

## SEM-II- Cost & Management Accounting-I Overhead Costing

The third important element of costs of any product or service is overheads. Overheads may be manufacturing or non-manufacturing. Later we briefly discuss the classification of overheads. Before that let us see what are overheads? Defining **overheads** particularly focuses on the concept of direct and indirect expenses which in turn depends on the traceability of the expenses with the product or service. In other words, expenses that cannot be directly traceable to any product or service are known as overheads. Simply, overheads are sum of all indirect expenses i.e.

$$\text{Overheads} = \text{Indirect materials} + \text{Indirect labour} + \text{Indirect expenses}$$

**Classification of overheads:** In general, overheads may be classified as

| Overheads            |                                     |                           |
|----------------------|-------------------------------------|---------------------------|
| Element wise         | Function wise                       | Behaviour wise            |
| a) Indirect material | a) Factory Overhead                 | a) Variable overhead      |
| b) Indirect labour   | b) Office & Administrative Overhead | b) Fixed overhead         |
| c) Indirect expenses | c) Selling & Distribution Overhead  | c) Semi-variable overhead |

Of the above classification functional and behavioural classification are included in the syllabus.

**Functional classification-** Functionally, overheads are classified into Factory overheads, Office and Administrative overheads, and Selling and Distribution overheads. Factory overhead is actually manufacturing overhead while other two are non-manufacturing overhead. Factory rent and taxes, indirect wages, are examples of factory overhead while, salary of office staff is an example of office and administrative overhead, and commission of salesman is an example of selling and distribution overhead.

**Behavioural Classification-** On the basis of behaviour, overheads can be classified as variable overhead, fixed overhead and semi-variable overhead.

**Variable overheads-** are those overheads that vary in direct proportion with the level of activity. For example, indirect wages, salesman's commission etc.

**Fixed Overheads-** are those overheads that remain fixed irrespective of the level of activity within a relevant range. For example, factory rent.

**Semi-variable Overhead-** are those overheads that vary with the level of activity but not in direct proportion. Examples are repair and maintenance, electricity charges etc.

We shall first discuss overhead costing of manufacturing overhead.

**Methods of segregating semi-variable cost into variable and fixed-** For segregating semi-variable cost into fixed and variable, the following methods are generally followed-

- i) High-point and Low-point method
- ii) Simultaneous equation method
- iii) Methods of Least Square
- iv) Scatter Diagram method.

Of the above, method (i) and (ii) are discussed for solving the problems in the preliminary level.

The above two methods are stated with following example. Units produced and total semi-variable costs are as below-

| Units | Total Costs |
|-------|-------------|
| 1000  | Rs 5000     |
| 2000  | Rs 6000     |
| 3000  | Rs 7000     |
| 4000  | Rs 8000     |

(2)

Sol: (i) Under High-point and Low- point method-

$$\text{Variable cost per unit} = \frac{\text{High-point cost} - \text{Low-point cost}}{\text{High-point unit} - \text{Low-point unit}}$$

So, variable cost per unit = (Rs 8000- Rs 5000)/ (4000- 1000) = Rs 3000/3000 = Re 1 per unit

Fixed cost = Total cost- variable cost per unit at any level can be applied  
= Rs 8000 – 4000 x 1 = 8000- 4000 = Rs 4000.

(ii) Under simultaneous equation method – Here we have to form two equations to find fixed and variable portion of semi-variable cost.

Let, a = variable cost per unit and b = fixed cost, applying we get

$$\begin{aligned} 1000a + b &= 5000 \dots\dots\dots(i) \\ 4000a + b &= 8000 \dots\dots\dots(ii) \end{aligned}$$

Solving we get, a= 1 and b= 4000.

**Steps of Factory Overhead costing-** Manufacturing overhead costing comprised of the following steps-

- (i) Collection of factory overhead costs
- (ii) Allocation of overhead costs
- (iii) Apportionment or distribution of overhead costs
- (iv) Re-distribution of service department cost to production department
- (v) Absorption of overheads.

- **Allocation and apportionment-** allocation refers to identification of overhead costs to the cost centre. But apportionment refers to the distribution of overhead cost on some logical base when identification to cost centre is not possible. A cost centre may be a person or location or an equipment or group of these in respect of which cost is ascertained for the purpose of cost control. It may be production cost centre or service cost centre.
- **Apportionment or distribution of overhead costs-** When overheads are not allocable, overheads would be apportioned or distributed on some logical bases, some of these are as below-

| Types of expenses                     | Basis of apportionment  |
|---------------------------------------|---|
| i) Rent, rates and taxes              | i) Area occupied/Floor space  |
| ii) Insurance of Stock                | ii) Value of Stock  |
| iii) Insurance of other fixed assets  | iii) Value of fixed assets  |
| iv) Depreciation of fixed assets      | iv) Value of fixed assets   |
| v) Stores overhead                    | v) Value of materials   |
| vi) Indirect wages                    | vi) Direct wages  |
| vii) Indirect materials               | vii) Direct materials   |
| viii) Lighting/Electricity expenses   | viii) wattage x working hours or No of light points or Space occupied |
| ix) Power                             | ix) Kw x working hours or H.P. of machine                             |
| x) Canteen expenses                   | x) No of workers  |
| xi) Supervisor's salary               | xi) No of workers   |
| xii) Employee welfare expenses        | xii) No of workers  |
| xiii) Workers' compensation insurance | xiii) direct wages  |
| xiv) General expenses                 | xiv) Working hours or direct wages                                    |
| xv) Repair & maintenance of assets    | xv) Value of assets   |

(3)

The above is illustrative and not exhaustive.

Let us discuss the distribution of overheads and re-distribution of service department cost to production department with an illustration.

**III-1.** P.Ltd is a manufacturing company having three production departments A,B and C, and two service departments X and Y. The following is the budget for December, 2019:

|                           | Total<br>Rs |
|---------------------------|-------------|
| Rent and rates            | 5000        |
| General lighting          | 600         |
| Indirect wages            | 1500        |
| Power                     | 1500        |
| Depreciation of machinery | 10000       |
| Sundry expenses           | 10000       |

| Additional information: | A<br>Rs | B<br>Rs | C<br>Rs | D<br>Rs | E<br>Rs |
|-------------------------|---------|---------|---------|---------|---------|
| Area (sq.m)             | 2000    | 2500    | 3000    | 2000    | 500     |
| Value of machinery (Rs) | 60000   | 80000   | 100000  | 5000    | 5000    |
| Machine hour            | 1000    | 2000    | 4000    | 1000    | 1000    |
| Light points ( nos)     | 10      | 15      | 20      | 10      | 5       |
| Direct wages            | 3000    | 2000    | 3000    | 1500    | 500     |
| H.P. of machines        | 60      | 30      | 50      | 10      | ---     |
| Working hours           | 6226    | 4028    | 4066    | ---     | ---     |

The expenses of D and E are allocated as follows

|   |     |     |     |     |     |
|---|-----|-----|-----|-----|-----|
| D | 20% | 30% | 40% | --- | 10% |
| E | 40% | 20% | 30% | 105 | --- |

You are required to do the following:

- A statement showing distribution of overheads
- A statement showing re-distribution of service department cost to production department
- Compute overhead recovery rate
- Ascertain total cost of an article if material cost is Rs 50, labour cost is Rs 30 and it passes through departments A,B and C for 4,5 and 3 hours respectively.

Sol: We shall discuss the theory while solving the problem:

**(i)Statement showing distribution of overheads**

| Item of expenses | Basis of apportionment | Total (Rs) | Production Deptt |      |      | Service Deptt |      |
|------------------|------------------------|------------|------------------|------|------|---------------|------|
|                  |                        |            | A                | B    | C    | D             | E    |
| Rent and rates   | Floor Space            | 5000       | 1000             | 1250 | 1500 | 1000          | 250  |
| General Lighting | Light points           | 600        | 100              | 150  | 200  | 100           | 50   |
| Indirect wages   | Direct wages           | 1500       | 450              | 300  | 450  | 225           | 75   |
| Power            | H.P. of machine        | 1500       | 600              | 300  | 500  | 100           | ---  |
| Depreciation     | Value of machine       | 10000      | 2400             | 3200 | 4000 | 200           | 200  |
| Sundries         | Direct wages           | 10000      | 3000             | 2000 | 3000 | 1500          | 500  |
| Direct wages     | Actual                 | 2000       | ---              | ---  | ---  | 1500          | 500  |
|                  | <b>TOTAL</b>           | 30600      | 7550             | 7200 | 9650 | 4625          | 1575 |

(4)

**Note:** Direct wages of production departments are included in the prime cost. However, direct wages of service department though it is direct in nature, but from the point of view of production as it is not producing any goods or services, hence direct wages of service department should be treated as indirect wages and accordingly overhead from the point of view of production department. So is the case for direct materials of service department.

• **Re-distribution of service department cost to production department**

For re-distribution of service department cost to production department the following methods are used depending upon the services rendered by the service department.

- i) Direct service to production department only
- ii) One-way service to production department and service department i.e besides giving service to production department one service department gives service to another service department only.
- iii) Reciprocal service given by the service departments i.e the service departments are giving services to each other.

**Case-I-** Suppose in the above illustration both the service departments D and E gives service in the ratio of 3:1:1 and 2:2:1 to A, B and C respectively. In that case re-distribution statement will be as under:

Statement showing re-distribution of overheads

| Item of expenses                | Production Deptt |      |       | Service Deptt |        |
|---------------------------------|------------------|------|-------|---------------|--------|
|                                 | A                | B    | C     | D             | E      |
| Total Overhead                  | 7550             | 7200 | 9650  | 4625          | 1575   |
| Service department D<br>(3:1:1) | 2775             | 925  | 925   | (4625)        | ---    |
| Service department E<br>(2:2:1) | 945              | 315  | 315   | ---           | (1575) |
| Total                           | 11270            | 8440 | 10890 | Nil           | Nil    |

**Case-II-** Service department D renders service to E worth Rs 2000 and the balance to A,B and C in the ratio of 3:1:1, while service department E provides service only to A,B and C in the ratio of 2:2:1. In that case re-distribution will be as under-

Statement showing re-distribution of overheads

| Item of expenses                                   | Production Deptt |      |       | Service Deptt |        |
|--|------------------|------|-------|---------------|--------|
|  | A                | B    | C     | D             | E      |
| Total Overhead                                     | 7550             | 7200 | 9650  | 4625          | 1575   |
| Service department D to E                          | ---              | ---  | ---   | (2000)        | 2000   |
| Service department D to<br>Production Deptt(3:1:1) | 1575             | 525  | 525   | (2625)        | ---    |
| Total  | 9125             | 7725 | 10175 | Nil           | 3575   |
| Service department E to<br>Production Deptt(2:2:1) | 2145             | 715  | 715   | ---           | (3575) |
|  | 11270            | 8440 | 10890 | Nil           | Nil    |

**Case-III-** Reciprocal services by one service department to another as given in the illustration:

In this case we may follow either a) Repeated distribution method or b) Simultaneous equation method

**Repeated distribution method:** in this case, service department with higher cost may be considered first and distributing in the given ratio to production and other service department. This process will continue until the entire service department costs are exhausted.

(5)

**Statement showing re-distribution of overheads**

| Item of expenses                  | Production Deptt |      |       | Service Deptt |        |
|-----------------------------------|------------------|------|-------|---------------|--------|
|                                   | A                | B    | C     | D             | E      |
| Total Overhead                    | 7550             | 7200 | 9650  | 4625          | 1575   |
| Service department D<br>(2:3:4:1) | 925              | 1388 | 1850  | (4625)        | 462    |
| Service department E<br>(4:2:3:1) | 815              | 407  | 611   | 204           | (2037) |
| Service department D<br>(2:3:4:1) | 41               | 61   | 82    | (204)         | 20     |
| Service department E<br>(4:2:3:1) | 8                | 5    | 7     | ---           | (20)   |
| Total Overhead                    | 9339             | 9061 | 12200 | Nil           | Nil    |

In the last step, share of cost of D from E will be distributed to A,B and C as it is negligible.

**Simultaneous equation method-** In this case we first construct two simultaneous equations to find the total cost of each service department, then the same will be distributed.

Let,

- a = Total cost of department D after receiving 10% share of E department's cost
- b = Total cost of department E after receiving 10% share of D department's cost

Then,  $a = 4625 + 0.10 b$  .....(i)  
 $b = 1575 + 0.10 a$  .....(ii) solving we get  $a = 4831$  and  $b = 2058$

**Statement showing re-distribution of overheads**

| Item of expenses                  | Production Deptt |      |       | Service Deptt |        |
|-----------------------------------|------------------|------|-------|---------------|--------|
|                                   | A                | B    | C     | D             | E      |
| Total Overhead                    | 7550             | 7200 | 9650  | 4625          | 1575   |
| Service department D<br>(2:3:4:1) | 966              | 1449 | 1932  | (4831)        | 483    |
| Service department E<br>(4:2:3:1) | 823              | 412  | 618   | 206           | (2058) |
|                                   | 9339             | 9061 | 12200 | Nil           | Nil    |

- **Absorption/ recovery of overheads:** The above table shows that each department's total overhead cost represent its own cost plus share of joint cost and share of service department cost. This total cost is now be charged to cost unit on some reasonable basis. This is called absorption of overhead. Basis of overheads absorption depends upon the process of production adopted in a particular department. There are different methods of absorption of overheads. Such methods are –
  - a) Production unit method (applicable in case of same products)
  - b) Percentage of value of raw material
  - c) Percentage of Direct labour cost(Applicable in case production process is labour intensive and depends on labour time and type)
  - d) Labour hour rate method (Applicable in case production process is labour intensive and depends on labour time)
  - e) Machine hour rate method. (Applicable in case production process is machine based)

The method of overhead absorption to be applied depends upon the production process in operation in a particular department. For example, where the production is labour intensive, labour hour rate method may be most appropriate; similarly where production is machine based only, machine hour rate method should be applied.

Thus in the given illustration, let us calculate overhead absorption or recovery rate depending upon the working hours given. The absorption rate may be computed separately or it may be computed in the re-distribution statement itself.

Overhead absorption rate = (Total overheads of the cost centre)/ quantum of absorption base

(6)

Here, Overhead absorption rate will be –

Department A = Rs 9339/6226 hrs = Rs 1.50

Department B = Rs 9061/4026hrs = Rs 2.25

Department C = Rs 12200/4066hrs = Rs 3.00

After determining the overhead absorption rate the cost of product is determined as below. In the give illustration the same is computed as below:

#### Statement showing cost of the articles

|                           |       |        |
|---------------------------|-------|--------|
|                           |       | Rs     |
| Raw materials             |       | 50     |
| Labour cost               |       | 30     |
| Overheads:                |       |        |
| Deptt A = 4 hrs x Rs 1.50 | 6.00  |        |
| Deptt B = 5 hrs x Rs 2.25 | 11.25 |        |
| Deptt C = 3 hrs x Rs 3.00 | 9.00  | 26.25  |
|                           |       | <hr/>  |
| Total Cost                |       | 106.25 |

- **Absorption of overheads on the basis of Machine Hour Rate:** Where the production in the factory is purely based on machine work, absorption rate will be adopted is machine hour rate. A standard format of which may be followed as below-

#### Computation of Machine Hour Rate

|                           |         |
|---------------------------|---------|
| Original Cost of Machine- | √       |
| (+) Installation Charges  | - √     |
| (+) Carriage etc          | - √     |
| Capital Cost              | <hr/> √ |
| Less: Scrap value         | √       |
| Depreciation              | <hr/> √ |
| Estimated Life            | --- yrs |

| Items of expenses                            | Amount (Rs) | Amount (Rs per hour) |
|--|-------------|----------------------|
| A. Fixed Expenses (illustrative only)        |             |                      |
| Rent, rates and taxes                        | ---         |                      |
| Insurance                                    | ---         |                      |
| Electricity Charges                          | ---         |                      |
| Supervisor's Salary                          | ---         |                      |
| Total fixed expenses                         | ---         |                      |
| B. <u>Effective Machine Hour</u>             |             |                      |
| Machine Hour booked                          | ---         |                      |
| Less: Normal Idle Time                       | ---         |                      |
| Effective machine hour                       | ---         |                      |
| C. Fixed expenses per hour (A/B)             |             | ---                  |
| D. <u>Variable expenses per hour</u>         |             |                      |
| Depreciation = Annual Dep/ B                 |             | ---                  |
| Repair and maintenance = Total Reair cost/ B |             | ---                  |
| Power = Power cost/ B                        |             | ---                  |
| Machine Hour Rate                            |             | ---                  |

**Comprehensive machine hour rate-** In case of comprehensive machine hour rate, wages of operator will be added with the above determined rate. This is mainly because when the production process is entirely machine operated except operators are engaged for its running, then in that case instead of charging operator's wages as direct wages the same is added with the overhead cost to find comprehensive rate.

(7)

- **Over or Under Absorption of Overheads:** Before we discuss over or under absorption let us say how many overhead absorption rates are there. There are four absorption rates.
  - i) Normal rate = Actual overhead incurred/ Actual quantum of absorption base
  - ii) Pre-determined Rate = Budgeted overhead / Budgeted quantum of absorption base
  - iii) Blanket Overhead Rate = Total Budgeted overhead/ Total quantum of estimated base
  - iv) Departmental Overhead Rate = (Total Budgeted or estimated overhead for each department) / Departmental absorption base

Where overhead absorption rate is based on historical cost, there will be no over or under absorption of overhead. However, where absorption of overheads is done on the basis of estimated overheads, the rate determined will be pre-determined overhead rate and there will be a chance of over or under absorption of overhead. Blanket rate is basically applicable for single product organisation, while departmental overhead rate is applicable in case of multiple product organisations. However, over or under absorption occur if-

Over absorption of overhead = Estimated Absorbed > Actual Overhead incurred

Under absorption of overhead = Estimated Overhead < Actual Overhead

Such over or under absorption of overheads occur may be due to –

- i) Wrong estimation of overheads or wrong estimation of absorption base.
- ii) Unanticipated change in the level of production
- iii) When there is significant change in the prices of materials and direct labours and recovery is done on the basis of materials and labour costs
- iv) If technology or production process is changed and as a result there is a change in overhead costs.

**III 2-** The budget of a machine shop for 2018-19 is as follows:

|  |                   |
|--|-------------------|
| Normal working week                                      | 42 hours          |
| Number of machines                                       | 15                |
| Hours spent on maintenance per week (normal loss)        | 5 hrs per machine |
| Estimated annual overhead                                | Rs 5,55,000       |
| Number of working weeks in 2018-19                       | 50                |
| The actuals in respect of 4-week period in 2018-19 are : |                   |
| Overhead incurred  | Rs 49,000         |
| Machine hour worked                                      | 2400              |

Calculate : a) Overhead rate per machine hour for 2018-19

b) The amount of over or under absorption of overhead in respect of the 4-week period.

Sol. Machine hour worked = Working weeks x working hours per week x no of machine- Normal idle time  
= 50 weeks x 42 hours x 15 - 15 x 5 x 50  
= 31,500 - 3750 = 27750 hrs

Machine hour rate = Total estimated annual overhead / machine hour worked  
= Rs 5,55,000 / 27750 = Rs 20

Computation of Over or under absorption of Overhead

|                    |                   |
|--------------------|-------------------|
|                    | Rs                |
| Overhead incurred  | 49,000            |
| Overhead absorbed  | 48,000            |
| [Rs 20 x 2400 hrs] | <u>          </u> |
| Under absorption   | <u>1,000</u>      |

- **Treatment of over or under absorption of overhead:** Over or under absorbed overheads may treated in three different ways. However a particular method is applicable depending upon the reasons of arising over or under absorption of overheads.

- i) The amount may be carried forward to next year
- ii) The amount may be charged to costing profit & loss account.
- iii)The amount may be adjusted through supplementary rate.

(8)

- Carried forward to next year- In this case over or under absorption of overhead is carried forward to next year through overhead reserve account for charge. However, such treatment is not acceptable as it ignores matching concept, because instead of charging or crediting current year's item in current year, the same is deferred for adjustment. It is basically accepted when, reasons for over or under absorption are not readily determinable.
- Charging to Costing Profit & Loss Account – When the over or under absorption of overhead is negligible or even where it is significant but it arises due to abnormal reasons the same should be charged to costing profit and loss account.
- Use of Supplementary Rate - This method is used when such over or under absorption arises due to wrong estimation of overheads, major change in the production method, error in estimating the recovery base. Let us first understand use of supplementary rate in case of under absorption of overhead. Later over absorption will follow automatically. Suppose overhead absorbed = Rs 1, 00,000 and overhead incurred = Rs 1,20,000. So there is under absorption = Rs 20,000. Overheads charged to current year's cost is Rs1,00,000, thereby cost is lower by Rs 20,000 and accordingly, increase in profit by the same amount. Thus, adjustment to be made in the current year with respect to the output produced. But output produced consists of full finished or half-finished goods and even for full finished goods a portion may remain unsold. So adjustment to be made to finished goods sold and the balance to be deferred for charge through Stock of WIP and that of Finished Goods.

$$\text{Supplementary rate} = \frac{\text{Over or under absorption of Overhead}}{\text{Actual activity level}}$$