs 35,000* |
| *ABC System* | | | |
| (i) Labour | 10% | Rs 10,000 | Rs 1,000 |
| (ii) Machining | Rs 25 per hour | 800 hours | 20,000 |
| (iii) Set up | Rs 10 per hour | 100 hours | 1,000 |
| (iv) Production order | Rs 100 per order | 12 orders | 1200 |
| (v) Material handling | Rs 20 per requisition | 5 requisitions | 100 |
| (vi) Parts administration | Rs 40 per part | 18 parts | 720 |
| | | | Rs 24,020 |

*Conclusion:* The total cost of product under ABC is Rs 24,020 whereas under traditional cost system it is Rs 35,000.

### *Example 22.2*

ABC manufacturing company has three accounts clerks responsible for processing purchase invoices. Each clerk is paid a salary of Rs 3,00,000 p.a. and is capable of processing 5000 invoices per year (working efficiently). In addition to the salary, the company spends Rs 90,000 per year for forms, postage etc. (assuming that 15,000 invoices are processed). During the year, 12,500 invoices were processed.

*Required:*

1. Calculate the activity rate for the purchase order activity. Break the activity into fixed and variable components.
2. Compute the total activity availability and break this into activity usage and unused activity.
3. Calculate the total cost of resources supplied and break this into activity usage and unused activity.

*Solution*

1. Activity Rate = [(3 × Rs 3,00,000) + Rs 90,000]/15
   = Rs 66 per invoice
   Fixed activity rate = Rs 9,00,000/15,000
   = Rs 60 per invoice
   Variable activity rate = Rs 90,000/15,000
   = Rs 6 per invoice
2. Activity availability = Activity usage + Unused activity
   15000 invoices = 12,500 invoices + 2500 invoices
3. Cost of resources supplied = cost of activity used + cost of unused activity

Rs 9,00,000 + (Rs 6 × 12,500) = (Rs 66 × 12,500) + (Rs 60 × 2500)
Rs 9,75,000 = Rs 8,25,000 + 1,50,000

### *Example 22.3*

ABC Company produces two types of stereo units. Activity data follows:

| *Activity Usage Measures* | *Product-Costing Data* | | |
|---|---|---|---|
| | *Deluxe* | *Regular* | *Total* |
| Units produced per year | 5,000 | 50,000 | 55,000 |
| Prime costs (Rs.) | 39,000 | 369,000 | 408,000 |
| Direct labour hours | 5,000 | 45,000 | 50,000 |
| Machine hours | 10,000 | 90,000 | 100,000 |
| Production runs | 10 | 5 | 15 |
| Number of moves | 120 | 60 | 180 |

**Activity Cost Data (overhead activities)**

| *Activity* | *Activity Cost (Rs)* |
|---|---|
| Setting up equipment | 60,000 |
| Material handling | 30,000 |
| Using power | 50,000 |
| Testing | 40,000 |
| Total | 180,000 |

*Required:*

1. Calculate the consumption ratios for each activity.
2. Group activities based on the consumption ratios and activity level.
3. Calculate a rate for each pooled group of activities.
4. Using the pool rates, calculate unit product costs.

*Solution*

1. Comsumption ratios:

| *Overhead Activity* | *Deluxe* | *Regular* | *Activity Driver* |
|---|---|---|---|
| Setups | 0.67[a] | 0.33[a] | Production runs |
| Material handling | 0.67[b] | 0.33[b] | Number of moves |
| Power | 0.10[c] | 0.90[c] | Machine hours |
| Testing | 0.10[d] | 0.90[d] | Direct labour hours |

[a] 10/15 (Deluxe) and 5/15 (Regular)
[b] 120/180 (Deluxe) and 60/180 (Regular)
[c] 10,000/100,000 (Deluxe) and 90,000/100,000 (Regular)
[d] 5,000/50,000 (Deluxe) and 45,000/50,000 (Regular)

2. Batch-level: setups and material handling
   Unit-level: power and testing

3.

| *Batch-Level Pool* | | *Unit-Level Pool* | |
|---|---|---|---|
| Setups | Rs 60,000 | Power | Rs 50,000 |
| Material handling | Rs 30,000 | Testing | 40,000 |

| | | | |
|---|---|---|---|
| Total | 90,000 | Total | Rs 90,000 |
| Runs | ÷ 15 | Machine hours | ÷ 100,000 |
| Pool rate | Rs 6,000/run | Pool rate | Re 0.90/ machine hour |

4. Unit Costs: Activity-Based Costing

| | *Deluxe (Rs)* | *Regular (Rs)* |
|---|---|---|
| Prime costs | 39,000 | 369,000 |
| Overhead costs: | | |
| Batch-level pool: | | |
| (Rs 6,000 × 10) | 60,000 | |
| (Rs 6,000 × 5) | | 30,000 |
| Unit-level pool: | | |
| (Re 0.90 × 10,000) | 9,000 | |
| (Re 0.90 × 90,000) | | 81,000 |
| Total manufacturing costs | 108,000 | 480,000 |
| units produced | ÷ 5,000 | ÷50,000 |
| Unit cost (total costs/units) | 21.60 | 9.60 |

***Example 22.4***

ABC company has been incurring two types of overhead costs-material handling and quality inspection. The costs expected for these categories for the coming year are as follows:

| | |
|---|---|
| Material handling | Rs 10,00,000 |
| Quality inspection | Rs 30,00,000 |

The company currently charges overhead using direct labour hours and expected actual capacity. This figure is 50,000 direct labour hours.

The factory manager has been asked to submit a bid and has assembled the following data concerning proposed job.

| | *Job* |
|---|---|
| Direct materials | Rs 37,000 |
| Direct labour (1000 hours) | Rs 70,000 |
| Number of material moves | 10 |
| Number of inspections | 5 |

The manager has been informed that many competitors use an ABC approach to assign overhead to jobs. Before, submitting his bid for the proposed job, he wants to assess the effects of this alternative approach. He estimates that the expected number of material moves for all jobs during the year is 1,000. He also expects 5000 quality inspections to be performed.

*Required:*

(a) Compute the total cost of the proposed job using direct labour hours to assign overhead. Assume the bid price is full manufacturing cost plus 25%, what would be the manager's bid?

(b) Compute the total cost of the job using the number of material moves to allocate material-handling costs and the number of inspections to allocate the quality inspections costs. Assume bid price is full manufacturing costs plus 25%. What should be his bid using this approach?

(c) Which approach do you think best reflects the actual cost of the job. Explain.

*Solution*

(a) Total overhead = Rs 10,00,000 + Rs 30,00,000
= Rs 40,00,000

Plant-wide absorption rate = Rs 40,00,000/50,000 his.
= Rs 80 per hour

Total cost of proposed job
(Using direct labour hour basis)

| | (Rs) |
|---|---|
| Direct materials | 37,000 |
| Direct labour | 70,000 |
| Prime cost | 1,07,000 |
| Overhead costs (1000 hours × Rs 80) | 80,000 |
| Total cost | 1,87,000 |
| Plus 25% (Rs 1,87,000 × 25%) | 46,750 |
| Bid price | Rs 2,33,750 |

(b) In ABC approach, consumption ratios are different for overhead activities (material handling and quality inspection in this case). Therefore, overhead pools are formed for each activity. The overhead rates for each of these pools are as follows:

Material moves = Rs 10,00,000/1000 material moves
= Rs 1000 per move

Quality inspections = Rs 30,00,000/5000 quality inspection
= Rs 600 per inspection

Total cost of proposed Job
(Activity-Based Approach)

| | Rs |
|---|---|
| Direct materials | 37,000 |
| Direct labour | 70,000 |
| Prime cost | 1,07,000 |
| Overhead costs: | |
| Material moves (10 × Rs 1,000) | 10,000 |
| Inspection (5 × Rs 600) | 3,000 |
| Total cost | 1,20,000 |
| Plus 25% (Rs 1,20,000 × 25%) | 30,000 |
| Bid price | 1,50,000 |

(c) The total cost of proposed job under traditional cost assignment (using direct labour hour) is Rs 2,33,750 and under ABC approach is Rs 1,50,000. The traditional approach overestimates the overhead and therefore, the company using this system would overbid the proposed job. ABC approach best reflects the actual cost of the proposed job.

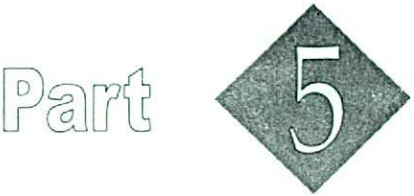
## THEORY QUESTIONS

1. What is Activity-Based Costing? Why is it needed?
2. What is a cost driver? What is the role of cost driver in tracing costs to products?
3. Explain the steps in applying Activity-Based Costing (ABC) in a manufacturing Company.
4. How are activities grouped in a manufacturing company?
5. Distinguish between activity-based costing and traditional costing system.
6. What are the benefits of activity-based costing?
7. Define unit level activities, batch level activities, product level activities and facility level activities.
8. "Overhead costs are source of product cost distortion." Do you agree, Explain.
9. Mr. Ashok kumar owns a large department store in Delhi. For 10 years, the accountant has applied overheads to the various departments—produce, meat, dairy, canned foods, bakery and floral—based on the basis of employee hours worked. Mr. Ashok Kumar's son who is a commerce student in University of Delhi has suggested his father should consider activity-based costing (ABC): In an attempt to implement ABC, Mr. Ashok Kumar and his son have identified the following activities. They need your help in determining a cost driver for each of the activities.

   *Cost pool*

   (a) Placing orders
   (b) Checking out customers
   (c) Bagging groceries
   (d) Delivering groceries
   (e) Stocking shelves
   (f) Janitorial and Maintenance
   (g) Training employees
   (h) Administrative
   (i) Advertising and Marketing
   (j) Accounting and legal service.

   *Ans:* Cost drivers are (a) Number of orders
   (b) Number of customers, sales volume.
   (c) Number of customers, sales volume
   (d) Number of delivery orders
   (e) Hours worked stocking
   (f) Square feet occupied
   (g) Total number of employees, number of new employees
   (h) Sales volume
   (i) Number of advertisement campaigns
   (j) Sales volume.




# Specialised Topics

- Cost Audit



# Cost Audit

## MEANING OF COST AUDIT

The Institute of Cost and Management Accountants (UK) defines cost audit "as the verification of cost accounts and a check on the adherence to the cost accounting plan." Cost audit is verifying the correctness of cost accounts, cost reports, cost data and costing methods.

## ADVANTAGES OF COST AUDIT

Cost audit is useful to many parties such as (i) management (ii) shareholder (iii) statutory auditor, (iv) government and consumers.

(i) *Management* Cost audit adds reliability to cost statements and cost data. It helps in detection of errors, frauds and irregularities. Management can make sound decisions on the basis of correct and reliable cost data.

(ii) *Shareholders* Cost audit increases the reliability of many cost data which are used by shareholders to analyse the financial position of a business firm.

(iii) *Statutory Auditor* Statutory auditor is also benefitted if cost system has been set up in an organisation. The statutory auditor can determine scope of his audit and make audit programme after evaluating cost accounting system used in organisation.

(iv) *Government and Consumers* Government needs cost data for many purposes such as fixation of prices, cost plus contract, productivity measurement, evaluation of management efficiency, week points of management and organisation. All these activities require that cost data should be correct and reliable which is possible if a good costing system has been followed in an organisation.

## FINANCIAL AUDIT AND COST AUDIT

Financial audit is the audit of financial accounts whereas cost audit is the audit of cost accounts. Financial audit aims to know whether the financial statements, viz., profit and loss account and balance sheet

present a true and fair view of the business result and state of affairs of a business enterprise or not. On the other hand, cost audit aims to determine the correctness of cost figures of each activity after proper analysis. Cost audit focuses on propriety of expenditure and efficiency of performance.

Financial audit is related with only historical figures and data after the expenditures have been incurred and accounts have been prepared. Cost audit is performed with the help of budgets and therefore has a futuristic focus.

## EFFICIENCY AUDIT AND COST AUDIT

Efficiency audit ensures that the resources flow into the most remunerative channels, viz. (a) every rupee invested in capital or in other fields gives optimum return; and (b) the planning of investment between the different functions and aspects is designed to give optimum results. The financial auditor does not comment on the performance efficiency of the company.

Since an appraisal of the extent of efficiency of utilization of factors of production is done in cost audit, it is rightly called "efficiency audit".

The following are the evidences to prove that Cost audit is efficiency audit:

(i) The Cost Auditor has to report in para (3) of the annexure*, the financial position of the company, giving inter alia—financial ratios like profit as % of capital, profit as % of net sales, current assets expressed as % of current liabilities, cost of production as % of capital employed, and working capital as % of cost of production. These ratios are useful for assessment of operational efficiency and comparing the financial health of one undertaking with another as well as for measurement of internal efficiency.

(ii) The Cost Audit Report under para 4 of the annexure reflects the installed capacity and actual capacity utilised as well as analysis of the reasons for shortfall in actual capacity utilised as compared to installed capacity.

(iii) Under para 6 of the annexure to Cost Audit Report, an analytical study of the consumption of raw materials per unit of production both in quantity and in value is made.

(iv) Under para 7, the cost auditor is expected to comment on the consumption of power and fuel in total as well as per unit of output.

(v) The Cost Auditor has to report on the direct labour cost per unit of output of the product under cost audit alongwith brief explanation for variation in the cost, as compared to two preceding years.

(vi) The details of expenditure under overheads, with reasons for significant variation in expenditure as compared to preceding two years, particularly increase in overhead expenditure without corresponding increase in turnover or output of the product under Cost Audit has to be commented upon in para 11 of Annexure to Cost Audit Report;

(vii) The Cost Audit Report, under para 9, contains information regarding consumption of stores and spares parts per unit of output which serves as a good indicator of upkeep of machines;

(viii) The Cost Audit Report contains information regarding the extent of non-moving items of stores as compared to the total inventory (vide para 9 of Annexure to the report).

* The Department of Company Affairs, Government of India has framed Cost Accounting Record Rules which contains format of Cost Audit Report and an Annexure containing the guidelines for preparing Cost Audit Report by the cost auditor.

(ix) In para 13 of Annexure to the Cost Audit Report the profitability of other exports from the company has to be commented upon;
(x) A cost auditor is expected to offer comments on various matters like rectification of imbalances in production facilities, fuller utilisation of installed capacities, increased productivity, limiting factors causing production bottlenecks and improved inventory policies.
(xi) A cost auditor is also expected to offer comments on the budgetory control systems and internal audit systems, prevailing in the organisation.

Thus, it can be established that no other audit except cost audit is so well designed to bring about the efficiency aspect of operations of a manufacturing unit in such elaborate detail.

## MANAGEMENT AUDIT

Management audit is a detailed and critical review of all aspects of the management. Management audit encompasses all facets of managerial operations, including internal controls, and ascertaining the extent of compliance with established policies, plans and procedures within an organisation. Management audit is sometimes known as operational audit. The basic objectives of a management audit are to:

(i) help management to manage better;
(ii) improve organisational profitability; and
(iii) ensure that management objectives are being met.

The management audit covers a very vast and broad scope and extends beyond the scrutiny of books of accounts to areas such as production, maintenance, materials management, consumption of inputs, marketing, personnel matters, etc. Technical aspects are also involved.

### Scope of Management Audit

Some important areas which management audit should probe to evaluate the performance efficiency to ascertain the drawbacks in the systems and procedures and to make suggestions to the management for remedial action and better control, could be the following:

(i) Production performance; (ii) sales performance; (iii) capacity utilisation; (iv) inventory holdings; (v) liquidity position; (vi) consumption efficiencies; (vii) costs of production; (viii) preventive maintenance; (ix) idle capacity; (x) purchases; (xi) receivables; (xii) overtime; and (xiii) controllable expenses.

### Potent Tool for Managerial Control

Management audit as the eyes and ears of the management can bring to focus the weak areas of the operation and bring the improvement in the operational efficiency by interaction with the functionaries and highlighting these areas to the top management for improvement in the systems, procedures and methods of internal control. It is, thus a potent tool for managerial control.

### Cost Reduction through Improvement in the Performance Efficiency

Cost of production is directly related with the operational efficiency and continuous efforts to improve operational efficiency will result in the reduction of costs and increase in the profitability. Some important areas needing a probe and suggestions towards reduction of costs by management audit could be:

(i) Input mix and cheaper substitues; (ii) consumption efficiencies; (iii) preventive maintenance to reduce idle capacity; (iv) utilisation and performance of plant and machinery; (v) control in inventory holdings; (vi) economic purchases; (vii) improvement of sales turnover of products having high P/V Ratio; (viii) control over recoverables; (ix) control over overtime; (x) improvement of industrial relations.

## PREPARATION OF COST AUDIT

Before starting the cost audit, an auditor should acquaint himself with several factors such as the following:

1. Cost accounting system used in organisation.
2. Production methods and manufacturing processes.
3. Information about raw materials and components used in production.
4. Concessions received from government, if any.
5. Memorandum and Articles of Association and important point mentioned therein about the costing requirements.
6. Information about cost records and documents.
7. Cost Accounting Rules or Cost Accounting Manual used in the organisation.

## SCOPE OF THE COST AUDIT

Cost audit covers the following important areas:

1. *Materials:* The cost auditor generally varifies the following items relating to materials:
   (i) Goods inward procedure
   (ii) Store-keeping arrangement.
   (iii) Accounting for scrap, wastage, materials transfers.
   (iv) Perpetual inventory system.
   (v) Materials pricing methods used.
   (vi) Adequacy of stock checking methods.
2. *Wages:*
   (i) Documents used in preparation of payroll.
   (ii) Wage rate changes authorisation for wage payments and overtime payments.
   (iii) Time recording.
   (iv) Internal check system.
3. *Overhead:*
   (i) Classification of overhead.
   (ii) Overhead budgets.
   (iii) Apportionment and allocation of overhead.
   (iv) Methods of absorption.
   (v) Policy regarding inclusion of overhead in work-in-progress.
   (vi) Accounting treatment of under- or over-absorption.

4. *General:*
   (i) Methods of establishing standards, revision of standards.
   (ii) Methods of calculating standards cost variances.
   (iii) Accounting codes and instructions.

**Areas of activity for which accounting records are to be maintained under Cost Accounting Record Rules**

*Costing Accounting Record Rules:* The Government of India had issued "Cost Accounting Record Rules" in respect of number of products/industries (as listed under section 209 (1) (d) of Companies Act). Before the imposition of Statutory Cost Audit it was expected from all such concerns to observe these rules. Such an audit is imposed in respect of those products/industries which are consumer oriented and earners of high profit margin. According to these rules, all companies engaged in activities of production or manufacturing, etc. (for which cost account records have been prescribed) should maintain accounting records ralating to the utilisation of materials, labour and other items of cost. Such books of account should facilitate the calculation and disclosure of cost of production and cost of sales of the products at a periodical intervals. Each books of account and the proforma prescribed by the rules should be completed within the prescribed time limit after the end of the relevant financial year of the company. Following records are to be maintained under Cost Accounting (Records) Rules generally applicable to various industries in India.

1. Records for raw materials, components, stores and spare parts.
2. Records for labour.
3. Records for overheads.
4. Records for utilities/services.
5. Records for fixed assets.
6. Records for packing.
7. Records for research and development expenses.
8. Records for conversion cost.
9. Records for by-products.
10. Records for work-in-progress and finished goods.
11. Records for cost of production and marketing.
12. Reconciliation of cost records with financial books.
13. Computation of variances.
14. Physical verification.
15. Statistical data.

## VALUE ANALYSIS

Value analysis or value engineering is a technique applied to analyse all aspects of an existing product or component to determine the minimum cost necessary for specific function requirements. This may result in various alterations being made to the product with object of reducing costs.

### Advantages of Value Analysis

The primary advantage of value analysis is reduction in product cost. Some other advantages are the following:

1. Value analysis improves sale and customer satisfaction since it determines the exact requirements of customers and product designing is done accordingly.
2. The quality of the product is improved.
3. The latest methods of production and technology are used in product manufacture.
4. By simplification and standardisation of design and method, problems and complexities in production methods are eliminated.
5. It coordinates all managerial functions and builds up a spirit of cooperation and team work.
6. It helps in accomplishing effective utilisation of production resources like capital, employees, materials, time, etc.

### Procedure of Value Analysis

Value analysis basically centres around determining the essential characteristics of a product that the customer requires and determining the most economical method of producing it by balancing cost with the utility of the product. The following are the steps involved in value analysis:

1. *Collecting relevant information* All necessary information about a product is first gathered, such as physichal characteristics, materials specification, product costs like materials, labour and overhead, market, competitive products, production methods, etc.
2. *Deciding alternatives* All alternatives are to be developed and the most appropriate alternative is to be decided upon in terms of suitability of method and costs involved. That alternative is considered best which gives the best satisfication to customers and reduces the cost.
3. *Approval for the accepted alternative* Management should approve the best alternative and give authority for the development of the modified or revised product.
4. *Execution* Production drawings and models are developed and production is done accordingly.
5. *Follow-up* Finally, the extent of cost reduction that has been achieved should be investigated.

## THEORY QUESTIONS

1. What are the areas of activity which a cost audit programme is expected to cover?
*(ICWA Inter, June)*
2. 'The statutory cost audit under the provisions of the Indian Companies Act is also intended to subserve social interests.' Comment.
*(ICWA June)*
3. Distinguish between:
   (i) Cost audit and financial audit
   (ii) Cost audit and management audit.
4. 'Cost audit is a necessity and not a luxury and is viewed as a barometer to measure the operational performance, the effectiveness of utilisation and working results.' Illustrate.
5. Explain the advantages of cost audit.
6. Is it correct to say that cost audit is efficiency audit. Give arguments.
7. Discuss the aspects usually covered in management audit.
8. What areas are covered in cost audit?
9. Explain the concept of value analysis as a technique of cost reduction.