
UNIT 8 CLASSIFICATION AND DISTRIBUTION OF OVERHEADS

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8.0 OBJECTIVES

After studying this unit, you should be able to:

- explain the concept of overheads;
- classify overheads element-wise, function-wise and behaviour-wise;
- describe the sources from which overheads under different standing order numbers are collected;
- explain various bases of allocation and apportionment of factory overheads; and
- prepare distribution summary showing the allocation and apportionment of various factory overheads.

8.1 INTRODUCTION

You have learnt that all indirect costs are collectively termed as ‘overheads’ and that they constitute an important component of total cost of a product, a job or a process. In this unit, you will learn about the meaning of overheads, the various categories into which they can be classified, and the procedure of collecting them under different standing order numbers. You

will also learn about the various bases of allocation and apportionment of factory overheads to different production and service departments and the preparation of distribution summary.

8.2 CONCEPT OF OVERHEADS

A cost is composed of three elements: (a) material, (b) labour, and (c) expenses. Each of these costs can be further classified as: (1) direct and (2) indirect. Direct costs are costs which can be easily identified directly with a particular product, process or department.

Indirect costs, on the other hand, refer to costs which cannot be conveniently identified with a particular product, process or department. These are common costs, like rent, repairs, salaries, lubricating oil, which are incurred for the benefit of a number of cost units or cost centres.

The total of all indirect costs i.e., indirect material, indirect labour and indirect expenses, is termed as ‘overheads’. Other terms in use for overheads are ‘on costs’, ‘overhead costs’, ‘supplementary costs’, ‘overhead expenses or charges’, etc.

The National Association of Accountants (USA) defines overheads (overhead costs) as follows:

- (a) **Fundamental concept :** Costs that have to be incurred although they have no directly measureable, observable relationship to specific activity units, production or cost objectives.
- (b) **Application definition :** While related to the accomplishment of the firm’s objectives, overhead costs are costs which cannot, as a practical matter, be assigned to those objectives in a direct fashion. A consistent method of cost allocation, which by some measure approximates the economic sacrifices incurred, must be adopted.

It is evident from the above that they cannot directly be identified to units of output and that they have to be suitably allocated or absorbed so as to determine the product cost, both total cost and unit cost.

8.3 CLASSIFICATION OF OVERHEADS

Overhead classification refers to the process of grouping the overheads according to their common characteristics so as to provide the managers with information that will enable them to manage the business effectively. The overheads can be classified according to:

- 1) Elements, 2) Functions and Departments, 3) Behaviour,

8.3.1 Element-wise Classification

According to elements overhead is divided into:

- i) Indirect materials, ii) Indirect labour, iii) Indirect expenses.
- i) **Indirect materials:** It is that material which does not form a part of the finished product or saleable service. Examples of indirect materials are : coal, lubricating oil, grease, sand paper used in polishing, etc. There are some items which may become a part of the finished product, like nuts, screws, bolts, pins, etc., but these are still considered as indirect materials for costing purposes as their cost is

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comparatively small.

- ii) **Indirect labour:** Indirect labour is not directly engaged in the production operations. They only assist or help in production operations. Examples of indirect labour are supervisor, clerk, cleaner, inspector, peon, watchmen, etc. Remuneration paid to these employees is considered as indirect labour cost.
- iii) **Indirect expenses:** All indirect costs, other than indirect materials and indirect labour are considered to be indirect expenses, like rent, depreciation, lighting and power, advertising, insurance, etc.

8.3.2 Function-wise Classification

This method of classification is based on the major functions/departments of a business organisation. They are:

- i) Production overheads, ii) Administration overheads,
- iii) Selling overheads, iv) Distribution overheads.

- i) **Production overheads:** These include indirect material cost, indirect wages and indirect factory expenses incurred from the stage of procurement of materials till the completion of the finished product. They are the expenses incurred in maintaining and operating a manufacturing division of an organisation. Indirect materials, like cotton waste, coal, oil, grease; indirect wages, like salaries of store keeper, supervisor, and indirect expenses, like factory rent, idle time, overtime, normal loss of material, factory light, etc. are the items of production overheads. These are also known as 'manufacturing overheads', 'works overheads', 'factory overheads'.
- ii) **Administration overheads:** These include all those expenses connected with the managerial functions of planning, directing, coordinating and controlling the operations of a business other than those related to production, selling, distribution and research and development. Examples are office rent and rates, office staff salaries, office lighting, depreciation, and repairs to office building and equipment, telephone charges, auditors' fees, legal expenses, etc.
- iii) **Selling overheads:** These include the costs incurred for creating demand for the product, for securing and servicing orders. Advertising, bad debts, salaries and commission to selling agents, travelling expenses, show room expenses are the examples of selling overheads.
- iv) **Distribution overheads:** These include the costs incurred in connection with the delivery of goods to customers. Some examples of distribution overheads are : packing cost, carriage outwards, maintenance, repairs and depreciation of delivery vans, warehouse expenses, wastage of finished goods, etc.

8.3.3 Behaviour-wise Classification

This classification is made on the basis of variability nature of overheads with production. Accordingly, they are classified into:

- i) Fixed overheads, ii) Variable overheads, ii) Semi-variable overheads.
- i) **Fixed overheads:** These overheads remain fixed or unaffected by

changes in the level of production. An increase or decrease in the output has no effect on the total amount of overheads. As a result, an increase in the volume of output will result in a decrease in the fixed cost per unit, owing to its spread over a large number of units and vice-versa. Some examples of fixed overheads are rent and rates, salaries, legal expenses, bank charges, etc.

- ii) **Variable overheads:** These overheads vary in direct proportion to changes in the volume of output. Variable overheads per unit remain fixed. Some examples of variable overheads are: indirect materials, fuel, power, stationery, salesmen commission etc.
- iii) **Semi-variable overheads:** These are the expenses that stand midway between fixed and variable overheads. They are partly fixed and partly variable. They vary with change in the volume of output but not in the same proportion as the change in the volume of output. Examples of such overheads are: telephone charges, depreciation, repair and maintenance, cost of supervision, etc.

Check Your Progress A

- 1) What do you mean by overheads?
- 2) Based on functional classification, list various types of overheads.
- 3) Give two examples of semi-fixed overheads.
- 4) Fill in the blanks.
 - i) According to elements of cost, the overheads are classified into indirect material
 - ii) The costs other than direct costs are known as.....
 - iii) Semi-variable overheads are fixed and variable.
 - iv) Symbols or code numbers of overheads are known as
 - v) Journal gives information relating toitems like depreciation, notional rent, etc.

8.4 COLLECTION OF FACTORY OVERHEADS

As mentioned earlier, overheads are not directly attributable to a particular cost unit, process or department. Hence, there is a need for distribution of overheads to different products manufactured or to the different departments. There are four steps in overheads distribution. They are:

- i) Collection of overheads
- ii) Allocation and apportionment to production and service departments
- iii) Re-apportionment of service department costs
- iv) Absorption of overheads

The first step in overhead distribution is the collection of overheads. This means the ascertainment of the total amount spent on each item of overheads during a particular period.

8.4.1 Standing Order Numbers

After the classification of overheads, each group of expenses should be given a distinct symbol or number so that each such group is easily distinguished from that of the other. Such symbols or numbers, are the codes for overheads and are known as standing order numbers.' Each standing order number represents a particular type of expenditure and as and when the expenditure is incurred, it is appropriately classified. The code numbers may be alphabetical (Mnemonic method), numerical or a combination of both.

Numerical method: Number from 01 to 10 may be for indirect materials; 11 to 20 for indirect labour and so on.

Mnemonic method:

S may be represent sales

SA for sales-advertising

SAS Sales-Advertising-South India.

Combination of alphabets and numbers system: Alphabet represent the main group and numbers denote the sub-group.

R — Repairs

R₁ — Repairs to machinery

R₂ — Repairs to building

R₃ — Repairs to vehicles

Thus, the manufacturing overhead costs are analysed and classified by the code numbers on the documents. Now, for the collection of factory overheads, these various documents have to be processed from which the necessary data can be extracted.

8.4.2 Sources

The sources from which overhead costs are collected are as follows:

- a) **Invoices:** These are documents received for sundry purchases against purchase requisition made by a particular department. The name or code number of the department will be indicated in the invoice itself. At the end of the month the total amount of purchases will be debited to Factory Overhead Account and credited to Cost Ledger Control Account.
- b) **Stores Requisitions:** Materials would be issued from stores only on receiving stores requisition from the departments. On the stores requisition, the code number of the department making the requisition would be indicated. This helps in charging the indirect materials to the particular department using them.
- c) **Wages Analysis Book:** This book gives information relating to indirect wages, overtime, bonus etc. When wages are paid to indirect workers, they are entered against the standing order numbers on the basis of job cards, time cards etc.
- d) **Cash Book :** The overheads which are paid in cash but not recorded anywhere else can be collected from this book.

- e) **Journal:** It gives the information relating to non-cash items like depreciation, notional rent, accruals and payments in advance. Therefore, it is necessary to scrutinise the journal for the accumulation of manufacturing overheads.
- f) **Subsidiary Records:** It is necessary to look into the reports regarding scrap, waste, spoiled materials, idle time and idle facilities for ascertaining their costs to be adjusted in overheads.

8.5 ALLOCATION AND APPORTIONMENT OF FACTORY OVERHEADS

After the overheads are classified and collected under various standing order numbers, the second step in overhead distribution is allocation and apportionment of overheads to production and service departments.

8.5.1 Allocation

According to the ICMA Terminology, allocation is “the allotment of whole items of cost to cost centres or cost units”. It refers to charging to the cost centre those overheads that have been incurred for that cost centre. It means that overheads have been incurred because of the existence of that cost centre. For example, if canteen is treated as a separate cost centre, salary paid to canteen manager can be allocated to canteen. If indirect wages and salaries are paid to the employees in each department, they can be wholly attributed to the concerned departments and charged accordingly. When separate meters are installed in departments, from meter reading, power charges for each department can be easily known and as such they are allocated to the concerned departments.

Thus, it can be said that, an overhead can be allocated to a cost centre if the following two conditions are satisfied:

- 1) The overhead must have been incurred because of the existence of that particular cost centre.
- 2) The exact amount of overhead incurred in a cost centre must be known.

8.5.2 Apportionment

Apportionment refers to the distribution of common items of cost to two or more cost centres on some appropriate basis. When the costs which are incurred for the factory as a whole and benefit two or more cost centres, then it is necessary to apportion them to different departments that receive benefit from such costs. For example, factory rent benefits all the departments. Hence, it should be apportioned to all the departments on the basis of the floor area occupied by each department in the factory.

The common factory overheads have to be apportioned to various production and service departments in the factory on some equitable basis.

A production department is one that engages in the actual manufacture of the product. Examples of production departments are weaving, spinning, crushing, mining, grinding, etc.

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A service department is one which renders a service that contributes indirectly in the manufacture of a product. It renders service to the production as well as other service departments. Examples of service departments are purchasing, stores, time keeping, personnel inspection, etc.

Principles of Apportionment

As stated earlier, the common factory overheads (common costs) have to be apportioned to various production and service departments on some equitable basis. In determining the basis to be adopted, the following guiding principles can be followed:

- 1) **Actual benefit:** According to this principle, overheads are distributed over various departments on the basis of the actual benefit received. This can be adopted where it is possible to measure the actual benefit derived from a particular expense. For example, rent can be apportioned to different departments on the basis of area occupied. Similarly, machine shop expenses may be apportioned on the basis of actual time devoted to each job for which proper job cards are maintained.
- 2) **Potential benefit:** It would be ideal to distribute common costs on the basis of actual benefit received, but, in most cases, the measurement of actual benefit may not be possible or it may be too cumbersome to keep the necessary records. Hence, it is advocated that the apportionment may be done on the basis of potential benefit (benefit likely to be received). For example, if lighting costs were to be apportioned on the basis of actual benefit received, you will have to keep record of the number of lighting points in each department, the wattage of bulbs used in each lighting point, and the amount of time for which each point was on. This is rather impractical. Hence, lighting costs can be apportioned simply on the basis of lighting points in each department. Similarly, cost of transport for workers can be apportioned on the basis of the number of employees in each department. This method is also called 'service or use' method.
- 3) **Specific criteria:** According to this principle, the overheads can be apportioned to different departments in a **given ratio** which may be determined after careful survey for different service functions. This method, therefore, is also known as 'survey method' and it is particularly useful where it is difficult to select a suitable basis for apportionment. For example, for the apportionment of works manager's salary, it may be difficult to identify a suitable basis. Hence, a survey may be conducted to ascertain the time and attention given by him to different cost centres and a reasonable ratio fixed for the purpose.
- 4) **Ability to pay:** This method is based on the principle that more the revenue of a department, the higher should be the proportionate charge for the services. For example, the cost of maintaining stores may be apportioned to different production departments on the basis of the value (not the volume) of materials consumed.

Basis of Apportionment: In the light of the above principles, the usual basis for apportioning common items of factory overhead can be as follows:

Classification and Distribution of Overheads

	Expenses	Basis
1.	Rent, Rates, and taxes, insurance, depreciation and repairs, fire precaution, air condition of buildings	Floor area occupied
2.	Canteen, welfare expenses, time keeping, personnel office, fringe benefits supervision.	No. of employees
3.	Depreciation, repairs & maintenance and insurance to plant and machinery	Capital cost of plant and machinery
4.	Power/Steam consumption, lighting	Technical estimates (i.e. HP hours, number of light points)
5.	Store keeping and material handling expenses	Weight/value of Materials
6.	Internal transport	Number of requisitions, weight/ Value of materials
7.	Compensation to workers, ESI and PF contribution, holiday pay	Direct wages
8.	General Overheads	Direct Labour hours or Machine hours or Direct wages.

8.6 PREPARATION OF OVERHEADS DISTRIBUTION SUMMARY

The allocation and apportionment of overheads to production and service departments is also known as ‘departmentalisation or primary distribution of overheads’. It is done by preparing an overheads distribution summary. For the preparation of overheads distribution summary, all those overheads which can be directly identified with a particular department, will be taken/ allocated to the concerned department and those which cannot be identified with a particular department will be apportioned i.e., distributed on equitable basis to different departments.

The Proforma of overhead distribution summary is given in Figure 7.1.

Figure 7.1: Proforma of Overhead Distribution Summary
Departmental Overhead Distribution Summary

Expenses	Basis of Apportionment	Total	Production Departments			Service Departments	
			A	B	C	D	E
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.

Look at Illustration 1 and study how departmental overheads distribution summary is prepared.

Overheads

Illustration 1:

XYZ Co. Ltd has two production departments (Spinning and Weaving) and two Service Departments (Stores and Time Keeping).

The following information is supplied from the costing records of a company:

	Rs.
Rent	4,000
Maintenance	2,400
Depreciation	1,800
Lighting	400
Insurance	2,000
Employer's contribution to Provident Fund	600 3,600
Energy	6,000
Supervision	

	Departments			
	Spinning	Weaving	Stores	Time Keeping
Floor space (sq. ft.)	300	220	180	100
Number of workers	48	32	24	16
Total Direct Wages (Rs.)	16,000	12,000	8,000	4,000
Cost of Machinery (Rs.)	48,000	36,000	24,000	12,000
Stock of goods	30,000	18,000	12,000	---

Prepare a statement showing apportionment of costs to various departments

Solution: Departmental Overheads Distribution Summary

Expenses	Basis of apportionment	Total Rs	Production Departments		Service Departments	
			Spinning Rs.	Weaving Rs.	Stores Rs.	Time Keeping Rs.
Rent	Floor space (300:220:180:100)	4,000	1,500	1,100	900	500
Maintenance	Cost of machine (48 : 36: 24: 12)	2,400	960	720	480	240
Depreciation	-do-	1,800	720	540	360	180
Lighting	Floor space (300:220:180:100)	400	150	110	90	50
Insurance	Stock of goods (30:18: 12:00)	2,000	1,000	600	400	--
Employer's contribution	Direct wages (16 : 12: 8 : 4)	600	240	180	120	60
Energy	Cost of machine (48 :36: 24: 12)	3,600	1,440	1,080	720	360
Supervision	No. of workers (48 :32:24: 16)	6,000	2,400	1,600	1,200	800
Total overheads as per primary distribution		20,800	8,400	5,930	4,270	2,190

Re-Appportionment of Service Department Costs: Once the overheads have been allocated and apportioned to production and service departments, next step in overhead distribution is to re-apportion the service department total costs to production departments.

As the ultimate object is to charge the overhead to cost units, and no cost units pass through service departments, it becomes necessary to apportion the service departments costs also to production departments on some equitable basis. This is known as secondary Distribution.

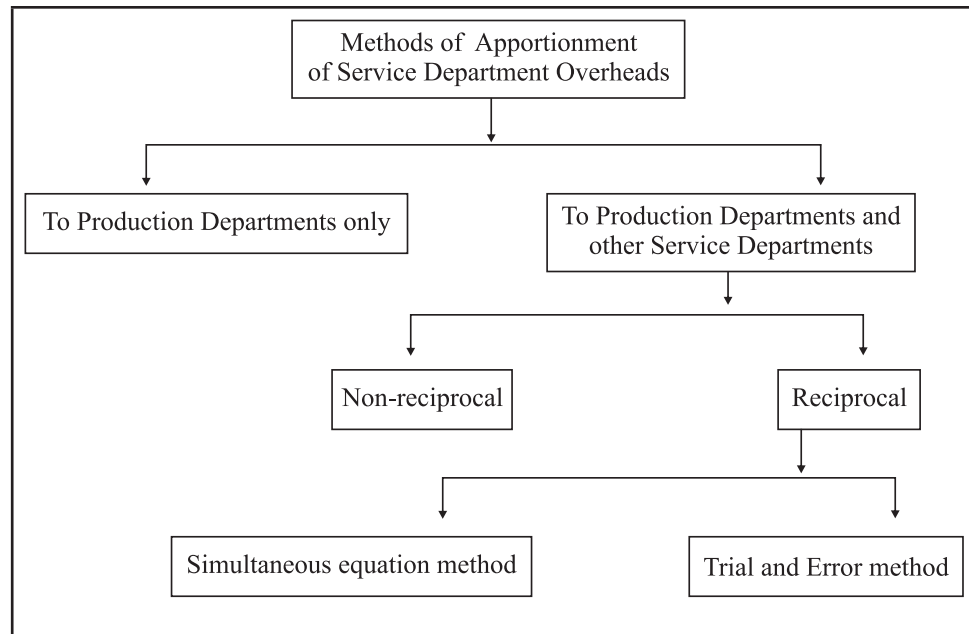
The common basis of for apportionment of service department costs to production departments (secondary distribution) are given below:

Service Department	Basis for apportionment
1. Purchase department	Number of purchase orders or number of purchase requisitions or value of materials purchased for each departments
2. Stores department	Number of material requisitions or value/quantity of materials issued to each department.
3. Time-keeping department Pay-roll department	Number of employees or total labour or machine hours
4. Personnel department, canteen, welfare, medical, recreation and security, departments	Number of employees or total wages
5. Repairs and Maintenance	Number of hours worked in each department
6. Power House	Meter reading or H.P. Hour for powers Meter reading or floor space for lighting, heat consumed
7. Inspection	Inspection hours or value of items inspected
8. Drawing Office	Number of drawings made or man-hours worked
9. Accounts department	Number of workers in each department or time devoted
10. Tool Room	Direct labour or Machine hours or wages
11. Internal transport department	Weight or/and distance

Methods of Apportionment

The following chart will explain you the different methods of apportionment of service department costs to production departments.

Overheads



Note : While preparing the overhead distribution summary, it may be noted that all direct expenses of service departments are to be taken into account as the total expenses (Direct plus Overheads) of service department are indirect expenses to production departments. But not to be taken direct expenses of production departments into account.

8.6.1 Apportionment of Service Department Costs to Production Departments Only

Under this method, the costs of each service department is apportioned to production departments only without apportion to the other service department on the basis as decided. The following illustration 2 will explain the preparation of the distribution summary.

Illustration 2:

From the following information, prepare the departmental overhead distribution summary under the method of apportionment to production departments only.

Item	Production Deptt.				Service Deptt.
	A	B	C	X	Y
Direct wages (Rs.)	60,000	90,000	1,20,000	30,000	60,000
Direct Material (Rs.)	30,000	60,000	60,000	44,000	45,000
Staff Number	3,000	4,500	4,500	1,600	1,400
Electricity KWh	12,000	9,000	6,000	3,000	3,000
Asset Value (Rs.)	1,20,000	80,000	60,000	20,000	20,000
Light points	20	32	8	12	8
Area (Sq. Yards)	300	500	100	100	100

The overheads for the period were

Classification and Distribution of Overheads

	Rs.		Rs.
Power	2,200	Depreciation	60,000
Lighting	400	Repairs	12,000
Stores	1,600	General Overheads	24,000
Welfare to staff	6,000	Rent & taxes	1,100

Apportion the overheads of service department Y according to direct wages and those of service department X in the ratio of 5:3:2 the production departments.

Solution :

Departmental Overhead distribution Summary

Expenses	Basis	Total	Production Deptts.			Service Deptts.	
			A	B	C	X	Y
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Power	KWh	2,200	800	600	400	200	200
Lighting	Light points	400	100	160	40	60	40
Stores Overhead	Direct Material	1,600	200	402	402	295	301
Welfare to the Staff	Staff Number	6,000	1,200	1,800	1,800	640	560
Depreciation	Asset value	60,000	24,000	16,000	12,000	4,000	4,000
Repairs	Asset value	12,000	4,800	3,200	2,400	800	800
General overhead	Direct wages	24,000	4,000	6,000	8,000	2,000	4,000
Rent & taxes	Area	1,100	300	500	100	100	100
Wages	Allocated	90,000	—	—	—	30,000	60,000
Material	—	89,000	—	—	—	44,000	45,000
Total as primary distribution		2,86,300	35,400	28,662	25,142	82,095	1,15,001
Department Y Wages			25,556	38,334	51,111	—	(1,15,001)
Service Department X 5:3:2			41,048	24,628	16,419	(82,025)	
Total as per secondary distribution			1,01,990	81,626	92,684	—	

Note: Service departments' total cost (Direct cost + Overhead cost) has to be reapportioned to production departments, direct wages and direct material cost of service departments is taken in overhead distribution summary. As the total cost of service department will become the overheads to production department.

8.6.2 Apportionment to Production and Other Service Departments

In the previous method service department overheads are apportioned to production departments only but not apportioned to other service department as an assumption that service departments are not consuming the services

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of other service departments. Factually it is not true as service department render services not only to production departments but also to other service departments. For instance, pay roll department not only provide services to production department but also provide services to canteen, stores, maintenance, powerhouse, etc., departments.

Similarly, canteen, etc render services not only to production departments but also other service departments like power house pay roll, internal transport, store etc., department. Thus, besides to production departments, inter-service department apportionment may be done under two basis 1) Non-reciprocal basis and 2) Reciprocal basis. Now you will learn about the apportionment under these two methods.

8.6.2.1 Non-Reciprocal Method of Apportionment

This method is also termed as “Step Ladder Method”. It is followed when the service department provide the services to other service departments but not receive the services from other service departments significantly. This method is applied when service departments are not inter-dependent in rendering services. Under this method, service departments are arranged in the following descending order:

Take an example that a factory is having three service departments. Among them, the service department which render services to other two service departments along with the production departments is placed at first and apportioned its overheads. Next, the service department which renders services to the third service department and production departments excluding the first service department is place at second. The total overheads of their service department is apportioned finally to all production departments (excluding First and Second service departments). It may be noted that the above process is continued till the cost of the last service department is apportioned.

Illustration 3 should help you to understand the process of apportionment of the costs of service departments under ‘Step Ladder Method (non-reciprocal).

Illustration 3:

A manufacturing company has three production and four service departments. After primary distribution of overheads, including all direct costs of their respective service departments, the results and data required for secondary distribution is given below for apportionment to production departments under “Step Ladder Method”.

Departments Production:	Factory Overheads (Rs.)	Direct Labour flows	No. of Employees	Area in Sq. M.
A	1,90,000	5,000	100	3,000
B	75,000	4,000	120	1,500
C	85,000	5,000	80	1,500
Service :				
P	50,000	1,000	10	500
Q	75,000	4,000	40	2,000
R	1,10,000	6,000	50	1,500
S	35,000	2,000	30	1,000

The service departments order is arranged on the basis of the service rendered to next service departments (non-reciprocal) and production departments. The costs of service department are apportioned on the following basis:

Classification and Distribution of Overheads

Service Departments	Basis
P	- No. of Employees
Q	- Direct Labour hours
R	- Area in Sq. M.
S	- No. of Employees

Solution:

Overhead Distribution summary under Step Ladder Method

Particulars	Basis of Apportionment	Production Departments			Service Departments			
		A	B	C	P	Q	R	S
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Overhead Costs	--	1,90,000	75,000	85,000	50,000	75,000	1,10,000	35,000
Cost of P Deptt.	No. of Employees (10:12:8:4:5:3)	11,905	14,286	9,524	(-)50,000	4,762	5,952	3,571
Cost of Q Deptt.	Direct Labour Hours (5:4:5:6:2)	18,128	14,502	18,128	--	(-)79,762	21,753	7,251
Cost of R Deptt.	Area in Sq. M. (6:3:3:2)	59,016	29,508	29,508	--	--	(-)1,37,705	19,673
Cost of S Deptt.	No. of Employees (10:12:8)	21,832	26,198	17,465	--	--	--	(-)65,495

Under the method of Step Ladder Method the above preparation of overhead distribution summary, you may notice that the costs of service department P was apportioned to other service departments and production departments. The costs (its own overheads plus cost of service received from P service department) apportioned to other service departments (R and S) except P service department as it does not receive service from either Q R and S departments. Similarly, so on for R and S departments. If you observe the columns of service departments it appears steps are formed. Hence, this method is termed as Step Ladder Method.

8.6.2.2 Apportionment on Reciprocal Basis

In most of the situations, as explained at section 7.6.2, the service departments not only render the services to other service departments besides production departments but also receive the services from other service departments. For example, 'Canteen' services are used by 'Power house' and 'Power house' services are used by canteen department. Reciprocal approach is more scientific when the service department are inter - dependent on each other to render and receive the services.

There are three following methods for apportionment of overhead costs on reciprocal basis.

- 1) Simultaneous Equation Method
- 2) Repeated Distribution Method
- 3) Trial and Error Method

Overheads

Here we discuss **only first and third methods** for apportionment. Because second method is same as the concept of third method. Under the second method repeated distribution will be done both service and production department. Where as under Trial and Error method, repeated distribution will be done first among service departments only. Once it is completed the total overhead costs of service departments will be finally distributed to production departments. It is important to note that the distribution starts as per the order of the arrangement of service departments.

- 1) **Simultaneous Equation Method** : This method is developed with the help of the following algebraic equation to find out the total service departments overhead costs. Then after apportionment will be done to production departments.

Equation:

$$X = a + bY$$

$$Y = a + bX$$

Whereas;

X = Total overhead costs of first Service Department

Y = Total overhead costs of next (second) Department

a = Overheads of respective service department before re-apportionment (as per primary distribution)

b = Share of overheads of one service department to be apportioned to the other service department.

Illustration 4 will explain to you how overheads are apportioned to production and service departments (primary distribution). Then after, total overhead cost of service departments to production departments (secondary distribution) under Simultaneous Equation Method.

Illustration 4 :

Calicut Soaps Limited supplied you the following information for the month ending December 2020. Find out the total overheads costs of production departments using Simultaneous Equation Method.

Item	Production Departments			Service Departments	
	A	B	C	X	Y
Direct wages (Rs.)	14,000	12,000	10,000	2,000	2,000
Direct Material (Rs.)	6,000	5,000	4,000	3,000	2,000
Employee Numbers	400	300	300	100	100
Electricity KWh	16,000	12,000	12,000	4,000	6,000
Light points - Numbers	20	30	30	10	10
Asset Value (Rs.)	1,00,000	60,000	40,000	20,000	20,000
Area (Sq. Yards)	1,600	1,200	1,200	400	400

The expenses for the month were:

Stores overhead	800	Repairs and Maintenance	2,400
Motive power	3,000	General Overheads	20,000
Lighting	400	Rent & taxes	1,200
Labour welfare	6,000		
Depreciation	12,000		

The expenses of Service Departments are apportioned on the following percentage basis:

Classification and Distribution of Overheads

	A	B	C	X	Y
X	20%	40%	30%	--	10%
Y	40%	20%	20%	20%	--

Solution: Firstly, let us apportion the overheads to Production and Service Departments which is known as Primary Distribution of Overheads

Primary Distribution of Overheads Summary

Expenses	Basis	Total	Production Deptts.			Service Deptts.	
			A	B	C	X	Y
		Rs.	Rs.	Rs.	Rs.	Rs.	Rs.
Direct wages	Allocation	4,000	—	—	—	2,000	2,000
Direct Material	Allocation	5,000	—	—	—	3,000	2,000
Stores Overhead	Material	800	240	200	160	120	80
Power	KWh	3,000	960	720	720	240	360
Lighting	Light points	400	80	120	120	40	40
Labour Welfare	Employees	6,000	2,000	1,500	1,500	500	500
Depreciation	Asset value	12,000	5,000	3,000	2,000	1,000	1,000
Repairs & Maintenance	Asset value	2,400	100	600	400	200	200
General overhead	D. Wages	20,000	7,000	6,000	5,000	1,000	1,000
Rent & Taxes	Area	1,200	400	300	300	100	100
Total as per primary distribution		54,800	16,680	12,440	10,200	8,200	7,280

As per primary distribution summary, the total overheads costs of service departments X and Y are Rs. 8,200 and Rs. 7,280 respectively.

Let us, now, find out the total overhead costs of two service departments after distribution among them based on the percentage given in respect of services rendered and received using simultaneous equation method.

Let, X denotes the total overheads of X Service department.

Y denotes the total overheads of Y Service department.

Note : Total overheads are the overheads after distribution of the share among service departments.

$$X = a + bY \dots\dots\dots(i)$$

$$Y = a + bX \dots\dots\dots(ii)$$

Where, a = overheads of respective department as per primary distribution.

b = share of overheads of one service department to be distributed to the other service department.

Overheads

Thus,

$$X = 8,200 + 20\% \text{ of } Y$$

$$Y = 7,280 + 10\% \text{ of } X$$

or

$$X = 8,200 + 0.2 Y \dots\dots\dots (i)$$

$$Y = 7,280 + 0.1X \dots\dots\dots (ii)$$

In order to solve the equations by eliminating decimals re-arrange them multiply by 10

$$10X - 2Y = 82,000 \dots\dots\dots (i)$$

$$-1X + 10Y = 72,800 \dots\dots\dots (ii)$$

To eliminate X, multiply equation (ii) by 10 and add the equations

$$\begin{array}{r} 10X - 2Y = 82,000 \\ -10X + 100Y = 7,28,000 \\ \hline 98Y = 8,10,000 \end{array}$$

$$Y = \frac{8,10,000}{98} = 8,265$$

Place the value of Y in the equation (i) i.e.,

$$X = 8,200 + 0.2Y$$

$$X = 8,200 + 0.2 \times 8,265$$

$$X = 8,200 + 1,653$$

$$X = 9,853$$

Thus, the total overhead costs of X and Y service departments are Rs. 9,853 and Rs. 8,265 respectively.

Now, these overheads are to be apportioned to production departments A, B and C in the given percentages. This process is named as secondary distribution summary. Let us see

Secondary Distribution Summary

Particulars	Total	Production Departments (in Rs.)		
		A	B	C
Overheads as per Primary Distribution	39,320	16,680	12,440	10,200
Service Department X (90% of Rs. 9,853)	8,868	1,971	3,941	2,956
Service Department Y (80% of Rs. 8,265)	6,612	3,306	1,653	1,653
	54,800	21,957	18,034	14,809

2) Trail and Error Method

When the Service department are more than two, it is complicated and cumbersome in calculations under simultaneous equation method. This

method reduces the complexities in calculations. Under this method, the overhead costs as per primary distribution of first service department is apportioned to other service departments only in the decided percentages or ratios. Next the costs of second service department is apportioned to first and other service departments. Next the cost of third service department is apportioned to first, second and other service departments and so on. This process is repeated till costs of service department reduced to negligible amounts. Since the distribution is repeated among the service departments only it is called trial and error method. Then after the distributed costs are totalled and proceed for preparation of secondary distribution to apportion the total overhead costs of service departments to production departments only as per given percentages or ratios.

The following illustration 5 will help you to understand application of this method.

Illustration 5:

A manufacturing company has three production departments and four service departments. The total overheads of each as per primary distribution are as follows:

	Production Departments		Service Departments
	(Rs.)		(Rs.)
A	50,000	1	10,000
B	80,000	2	15,500
C	60,000	3	20,000
		4	16,000

The costs of service departments are charged on percentage basis which is as follows:

	A	B	C	1	2	3	4
1	30%	25%	25%	--	8%	5%	7%
2	25%	30%	25%	10%	--	4%	6%
3	35%	20%	20%	10%	5%	--	10%
4	20%	25%	40%	5%	3%	7%	--

Find out the total overheads of production department using Trial and Error Method.

Solution:

Computation of Service Department costs under Trial and Error Method

Details	Service Departments			
	1(Rs.)	2(Rs.)	3(Rs.)	4(Rs.)
Overheads as per primary distribution Service	10,000	15,500	20,000	16,000
Department 1 : (20% of Rs. 10,000)	--	800	500	700
Department 2 : (20% of Rs. 16,300 i.e, 15,500 + 800)	1,630	--	652	978

Overheads

Department 3: (25% of Rs. 21,152 i.e., 20,000 + 500 + 652)	2,115	1,058	--	2,115
Department 4: (15% of Rs. 19,793 i.e., 16,000 + 700 + 978 + 2115)	990	594	1385	--
Department 1 : (20% of Rs. 4,735 i.e., 1,630 + 2,115 + 990)	--	379	237	331
Department 2 : (20% of Rs. 2031 i.e., 594 + 379)	203	--	81	122
Department 3 : (25% of Rs. 1,703 i.e.,1305+237 + 81)	170	85	--	170
Department 4 : (15% of Rs. 623 i.e., 331+ 122 + 170)	31	19	44	--
Department 1 : (20% of Rs. 404 i.e, 203 + 170 + 31)	--	32	20	28
Department 2 : (20% of Rs. 136 i.e, 85 + 19 + 32)	14	--	5	8
Department 3 : (25% of Rs. 69 i.e, 44 + 20+ 5)	7	3	--	7
Department 4 : (15% of Rs. 43 i.e, 28 + 8 + 7)	2	1	3	--
Department 1 : (20% of Rs. 23 i.e, 14 + 7 + 2)	--	2	1	2
Department 2 : (20% of Rs. 6 i.e, 3 + 1 +2)	1	--	0	0
Total	15,163	18,473	22,928	20,461

After ascertainment of the total costs of service departments on the basis of Trial and Error method, Now you have to prepare secondary distribution in the same manner as was done in the Simultaneous Equation Method which is as follows.

Secondary Distribution Summary

Particulars	Total	Production Departments		
		A (Rs.)	B (Rs.)	C (Rs.)
Overheads as per primary distribution	1,90,000	50,000	80,000	60,000
Service Department 1: (80% of Rs. 15,163)	12,131	4,549	3,791	3,791
Service Department 2: (80% of Rs. 18,473)	14,778	4,618	5,542	4,618
Service Department 3: (75% of Rs. 22,928)	17,197	8,025	4,586	4,586
Service Department 4: (85% of Rs. 20,461)	17,391	4,092	5,115	8,184
Total	2,51,497	71,284	99,034	81,179

You may be noticed that the apportionment of service department costs under Trial and Error method, firstly we have ascertained the total service department costs. Then after apportioned to production departments only as per their respective share of percentage given.

Here you may be observed that the total overheads of service departments and production departments given in the illustration were Rs. 2,51,500. But in the above secondary distribution it appears as Rs. 2,51,493. There is a deficit of Rs. 3. This amount can be distributed to all three production departments equally i.e., one rupee each. That is the reason this method is less accurate when compared to the Simultaneous Equation Method which gives accurate results but as said earlier, it is cumbersome in calculations where more than two service departments are there.

Check Your Progress B

- 1) What is allocation of overheads?
- 2) What do you mean by apportionment of overheads?
- 3) What is re-apportionment? Explain different methods of Secondary Distribution.
- 4) State whether each of the following statements is **True** or **False** and justify your answer.
 - i) Rent is apportioned on the basis of direct wages.
 - ii) Power house is a production department.
 - iii) The basis for apportionment of canteen and welfare expenses is the number of employees.
 - iv) The basis for re-apportionment of repairs and maintenance department is the number of machine in each department.
 - v) The most practical method of apportionment is the potential benefit.
- 5) Take up the illustration 2 and prepare Secondary Distribution summary using Simultaneous Equation and Trial and Error methods.

The Company decided to apportion the Service Department costs on the following basis:

	A	B	C	X	Y
X	40%	20%	30%	--	10%
Y	30%	30%	20%	20%	--

8.7 LET US SUM UP

Overheads refer to all indirect costs including indirect materials, indirect labour and indirect expenses. These can be classified according to the functions to which they relate and according to their variability in relation to the volume of output.

Overheads are also taken into consideration while calculating the total cost per unit. But, they cannot be directly identified with particular products. Hence, they are distributed among different products in an indirect manner.

Overheads

The first step in overhead distribution is the collection of overheads (ascertainment of the total amount) under various standing order numbers. The next step is to allocate and apportion them to various production and service departments on some suitable basis. The guiding principles of apportionment are: (i) actual benefit (ii) potential benefit (iii) specific benefit (iv) ability to pay. The third step is to re-apportion the cost of service departments to production departments to facilitate the distribution of overheads among different products manufactured in the factory.

The last and final stage in overhead distribution is the absorption of overheads. This will be discussed in Unit 9.

8.8 KEY WORDS

Allocation: Allotment of whole amount of overhead cost to a particular cost centre. **Apportionment:** Distribution of common costs to various cost centres on some equitable basis.

Balance of Debt System: A system of wage payment under which a worker is paid on the basis of piece rate subject to a minimum wage based on the time spent by him in the factory. The extra payment is recouped from his subsequent extra earnings.

Common Costs: Overheads incurred jointly for various cost centres.

Departmentalisation (Primary Distribution): Allocation and apportionment of overheads to production and service departments.

Differential Piece Rate System: A system under which piece rate varies according to the efficiency of workers.

Overheads Distribution Summary: A statement showing allocation and apportionment of various items of overheads.

Piece wage system: A system under which wages payable to workers are based on their output.

Re-apportionment (Secondary Distribution): Apportionment of service department's cost to production department.

Time Wage system: A system under which wages payable to workers are based on the time spent by workers in the factory.

8.9 ANSWERS TO CHECK YOUR PROGRESS

- A) 2. factory overheads, administrative overheads, selling overheads and distribution overheads.
4. i) indirect labour ii) overheads iii) partly, partly iv) standing order numbers v) non-cash
- B) 4. i) False ii) False iii) True iv) False v) True

8.10 TERMINAL QUESTIONS/EXERCISES

Questions

- 1) Define overheads. What are the various methods of classifying overheads. Discuss functional classification.

- 2) Name various steps involved in the distribution of overheads and explain them briefly.
- 3) How and why the service departments costs are apportioned to production departments?
- 4) What are standing order numbers? Explain various sources used for collection of overheads.
- 5) Discuss various principles of apportionment of overheads. Give a few examples of the bases used for apportionment and re-apportionment.
- 6) Discuss the concepts of various method for apportioning the Service Department Costs to production Departments.

Exercises

- 1) Following figures have been extracted from the accounts of a manufacturing concern for the month of December 2018.

Indirect Materials:

		Rs.
Production Departments	X	1,000
	Y	1,800
	Z	500
Maintenance Deptt.	P	3,000
Stores Deptt.	Q	800

Indirect Wages:

Production Deptt.	X	1,400
	Y	1,900
	Z	400
Maintenance Deptt.	P	2,000
Stores Deptt.	Q	1,300
Power and Light		12,000
Rent		5,600
Insurance on assets		2,000
Meal charges		6,000

Depreciation @ 6% on capital value of assets. From the following additional information, calculate, the share of overheads of each department.

Item	Production			Service	
	X	Y	Z	P	Q
Area (sq. ft.)	4,000	4,000	3,000	2,000	1,000
Capital value of asset (Rs.)	2,00,000	2,40,000	1,60,000	1,20,000	80,000
K.W. hours	4,000	4,400	1,600	1,500	500
No. of employees	180	240	60	80	40

(Answer: X : Rs 11,300; Y : Rs. 13,900; Z: Rs. 5,500; P :Rs. 9,000;Q: Rs. 4,000.)

- 2) M. Co. Ltd., has three production departments A, B, and C and two service Departments D and B. The following figures are extracted from the records of the company:

Overheads

	Rs.
Rent and rates	10,000
Indirect Wages	3,000
Depreciation	20,000
Lighting	1,200
Power	3,000
Sundries	20,000

The following further details are available:

Items	Total	A	B	C	D	E
Floor space (sq. ft.)	20,000	4,000	5,000	6,000	4,000	1,000
Light points	120	20	30	40	20	10
Direct wages (Rs.)	20,000	6,000	4,000	6,000	3,000	1,000
H.P. of machines	300	120	60	100	20	--
Value of machines (Rs.)	5,00,000	1,20,000	1,60,000	2,00,000	10,000	10,000

Apportion the costs to various departments on the most equitable basis.
(**Answer:** A: Rs. 15,100; B: Rs. 14,400; C: Rs. 19,300; D: Rs. 9,250; E: Rs. 3,150)

3) A factory has two production departments A and B and two service departments-Purchasing Department C and Time keeping department D.

	A	B	C	D
Wages (Rs.)	16,000	12,000	6,000	6,000
Area sq. meter.	1,500	1,100	900	500
Number of employees	80	60	40	20
Value of Plant and Machinery (Rs.)	32,000	24,000	16,000	8,000
Value of direct materials purchased (Rs.)	10,000	20,000	--	--
Lighting units	5,000	3,000	1,500	5,000

The following costs have been incurred:

	(Rs.)		(Rs.)
Supervision	6,000	Rent	1,600
Repairs to Plant and Machinery	2,400	Depreciation to Plant and Machinery	4,000
Light	2,000	Power	2,000
Employer's contribution to ESI	400	Canteen expenses	200

From the above information apportion the service departments costs to production departments, ignoring inter-service, department transfer.

(**Answer:** A: Rs. 15,220; B : Rs. 15,280)

- 4) Calculate the overheads applicable to production departments A & B. **Classification and Distribution of Overheads**
 There are also, two Service. Departments X & Y. X renders service worth Rs. 24,000 to Y and the balance to A & B as 3:2 Y renders service to A and B as 9:1.

You are also required to prepare secondary distribution summary using the following methods i) Simultaneous Equation Method, and ii) Trial and Error Method.

The Service Department expenses are apportioned on percentage basis as follows:

	A	B	X	Y
X	40%	40%	--	20%
Y	50%	40%	10%	--

	A	B	X	Y
Floor space (Sq. ft.)	10,000	8,000	2,000	4,000
Assets (Rs. in lakhs)	20	10	6	2
H.P. of machines	2,000	1,000	800	200
Number of workers	200	100	100	50
Light points	100	60	40	40
Expenses are :	Rs.			
Depreciation	3,80,000			
Rent, Rates etc.	72,000			
Insurance	30,400			
Power	40,000			
Canteen expenses	20,000			
Electricity	9,600			

(Answer: A : Rs, 3,73,560; B : Rs. 1,79,940) and i) & ii) A: Rs. 3,43,900
 B: Rs, 2,08,100

- 5) The R.T. Engineering Industries produced products P and Q during January 1980.

Direct Department Expenses of the 3 services sections and 2 production sections through which the products pass and other relevant information are furnished below:

Section/ Departments	Expenses Rs.	Number of Workers	Labour hour	Labour cost (Rs.)	Installed Capacity of electric motors
Service Section X (Personnel and amenities)	30,000	12	--	--	--
Service Section Y (Electrical)	40,000	10	--	--	--

Overheads

Service					
Section Z (Mill weight) Production	10,000	10	600	--	--
Section A Production	70,000	50	6,000	26,000	40 HP
Section B Production	80,000	50	12,000	36,000	60 HP

- i) Expenses of additional information as follows: Service Section Y directly apportioned on electric power used on installed capacity of electric motors in Departments A and B.
- ii) The industry decided to apportion the service department costs on the following percentage.

	A	B	X	Y	Z
X	40%	35%	5%	10%	5%
Y	40%	45%	4%	6%	5%
Z	45%	35%	10%	5%	5%

Of the 600 effective hours of Mill weight in Section Z, 240 hours relate to Section A and 360 to Section B.

Show the apportionment of Service Sections to Production Sections under the following methods i) Non-reciprocal (Step Ladder) method, ii) Trial and Error method.

(Answer: A: Rs. 1,04,500 ; B: Rs. 1,25,500)

- 6) The following information of a manufacturing company which has three production departments A, B and C and two Service Departments P and Q.

Particulars	Production Departments			Service Departments	
	A	B	C	P	Q
Overheads as per primary distribution (Rs.)	12,600	14,800	5,600	9,000	4,000

The company decided to apportion the Service department overhead costs on the following percentages:

	A	B	C	P	Q
P	40%	30%	20%	--	10%
Q	30%	30%	20%	20%	--

Prepare Secondary distribution and find out total overheads of production departments using simultaneous equation method and Trial and Error Method.

(Answer : A Rs. 18,100 B Rs,19,300 C Rs, 8,600)

Note: These questions will help you to understand the unit better. Try to write answers for them and verify with the content. But do not submit your answers to the University. These are for your practice only.

SOME USEFUL BOOKS

Arora, M.N. 1988, A Text Book of *Cost Accountancy*, Vikas Publishing House Pvt. Ltd., New Delhi. (Chapter 9-12).

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Himalaya Publishing House, Bombay, (Chapter 8-10).

Owler, L.W.J. and J.L. Brown, 1984. Wheldon's *Cost Accounting*, ELBS, London. (Chapter 7-9).



UNIT 9 ABSORPTION OF FACTORY OVERHEADS

Structure

- 9.0 Objectives
- 9.1 Introduction
- 9.2 Meaning of Absorption
- 9.3 Methods of Absorption
 - 9.3.1 Production Units Method
 - 9.3.2 Direct Material Cost Method
 - 9.3.3 Direct Wages Method
 - 9.3.4 Prime Cost Method
 - 9.3.5 Direct Labour Hour Method
 - 9.3.6 Machine Hour Method
- 9.4 Requisites of a Good Method of Absorption
- 9.5 Over-Absorption and Under-Absorption of Factory overheads
 - 9.5.1 Causes of under or over-absorption
 - 9.5.2 Disposal of under and over-absorption
- 9.6 Let Us Sum Up
- 9.7 Key Words
- 9.8 Answers to Check Your Progress
- 9.9 Terminal Questions/Exercises

9.0 OBJECTIVES

After studying this Unit, you should be able to:

- explain the meaning and need for absorption of overheads;
- describe different methods of absorption and their relative merits and demerits;
- decide on a suitable method of absorption; and
- explain the meaning of over-absorption and under-absorption and their treatment in cost accounts.

9.1 INTRODUCTION

In Unit 7 you learnt about the first three steps in overhead distribution viz., (i) collection of overheads. (ii) allocation of overheads, and (iii) apportionment of overheads. You also learnt about the preparation of overhead distribution summary whereby the cost of operating each production department could be ascertained. You know that the basic purpose of this exercise is to ultimately distribute various overheads to different products manufactured in the factory. For this purpose, another step in overhead distribution is followed. This is termed as absorption of overheads. In this unit, you will study the various methods of absorption of overheads their merits and demerits, calculation of overhead rate under each method, and the treatment of over-absorption and under -absorption of overheads in cost accounts.

9.2 MEANING OF ABSORPTION

Once the total overhead cost of various production departments is ascertained by means of allocation, apportionment and re-apportionment, these costs should be charged to the cost units i.e., the products that pass through these production cost centres. As the ultimate objective is to find out the cost of production it is necessary to distribute the overhead costs of production departments/cost centres to the cost units.

This process of charging or apportioning the overheads is **known as 'Absorption'**.

The total overhead cost of a production cost centre consists of:

- i) its own indirect cost e.g., indirect materials, indirect wages, depreciation of machinery etc. (allocation);
- ii) a share in expenses common to various departments e.g., factory rent, power and lighting, building insurance etc. (apportionment) ; and
- iii) a share in the total cost of service departments (re-apportionment).

There are two steps involved in the absorption of overhead cost to cost units/products.

- 1) Computation of overhead absorption rate; and
- 2) Application of the overhead absorption rate, as calculated above, to cost units/ products:

Absorption rate is the rate at which overheads are charged to different cost units/products. It may be in the form of a percentage or a rate per unit of a product per machine hour, per labour hour, etc. After the absorption has been worked out, the overhead cost of a product or a job can be calculated by multiplying the overhead rate with units of base in the cost units. For example, if the overhead cost of a production department is Rs. 50,000 and total direct wages for different jobs completed in that department are Rs. 2,00,000 the overhead absorption rate will be 25% of wages. Now, if wages incurred on a particular job are Rs. 2,000, the overhead cost of that job will be Rs. 500 (25% of Rs. 2,000). Similarly, if hours worked were to be taken as the basis of charging overheads, and the numbers of hours worked in that department is 1,000 hours, the overhead absorption rate will be Rs. 50 per hour (Rs. 50,000 ÷ 1,000). Now if the job has taken 12 hours to complete, the overhead costing of that job will be Rs. 600 (Rs. 50 × 12).

9.3 METHODS OF ABSORPTION

As indicated earlier, there are various methods of computing absorption rate. The methods differ only in respect of the base selected. The numerator in all the methods is the total overheads for the department and the denominator is the appropriate base selected. Depending upon the base selected, there are **six methods**, of overhead absorption. These are discussed below one by one.

9.3.1 Production Units method

This method is simplest of all the methods. Here the base taken is the number of units produced. Hence, the overhead rate is ascertained in terms of per unit of a product. This method is suitable where the units are of uniform

Overheads

size, quality and standard. It is used in mining, foundries and brick-making, etc. where the output can be measured conveniently in physical units. For example, if the production overheads are Rs. 75,000 and the number of units produced are 1,500, the overhead rate will be:

$$\begin{aligned}\text{Overhead Rate} &= \frac{\text{Amount of Production Overhead}}{\text{No. of Units produced in that department}} \\ &= \frac{75,000}{1,500} = \text{Rs. 50 per unit}\end{aligned}$$

9.3.2 Direct Material Cost Method

Under this method, the base selected is the directed material cost and the overhead absorption rate is computed as a percentage of direct material cost. For example, if production overheads are Rs. 1,00,000 and the direct material cost is Rs. 2,00,000, the overhead rate will be 50% of material cost calculated as follows:

$$\frac{\text{Production Overheads}}{\text{Material Cost}} \times 100 = \frac{1,00,000}{2,00,000} \times 100 = 50\%$$

Now, if the direct material cost of a job or cost unit is Rs. 3,000, the overhead to be absorbed by the cost unit will be 50% of Rs. 3,000 i.e. Rs. 1,500.

This method is suitable when (a) the production units are uniform as size and make, (b) require same type of material in equal quantities, (c) where material cost constitutes a substantial proportion of prime cost, and (d) where overhead contains a large proportion of costs related to materials, like purchasing, receiving, storing, etc.

The limitations of this method are:

- i) When there are wide fluctuations in material prices, it gives rise to misleading overhead absorption rates because overheads are not necessarily accompanied by similar changes.
- ii) If different materials are required for different jobs, job cost comparisons would give misleading results and a wrong idea of profitability because of difference in the price of materials.
- iii) This method does not recognise the importance of time factor. Two jobs using the same raw material would absorb the same amount of overhead though the time consumed by the jobs differ.
- iv) This method does not recognise the difference between the work done by skilled and unskilled workers.

9.3.3 Direct Wages Method

Under this method, the absorption rate is ascertained by taking direct wages as the base and expressing it as a percentage of direct wages.

For example, production overheads are Rs. 1,60,000 and the direct labour cost is Rs. 2,00,000, the overhead rate will be 80% of direct wages calculated as follows:

$$\begin{aligned}\text{Overhead rate} &= \frac{\text{Production Overheads}}{\text{Direct Labour Cost}} \times 100 \\ &= \frac{1,60,000}{2,00,000} \times 100\end{aligned}$$

Now, if the direct wages of job are Rs. 4,000, the absorption of production overheads by the job will be 80% of Rs. 4,000 i.e. Rs. 3,200.

It is particularly suited when (a) the rates of wages are the same, (b) similar nature of work is done by the labour, (c) the workers are of same or equal efficiency, and (d) the use of machines is negligible.

Though this method is simple, easy to understand and duly recognises the time factor, it suffers from the following limitations:

- i) No distinction is made between skilled and unskilled workers. The work done by unskilled workers should bear a higher charge of factory overheads as they take more time and utilise factory facilities for a longer period. But, under this method, more amount of factory overhead is charged to the work done by skilled workers, as the skilled workers are paid at a higher rate.
- ii) The difference between the work done by machines and hand workers is not recognised. Certain machine expenses like depreciation, power etc., should be charged only to the work done on machines. But, total factory overhead is absorbed by all the units whether done by machines or by hand workers.
- iii) The relationship between direct wages and overhead is less close.

Despite the above limitations, it is most commonly used method for the absorption of Absorption of factory overheads. Factory Overheads.

9.3.4 Prime Cost Method

Prime cost is the aggregate of direct materials and direct wages. In order to combine the advantages of both the methods, sometimes prime cost is taken as the basis for the overhead absorption rate.

$$\text{Overhead rate} = \frac{\text{Production overhead}}{\text{Prime Cost}} \times 100$$

Production overhead = Rs. 80,000

Prime Cost = Rs. 1,00,000

$$\text{Overhead rate} = \frac{80,000}{1,00,000} \times 100 = 80\%$$

If the prime cost of a job is Rs. 500: production overheads to be absorbed by the job will be 80% of Rs. 500 i.e., Rs. 400.

Though, overheads are more related to labour cost than material cost, the method gives equal importance to both materials and labour. If the cost of material is a considerable item of prime cost, the time factor will be ignored under this method, and this is the main limitation of this method.

9.3.5 Direct Labour Hour Method

Under this method, the overhead absorption rate is calculated per labour hour. It is done by dividing the total overheads in the production department by the number of hours worked by labour in that department. The overhead pertaining to a job or product is ascertained by multiplying the hourly rate with the number of labour hours spent for that job or product.

This method tries to eliminate the defects of direct wage method. It takes into consideration time factor and the difference in wage rate does not affect its validity. It is suited to those concerns which are labour oriented.

Illustration 1:

Compute labour hour rate from the information given below:

Total number of operators working in the department of a factory is 20, The department works for 300 days in a year and number of hours per day worked is 8: Idle time is 5% of the total number of days. Total departmental overheads are Rs. 22,800.

Solution:

$$\text{Labour hour rate} = \frac{\text{Total overheads}}{\text{Net working labour hours (effective)}}$$

$$\text{Number of days in a year} = 300$$

$$\text{No. of labour hours per day} = 8$$

$$\text{Total labour hours in a year} = \text{No. of days in a year} \times \text{No. of labour hours per day.}$$

$$= 300 \times 8 = 2,400 \text{ hours}$$

$$\text{Less 5\% idle time (5\% of 2,400)} = 120 \text{ hours}$$

$$\text{Net/Effective labour hours} = 2,280 \text{ per operator}$$

$$\text{Total net working hours in a year} = \text{Net labour hours in a year} \times \text{No. of operators}$$

$$= 2,280 \times 20 = 45,600$$

$$\text{Total works overhead} = \text{Rs. } 22,800$$

$$\text{Direct Labour hour rate} = \frac{22,800}{45,600} = \text{Rs. } 0.50$$

If time taken by the workers to complete a job is 80 hours, then the factory overhead charged to that job would be Rs. 40 i.e. 0.50 labour hour rate \times 80 labour hours.

9.3.6 Machine Hour method

This method is similar to labour hour method. But, instead of taking labour hours as the base, machine hours forms the basis of calculating overhead rate. The absorption rate calculated by dividing the factory overheads apportioned to a machine by the number of hours the machine has been worked. Thus, we will get the rate per machine hour. This is called machine hour rate. In other words, it is the cost of running a machine for one hour separate rate is calculated for each machine or a group of similar machines. Here, the overheads will be apportioned to the machines instead of the departments. Each machine is considered to be a cost centre. The total

overheads of the machine will be by the number of hours worked by it. Thus, we get the absorption rate per machine he This rate will be multiplied with the number of machine hours spent for a particular job to get the cost to be absorbed. by that job.

If production overheads of machine 1 Rs. 5,000

$$\begin{aligned} \text{Machine hour rate will be} &= \frac{\text{Production overheads}}{\text{No. of machine hours}} \\ &= \frac{5,000}{500} = \text{Rs.10} \end{aligned}$$

If machine 1 has been used for 5 hours for a job, overheads to be absorbed by that job be Rs. 50 (Rs. 10 × 5).

This method is suitable where work is carried on mostly by the machine because in such cases the overheads are more related to the machines.

You may note that we are going to discuss computation of Machine Hour Rate in the next unit in detail.

Let us take an example (Illustration 2) involving calculation of overhead absorption rates under various methods of absorption and see how it affects the total cost of a job or a product.

Illustration 2:

The production department of a factory furnishes the following information for the month October, 1990.

	Rs.	Hours
Materials used	54,000	
Direct wages	45,000	
Overheads	36,000	
Labour hours worked		36,000
Machine hours worked		30,000

For an order executed by the-department during October, the relevant data is as follows:

	Rs.	Hours
Materials used	6,000	
Direct, wages	3,200	
Labour hours worked		3,200
Machine hours worked		2,400

Calculate the overheads chargeable to the job by (i) Direct Materials Cost Method, (ii) Direct Labour Cost Method, (iii) Labour Hour Rate, and (iv) Machine Hour Rate.

Solution:

Overhead Absorption Rates

$$\begin{aligned} \text{i) Direct Materials Cost Method} &= \frac{36,000}{54,000} \times 100 \\ &= 66\frac{2}{3}\% \end{aligned}$$

Overheads

$$\begin{aligned} \text{ii) Direct Labour Cost Method} &= \frac{36,000}{45,000} \times 100 \\ &= 80\% \end{aligned}$$

$$\begin{aligned} \text{iii) Labour hour rate} &= \frac{36,000}{36,000} \times 100 \\ &= \text{Rs. 1.00} \end{aligned}$$

$$\begin{aligned} \text{iv) Machine hour rate} &= \frac{36,000}{36,000} \times 100 \\ &= \text{Rs. 1.20} \end{aligned}$$

Statement Showing Cost of the Job under different Methods of Absorption

	Direct Materials Cost method Rs.	Direct Labour Cost method Rs.	LHR Rs.	MHR Rs.
Direct Materials	6,000	6,000	6,000	6,500
Direct Wages	3,200	3,200	3,200	3,200
Overheads (applied)	4,000	2,560	3,200	2,880
Cost of production	13,200	11,760	12,400	12,580

Working Note

Overheads chargeable to the job have been worked out under different methods of absorption as follows:

- i) Direct Material Cost Method = $66\frac{2}{3}\%$ of Rs. 6,000
= Rs. 4,000
- ii) Direct Labour Cost Method = 80% of Rs. 3,200
= Rs. 2,560
- iv) Machine Hour Rate = 2,400 × Rs. 1.20
= Rs. 2,880

9.4 REQUISITES OF A GOOD METHOD OF ABSORPTION

A good method of absorption should possess the following characteristics: It should be simple to understand and easy to operate.

- 1) It should take into consideration the time factor.
- 2) It should distinguish between work done by manual labour and the work done by machine.

- 3) It should distinguish between the work done by skilled and unskilled workers.
- 4) The method should provide an equitable basis for overhead absorption, it should not cause under or over absorption of overheads to any cost centre.
- 5) The method should not involve much clerical work and should be economical in application.

Check Your Progress A

- 1) What do you mean by absorption of overheads?
- 2) What are the two steps involved in the absorption of overheads.
- 3) List four important methods of absorption of factory overheads.
- 4) State whether each of the following statements is **True** or **False** and justify your answer.
 - i) Absorption is the last step in overhead distribution.
 - ii) The allotment of overheads to each department is called 'absorption'.
 - iii) Direct wages method of absorption of factory overheads duly takes time factor into account.
 - iv) The actual overhead absorption rate is the actual overheads divided by the estimated machine hours.

9.5 OVER-ABSORPTION AND UNDER-ABSORPTION OF FACTORY OVERHEADS

Overhead absorption rate may be actual rate or pre-determined rate. Actual rate is arrived at by dividing the actual overheads by the actual output or actual labour hours or actual machine hours or the period. But the actual rate cannot be computed till the end of the accounting period resulting in delay in computing the cost of a product. This causes a problem infixing the selling price for quotations and tenders. To solve this difficulty, pre-determined overhead absorption rates are calculated by dividing the estimated amount of overheads by the estimated production units or labour hours or machine hours.

When actual rates are used, the absorbed overheads will be exactly equal to the actual overheads incurred. There will be no under-absorption or over-absorption of overheads. But, when pre-determined rates are used, the overheads absorbed may be more than or less than the actual overheads. This will result in over-absorption or under-absorption of overheads. In other words, if the absorbed amount of overheads by the cost units is less than the actual amount of overheads, it is a case of under-absorption, and if, the absorbed amount of overheads by the cost units is more than the actual amount of overheads, then it is a case of over-absorption of overheads. This point will become clear by Illustration 3 as given below:

Illustration 3:

Estimated annual overheads in department X were Rs. 3,500 fixed; Rs. 6,500 variable. Estimated machine hours were 10,000. Actual machine hours worked were 9,500 and actual overheads incurred were

Overheads

Fixed	Rs.4,000
Variable	Rs.5,000

Find out under or over-absorption based on pre-determined rates.

Solution

$$\text{Pre - Determined Rate} = \frac{\text{Estimated Overheads}}{\text{Estimated Working Hour}}$$

$$\text{Fixed overheads} = \frac{3,500}{10,000} = \text{Rs. 0.35 per hour}$$

$$\text{Variable overheads} = \frac{6,500}{10,000} = \text{Rs. 0.65 per hour}$$

	Actual overheads	Overhead Absorbed at pre-determined rate	Over-absorbed	Under-absorbed
	Rs.	Rs.	Rs.	Rs.
Fixed	4,000	3,325*	675	--
Variable	5,000	6,175*	--	1,175
Total	9,000	9,500	675	1,175

* Fixed pre-determined rate \times actual hours worked

$$\text{Fixed} = 0.35 \times 9,500 = \text{Rs. 3,325}$$

* Variable = $0.65 \times 9,500 = \text{Rs. 6,175}$

9.5.1 Causes of Under or Over- absorption

Under or over absorption of overheads may be the result of any one or more of the following causes:

- 1) Error in estimating overhead cost.
- 2) Error in estimating the base i.e. quantity of output or labour hour or machine Hours.
- 3) Unexpected changes in production capacity.
- 4) Unexpected changes in the method of production resulting in change in the amount of overheads.
- 5) Seasonal fluctuations in the amount of overheads from period to period in certain industries.

9.5.2 Disposal of Under-absorption and Over-absorption

Under or over-absorption of overheads will affect the cost of production. Under-absorption understates the cost of production to the extent of the amount unabsorbed (Rs. 1,175 in Illustration 7). Over-absorption inflates the cost of production to the extent the amount absorbed is more (Rs. 675 in illustration 7). The under or over-absorbed amounts are disposed off according to any of the following methods:

- 1) **Use of supplementary rates:** If the amount of under or over-absorbed overheads is significant the difference between absorbed

the costing principle which states that the overhead of a particular year should be absorbed during the year in which it is incurred. However, it is considered suitable for seasonal factories in case of business where the normal business cycle extends over and the overheads are determined on as long term basis. This method can also be adopted during the initial years of a new project.

Check Your Progress B

- 1) State two requisites of a good method of absorption of factory overheads.
- 2) State whether each of the following statements is **True** or **False** and justify your answer.
 - i) Under-absorption results when charged overheads are less than the actual overheads.
 - ii) Transfer of under or over-absorption of overheads to costing Profit and Loss Account is considered suitable when their amount is significant.

9.6 LET US SUM UP

Absorption of overheads is the last step in the distribution of overheads. It is the process of apportioning the total expenses of the cost centres to cost units. There are six methods of absorption of factory overheads. These are: (1) production units method, (2) direct material cost method, (3) direct wages cost method, (4) prime cost method, (5) direct labour hour method, and (6) machine hour method. All methods have their merits and demerits. In view of the requisites of a good method of absorption of overheads, the machine hour is considered to be the best method absorption of factory overheads. But direct wage method is most commonly used because is simple, easy to operate and duly recognises time factor.

The overhead absorption rate may be the actual rate (based on actual overheads) or the pre-determined rate (based on estimates). When overheads are absorbed on the basis of pre-determined rate, there may be some difference between the overheads absorbed and actual overheads incurred. This difference is termed as under-absorption and over-absorption as the case may be. This requires an adjustment in cost accounts which may be done by using a supplementary rate, or by transferring the difference to the Costing Profit and Loss Account, or by carrying it over to the next accounting period through Suspense Account or Overhead Reserve Account.

9.7 KEY WORDS

Absorption: The process of charging the overheads of cost centres to cost units.

Labour Hour Rate: The overhead rate for one labour hour worked.

Over-Absorption: Excess of absorbed amount of overheads over the actual amount of overheads incurred.

Setting Up Time: Time spent by labour on making necessary adjustments in machine before work is commenced on the next job.

Under-Absorption: Excess of actual amount of overheads incurred over the absorbed amount of overheads.

9.8 ANSWERS TO CHECK YOUR PROGRESS

- A) 4. i) True ii) False iii) True iv) False
B) 2. i) True ii) False
-

9.9 TERMINAL QUESTIONS/EXERCISES

Questions

- 1) What do you mean by 'absorption of overheads'? Describe briefly the various methods of absorption of factory overheads.
- 2) Why direct wage cost method is the most commonly used method of absorption of factory overheads?
- 3) A factory which executes job orders has two departments: Deptt. A which has 60 workers and machines worth Rs. 6,00,000, and Deptt. B which has 600 workers and machines worth Rs. 60,000. What use would you make of this data in selection of overhead absorption rate?
- 4) What do you understand by under-absorption and over-absorption of overheads.
How are they treated in cost accounts.

Exercises

- 1) The following is the budget of 'Superb Engineering Works' for the year 2018.

Factory Overheads	:	Rs. 62,000
Direct Labour Cost	:	Rs. 1,24,000
Direct Labour Hours	:	Rs. 1,55,000

From these figures, ascertain the overhead application rates, using the following methods: (a) Direct Labour Hour; and (b) Direct Labour Cost.

Prepare a comparative statement of cost showing the result of applications of each of the above rate of job order Number 555 from the under mentioned data:

Direct Materials Rs. 90; Direct wages Rs. 25 ; Direct labour 20 hours ;

Machine hours = 30

Answer: Direct Labour hour rate = Re, 0.40; Direct Labour Cost method = 50%

Cost of Job No. 555 under LHR = Rs. 123; Under labour cost method = Rs. 127.50; and under MHR = Rs. 301.

- 2) Mayur Limited has three manufacturing departments A, B and C and one Service Department S. The following figures are available for one month of 25 working days of 8 hours per day. All these departments work for all the days and with full attendance.

Overheads

Expenditure	Total Rs.	Departments			
		S Rs.	A Rs.	B Rs.	C Rs.
Power and lighting	1,100	240	240	360	300
Supervisor's salary	4,000	--	--	--	--
Rent	500	--	--	--	--
Welfare	400	--	--	--	--
Others	1,200	400	400	200	200
	<u>7,200</u>				
Supervisor's salary		20%	30%	20%	30%
Number of workers		10	30	20	40
Floor area in Sq. ft.		400	200	300	100
Service rendered by Service Deptt.		-	30%	50%	20%

Calculate labour hour rate for each of the Department A, B and C.

Answer: A: Rs. 0.43 per hour B: Rs. 0.60 per hour Rs. 0.18 per hour.

Note: These questions will help you to understand the unit better. Try to write answers for them and verify with the content. But do not submit your answers to the University. These are for your practice only.

SOME USEFUL BOOKS

Arora, M.N. 1988, A Text Book of *Cost Accountancy*, Vikas Publishing House Pvt. Ltd., New Delhi. (Chapter 9-12).

Bhar, B.K. 1990. *Cost Accounting : Methods and Problems*, Academic Publishers, Calcutta. (Chapter 1-2).

Maheshwari, SN. and S.N. Mittal, 1990. *Cost Accounting : Theory and Problems*, Shree Mahavir Book Depot, Delhi. (Chapter 4, 5).

Nigam B.M.L. and G. L. Sharrna, 1990. *Theory and Techniques of Cost Accounting*,

Himalaya Publishing House, Bombay, (Chapter 8-10).

Owler, L.W,J. and J.L. Brown, 1984. Wheldon's *Cost Accounting*, ELBS, London. (Chapter 7-9).

UNIT 10 MACHINE HOUR RATE

Structure

- 10.0 Objectives
- 10.1 Introduction
- 10.2 Advantages and Limitations
- 10.3 Basis of Apportionment of Overheads
- 10.4 Computation of Machine Hour Rate
- 10.5 Let Us Sum Sup
- 10.6 Key Words
- 10.7 Answers to Check Your Progress
- 10.8 Terminal Questions/Exercises

10.0 OBJECTIVES

After studying this unit, you should be able to:

- explain the basis of apportionment of overheads to machines;
- state the advantages and limitations of Machine Hour Rate; and
- explain the procedure and compute Machine Hour Rate of the given date.

10.1 INTRODUCTION

As we discussed in the previous unit at 9.36, this is one of the methods of absorption of overheads. This method is similar to direct labour hour method. But instead of taking labour hours as the base, it take machine hours as the base. The machine hour rate is ascertained the cost of overheads of running a machine per one hour. This rate is ascertained by the total overhead costs of a machine with the total running hours of the machine in a given period.

10.2 ADVANTAGES AND LIMITATIONS

Advantages: Following are the advantages of Machine Hour Rate:

- 1) Considering the costing view point, this is accurate method of absorption of overheads.
- 2) In takes the actual running time of the machine and thus gives accurate results.
- 3) Under this method, standing charges (fixed overheads) and variable overheads are separately calculated, without any difficulty, the cost of idle time can be ascertained.
- 4) This method is most suitable for absorption of overheads, where large scale of the activity of production is carried out by machines.
- 5) Computation is made fixed costs and variable costs separately which facilitates cost analysis for cost control and other decisions.

Overheads

Limitations: The following are the limitations of this method:

- 1) This method is applicable where cost centres mostly due the production work on machines. Thus it is not universally applicable.
- 2) It demands addition staff for the clerical work which involves additional costs.
- 3) Accuracy in estimation of machine hours well in advance of production is a difficult task. Hence, there is a possibility of misleading results.

10.3 BASIS OF APPORTIONMENT OF OVERHEADS

As studies the basis of primary and secondary distribution of overheads to production and service departments in Unit 8, the following are the basis of apportionment of different overheads pertaining to machines.

Overheads	Basis of Apportionment
Fixed or Standing Charges:	
1. Rent, Rates, taxes other building expenses of factory	Ratio of floor area occupied by each machine
2. Insurance	Insured value of machine
3. Supervisor/Foreman's/Attendant's salary	Time devoted (actual/estimated) by the supervisors to each machine
4. Lighting	No. of light points of machine or floor area occupied by machine
Variable Charges:	
5. Machine repair and maintenance	Capital value or machine hours
6. Depreciation	Capital value or machine hours or multiple of both
7. Power/Steam	Units consumed by machine per hour per unit rate per unit
8. Chemicals, Lubricating oil and other consumables	Machine hours or capital value of machine

10.4 COMPUTATION OF MACHINE HOUR RATE

As explained earlier, Machine hour rate is the overhead rate for one hour of machine worked. The first step in the computation of machine hour rate is the departmentalisation of overheads. i.e., apportionment of overheads costs of service departments to production departments. Next, these overheads of the department are allocated and apportioned as per the basis given at 10.3 to different machines in that department treating each machine or a group of machines as separate cost centre. Then the total overheads pertaining to the machine are divided by the effective working hours of the machine to know the machine hour rate. The time required Absorption of for setting of the machine and its idle time are deducted from the total working hours of the Factory Overheads machine so as to get the effective working hours of the machine.

The overhead concerning a machine are divided into fixed or standing and variable/running overheads. The total fixed overheads (also called standing charges) are taken and divided by the machine hours for the period concerned

to get the fixed overhead hourly rate. For each variable overhead, per hour rate is directly computed. The total of fixed and variable hourly rate gives the machine hour rate. **It should be noted that while calculating the machine hour rate (MHR), one should take all expenses for a particular period (a year or a month) and the machine hours should also relate to the same period.** The proforma for computation of machine hour rate is given in Figure 10.1.

Figure 10.1: Computation of Machine Hour Rate

Standing charges:	Amount Rs.	Per hour Rs.
Rent	xxx	
Lighting	xxx	
Salary	xxx	
Insurance	xxx	
Cotton waste	xxx	
Total	xxx	

$$\text{Hourly rate} = \frac{\text{Total}}{\text{No. of Machine hours}}$$

Variable Expenses:	xxx
Depreciation	xxx
Repairs	xxx
ower	xxx
Machine hour rate	xxx

Look at Illustration 1 to 6 and study how MHR is computed under different situations.

Illustration 1: Compute the machine hour rate from the following data:

	Rs.
Cost of machine	1,00,000
Installation charges	10,000
Scrap value after 15 years	5,000
Rent of the shop per month	200
General-lighting for the shop per month	300
Insurance for the machine p.a.	960
Repairs p.a.	1,000
Power 10 units per hour	
Rate of power per 100 units	20
Shop supervisor salary p.m.	600
Estimated working hours p.a. are	1,000

The machine occupies one-fourth of total area of the shop. Supervisor devotes one-third of his time for this machine.

Overheads

Solution :

Computation of Machine Hour rate

	p.a.	per hour
	Rs.	Rs.
Standing charges:		
Rent 200 p.m. × 12 months = Rs. 2,400		
Machine occupies 1/4th area only (2,400 × 1/4)	600	
Lighting 300 pm. × 12 months = Rs. 3,600		
Machine occupies 1/4th area (3,600 × 1/4)	900	
Insurance	960	
Supervisor's salary		
600 × 12 months =Rs. 7,200		
He devotes 1/3rd of his time (7,200 × 1/3)	<u>2,400</u>	
Total standing charges p.a.	<u>4,860</u>	
Hourly rate 4,860 ÷ 1,000 Hours		4.86
Variable charges:		
Depreciation*		7.00
Repairs Rs. 1000 ÷ 1000 hours p.a.		1.00
Power for 100 units = Rs. 20		
for 10 unit = $\frac{10 \times 20}{100}$		<u>2.00</u>
Machinehour rate		<u>14.86</u>

	Rs.
*Depreciation Cost of the machines	1,00,000
Add: Installation	+ 10,000
	1,10,000
Less: scrap value	<u>- 5,000</u>
	<u>1,05,000</u>
$= \frac{1,05,000}{15\text{yrs}} =$	Rs.7,000 p.a.

Working hours p.a. 1,000
 Deprecation per hour = 7,000 ÷ 1,000 = Rs. 7

For More Than One Machine

Illustration 2: A machine shop contains four newly purchased machines each occupying equal amount 28 space and costing A Rs. 40,000, B Rs.

50,000; C Rs. 60,000 and D Rs. 80,000.

Machine Hour Rate

Expenses per annum of the Machine shop are:

	Rs.		Rs.
Rent	20,000	Power A	10,200
Rates	8,500	B	10,000
Light	6,300	C	24,000
Administration	19,000	D	29,000
Running Expenses	40,000		

Prepare a machine hour rate for each machine assuming (i) 45 hours in a week and 50 weeks a year, (ii) 80% and life of machine being 10 years without any scrap value.

Solution

Working hours : 45 hours in a week and 50 weeks a year with 80% utilization.

$$45 \text{ hours} \times 50 \text{ weeks} \times \frac{80}{100} = 1,800 \text{ hours}$$

$$\text{Depreciation} = \frac{\text{Cost}}{\text{Life}} \quad A = \frac{40,000}{10} = \text{Rs. } 4,000 \text{ p.a.}$$

$$B = 50,000 \div 10 = \text{Rs. } 5,000 \text{ p.a.}$$

$$C = 60,000 \div 10 = \text{Rs. } 6,000 \text{ p.a.}$$

$$D = 80,000 \div 10 = \text{Rs. } 8,000 \text{ p.a.}$$

Computation of Machine Hour Rate

	A	B	C	D
	Rs.	Rs.	Rs.	Rs.
Standing Charges				
Running apportioned equally (space)	5,000	5,000	5,000	5,000
Rates -do-	2,125	2,125	2,125	2,125
Light -do-	1,575	1,575	1,575	1,575
Administration -do-	4,750	4,750	4,750	4,750
Total expenses p.a.	13,450	13,450	13,450	13,450
Running Charges				
Depreciation	4,000	5,000	6,000	8,000
Power	10,200	10,000	24,000	29,000
Other running expenses (equally)	10,000	10,000	10,000	10,000
	37,650	38,450	53,450	60,450
Machine hour rate				
(Total expenses ÷ 1,800 hrs)	20.92	21.36	29.69	33.58

Overheads

Hourly Rate with setting up Time

Illustration 3 : Calculate machine hour rate from the following data:
Total machine hours worked p.a. 4,400

Setting up time 400 hours.

Expenses for the machine p.a.

Rent Rs. 12,000; Lighting Rs. 1,200 ; Repairs Rs. 2,400 ; Supervision Rs. 4,800. Two attendants looking after 4 Machines were paid Rs. 120 per month each.

Power consumed by the machine 10 units per hour @ Rs. 40 per 100 units.
Cost of the Machine Rs. 17,200.

Scrap value Rs. 1,200.

Life period 16,000 hours.

Sundry supplies for the machine shop are Rs. 480 p.m. There are four identical machines in the machine shop. Supervisor is expected to devote his time equally for all the machines.

Computation of Machine hour rate

Standing charges	p.a.	per hour
	Rs.	Rs.
Rent	12,000	
Light	1,200	
Supervision 4 identical machines equal time 1/4th × 4800	1,200	
Attendants salary 2 Attendants 120 p.m. × 12 months = 2880 for four machines For 1 machine 2880 ÷ 4 =		
	720	
Sundry supplies for the shop 480 p.m. × 12 months = 5,760 for four machines For one machine 5760 ÷ 4		
	1,440	
Total	16,560	
Hourly rate 16,560 ÷ 4000		4.14

Running charges:

$$\text{Depreciation} = \frac{17,200 - 1,200}{16,000 \text{ hours (life time)}} \quad 1.00$$

$$\text{Repairs } 2,400 \div 4,000$$

Power for 100 units – Rs. 40

4.00

Machine Hour Rate

For 10 Units per hour = $\frac{10 \times 40}{100}$
Machine hour rate

9.74

Effective working hours p.a. = 4,400 hours p.a. – 400 hours set up time = 4,000 hours.

When Annual Working Hours Are Not Given

Illustration 4 : Compute a machine hour rate for the month of January.

Cost of machine Rs. 64,000

Scrap value Rs. 4,000

Effective working hours 10,000

Repairs and maintenance over the life period of Machine Rs. 5,000. Standing charges allocated this Machine Rs. 1,000 for January. Power consumed by the Machine at Re. 0.60 per units Rs. 1,200 p.m. The machine consumes 10 units of power per hour.

Solution:

Calculation of annual working hours by taking power as the basis.

For Rs. 0.60 = 1 unit.

For Rs. 1,200 – ?

$$\frac{1,200}{0.60} = 2,000 \text{ units}$$

For 10 units of power – time is 1 hour.

For 2,000 = Units of power – Time

$$= \frac{2,000 \text{ units}}{10 \text{ units}} = 200 \text{ hours p.m.}$$

Computation of machine hour rate

	p.m.	per hour
	Rs.	Rs.
Standing charges:		
Hourly rate 1000 ÷ 200 hours	1,000	5.00
Variable charges:		
Depreciation = $\frac{64,000 - 4,000}{10,000}$		6.00
Repairs 5,000 + 10,000) life hours		0.50
Power 10 units @ 0.60 .		6.00
		<hr/>
Machine Hour Rate		17.50

Comprehensive Machine Hour Rate : You know that direct wages are not included in production overhead. Hence, these are not considered while including the machine hour rate. But, sometimes, the direct wages of

Overheads

a machine operator are also included while calculating the machine hour rate. In that case, it is known as 'comprehensive machine hour rate'. Thus, overheads and direct wages are absorbed in one single rate in the cost of a product. In Illustration 4, if the wages of machine operator were Rs. 800 p.m., then direct wages rate per machine hour would be Rs. 4 ($800 \div 200$). The machine hour rate as per Illustration 6 is Rs. 17.50. The comprehensive machine hour rate will be Rs. 21.50 ($17.50 + 4$).

Illustration 5 : The following expenses have been incurred in respect of a work shop having 5 identical machines and occupied equal space:

Particulars		Rs.
1)	Rent and Rates of workshop (p.a.)	80,000
2)	Repairs and Maintenance of 5 machines (p.a.)	10,000
3)	Lighting for workshop (p.a.)	15,000
4)	Power Charges of 5 machines @ Rs. 2 per unit	1,20,000
5)	One Supervisor's Salary (p.m.)	30,000
6)	Two Attendent's Salary (p.m.)	20,000
7)	Annual Interest on hire-purchase for machines	25,000
8)	Cotton for cleaning for the workshop (p.a.)	1,000
9)	Depreciation on each machine (p.a.)	6,000
10)	Direct wages	1,60,000

Each machine consumes 10 units of power per hour. Supervisor and attendants spent equal time on each machine. Calculate Machine Hour Rate per machine.

Solution:

Computation of Machine Hour Rate for a Machine

Particulars	Per annum (Rs.)	Per Hour (Rs.)
Standing Charges		
Rent and Rates: Rs. $80,000 \div 5$	16,000	
Lighting : Rs. $15,000 \div 5$	3,000	
Supervisor salary (p.m.) Rs. $30,000 \times 12 \div 5$	72,000	
Attendants Salary (p.m.) Rs. $20,000 \times 12 \div 5$	48,000	
Interest on Hire-purchase of Machines	1,60,000	
Direct Wages (Rs. $25,000 \div 5$)	5,000	
Cotton for cleaning (Rs. $1,000 \div 5$)	200	
Total Standing Charges (p.a.)	2,04,200	
Standing Charges per hour (Rs. $2,04,200 \div 1,200$ hours)		170.17
Variable Charges:		
Depreciation (Rs. $6,000 \div 1,200$ hours)		

Repairs and Maintenance	5.00
(Rs. 10,000 ÷ 5 machines = Rs. 2,000)	
Rs. 2,000 ÷ 1,200 hours	1.67
Power : per hour consumption 10 units @ Rs.2	20.00
Comprehensive Machine Hour Rate	196.84

Machine Hour Rate

Working Notes:

- i) Since working hours of a machine is not given in the illustration, power consumption has been taken into account for calculation of working hours of a machine.

Total power consumption of machines = Rs. 1,20,000

Unit rate = Rs. 2.00

Total units consumed by 5 machines:

$1,20,000 \div 2 = 60,000$ units

Per machine consumption: $60,000 \text{ units} \div 5 = 12,000$ units

One Machine consumption is 10 units of power per hour.

Therefore, working hours of a machine per annum = $12,000 \text{ units} \div 10 \text{ units (Units consumed a machine p.a.} \div \text{per hour consumption)} = 1,200$ hours per annum.

- 2) All expenses are charged equally to 5 machines as they are identical and occupied equal space.

Illustration 6 : A production department works on an average 170 hours in a month. There are four machines in the department. The following information is provided:

Particulars	Machines			
	I (Rs.)	II (Rs.)	III (Rs.)	IV (Rs.)
Interest paid on capital (p.a.)	2,400	9,000	2,100	13,500
Depreciation (p.a.)	6,600	24,000	3,600	36,000
Repairs (p.a.)	1,200	11,100	900	1,800
Power (p.m.)	3,000	4,000	2,000	2,000
Direct wages (p.m.)	50,000	30,000	60,000	90,000
Lubricating oil (p.m.)	100	200	200	400
Floor area occupied	14%	10%	15%	16%

Monthly charges for rent and taxes for the entire factory are Rs. 75,000.

Foreman salary is Rs. 40,000 p.m. and attendant salary is Rs. 15,000 p.m. Both spent equal time on 4 machines.

You are required to calculate:

- Simple Machine Hour Rate
- Comprehensive Machine Hour Rate

Solution:**Calculation of Simple and Comprehensive Machine Hour Rates**

Particulars	Machines			
	I (Rs.)	II (Rs.)	III (Rs.)	IV (Rs.)
Standing Charges (p.m.)				
Interest on Capital	200	750	175	1125
Rent and Rates	10,500	7,500	11,250	12,000
Supervisor Salary	10,000	10,000	10,000	10,000
Attendant Salary	3,750	3,750	3,750	3,750
Total monthly Standing Charges	24,450	22,000	25,175	26,875
A) Hourly Standing Charges (170 hours in a month)	143.82	129.41	148.09	158.09
Variable Charges (p.m.)				
Depreciation	550	2,000	300	3,000
Repairs	100	925	75	150
Power	3,000	4,000	2,000	2,000
Lubricating Oil	100	200	200	400
Total monthly variable charges	3,750	7,125	2,575	5,550
B) Hourly variable charges (170 hours p.m.)	22.06	41.91	15.18	32.65
i) Simple Machine hour rate (A + B)	165.88	171.32	163.27	191.55
Add:				
Direct wages per hour (Direct wages 170 hours)	294.12	176.47	352.94	529.41
Comprehensive Machine Hour Rate	460.00	347.79	516.21	720.96

Check Your Progress A

- 1) List out the Standing charges and Variable Charges for calculation of Machine Hour Rate.
- 2) What is comprehensive Machine Hour Rate?
- 3) State whether each of the following statements is **True** or **False** and justify your answer.
 - i) Machine hour rate is the best method of absorption of overheads under all conditions.
 - ii) Direct wages of a machine operator are included in comprehensive machine hour rate.
 - iii) Machine hour rate is simple and is easy to operate.
 - iv) Effective machine hours are ascertained by adjusting the setting up time in the total working hours of a machine.

10.5 LET US SUM UP

Machine Hour Rate is ascertained the cost of overheads of running a machine per one hour which is termed as simple machine hour rate. When the direct

wages of a machine is taken into account it is called comprehensive machine hour rate.

Machine Hour Rate

10.6 KEY WORDS

Comprehensive Machine Hour Rate : Overhead and direct wages absorbed by the cost units in one single rate.

Machine Hour Rate: The overhead rate for one hour of machine worked.

10.7 ANSWERS TO CHECK YOUR PROGRESS

A) 3. i) True ii) False iii) False iv) True

10.8 TERMINAL QUESTIONS/EXERCISES

1. What do you mean by Machine Hour Rate and Comprehensive Machine Hour Rate ?
2. What are the basis of various expenses to be apportioned to a machine.
3. Explain the computation of machine hour rate with the help of an example.

Exercises

1. Calculate Machine Hour Rate for Machine A.

Consumable Stores	600	for Machine A
Consumable stores	1,000	for Machine B
Repairs	800	for Machine A
Repairs	1,200	for Machine B
Lighting and Heating	360	
Rent	1,200	
Insurance of Building	4,800	
Insurance of Machines	800	
Depreciation of Machines	700	
Room Service	60	
General Charges	90	

Additional Information :

	Working hours	Area (Sq. ft)	Book Value (Rs.)
Machine A	1,000	100	12,000
Machine B	2,500	500	20,000

(Answer: Rs. 2.91)

(Hint: Insurance and depreciation of Machines should be apportioned on the basis book values of machines and all other expenses on the basis of floor area covered).

Overheads

- 2) Calculate the machine hour rate to recover the overhead expenses given below:

	Per hour	Per annum
Electric Power	75Ps.	
Steam	10 Ps.	
Water	2 Ps	
Repairs		Rs. 530
Rent		Rs. 270
Running hours		
Rs. 2,000		
Original Cost	Rs. 12,500	
Book Value	Rs. 2,870	
Replacement value	Rs. 11,500	
Depreciation	$7\frac{1}{2}\%$	

(Answer: 1.74)

(Hint: Depreciation to be charged on original cost.)

- 3) Calculate Machine Hour Rate from the following data:

	Rs.
Cost of Machine	1,00,000
Installation Charges	10,000
Estimated scrap value (after working of 15 years)	5,000
Rent and Rates for shop p.m.	200
Lighting for the shop p.m.	300
Insurance of machine p.a.	960
Repairs p.a.	1,000
Power consumption — 10 units per hour	
Rates of power per 100 units	20
Estimated working hours p.a. — 2,200)	
(This includes setting up time of 200 hours)	
Shop supervisor's salary p.m.	600

The machine occupies 1/4 of the shop. The supervisor is expected to devote 1/5 of his time for supervising the machine.

(Answer: Rs. 7.95)

Note: These questions will help you to understand the unit better. Try to write answers for them and verify with the content. But do not submit your answers to the University. These are for your practice only.

SOME USEFUL BOOKS

Arora, M.N. 1988, A Text Book of *Cost Accountancy*, Vikas Publishing House Pvt. Ltd., New Delhi. (Chapter 9-12).

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Himalaya Publishing House, Bombay, (Chapter 8-10).

Owler, L.W,J. and J.L. Brown, 1984. Wheldon's *Cost Accounting*, ELBS, London. (Chapter 7-9).



UNIT 11 TREATMENT OF OTHER OVERHEADS AND ACTIVITY BASED COST ALLOCATION

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- 11.9 Answers to Check Your Progress
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11.0 OBJECTIVES

After studying this Unit, you will be able to:

- explain the methods of absorption of administration overheads;
- explain the methods of absorption of selling and distribution overheads;
- describe the treatment of certain items of overheads like interest, depreciation, research and development expenditure in cost account; and
- identify the items that are excluded from cost accounts.

11.1 INTRODUCTION

In Unit 8, you learnt about the distribution of production overheads including the methods of their absorption in cost units. In this unit, you will learn about the distribution of non- production overheads viz., administrative overheads and selling and distribution overheads. This unit, also discusses the treatment of certain peculiar items of overheads like interest, depreciation, research and development cost, labour welfare expenses, royalties, etc.

11.2 OFFICE AND ADMINISTRATION OVERHEADS

You know that administration overheads are the costs of formulating the policy, directing the organisation and controlling the operations of an undertaking. 'They have no direct connection with production or sales. The examples of such expenses are salaries of office

Staff, legal charges, audit fees, depreciation of office machines and building, office rent, stationery, postage, typing charges, etc.

Administration overheads are collected and classified in the same way as production overheads. These are usually apportioned to various administrative departments which act as cost centres for the purpose of collection and control of administration overheads. The cost centres may be general office; accounts department, personnel department, law department, etc. Some people argue that there are only two basic functions of a business i.e., production and sales. As administration overheads are incurred for the benefit of these two functions, they should be apportioned between production and sales department on some equitable basis. But, generally it is advocated that **administration is also a separate function like production and sales and, therefore, the administration overheads should be taken as an independent item of cost and added to the cost of a job or a product.**

There are various methods of absorption of administration overheads.

These are:

(1) production units method (absorption rate worked out per unit of output), (2) as a percentage of conversion cost, (3) as a percentage of sales, and (4) as a percentage of works cost. Of these, the commonly used method is the percentage of works cost. Under this method, the absorption rate is worked out as follows:

$$\frac{\text{Total Administration overheads}}{\text{Total Works Cost}} \times 100$$

For example, if a works cost is Rs. 10,000 and the total administration

overheads are Rs. 2,000, the absorption rate will be $20\% \left(\frac{2,000}{10,000} \times 100 \right)$

of works cost. Now, if works cost of particular product is Rs. 600, the administration expenses to be added to its cost will be Rs. 120 (20% of Rs. 600).

Though administration overheads are fixed in nature and are incurred as a matter of policy of the management code control can be exercised through budgets, standard costing and by comparison with part performance.

11.3 SELLING AND DISTRIBUTION OVERHEADS

Selling and distribution overheads are also nonproduction costs and they are incurred after the production of products or services is completed and hence known as 'after-production costs'. You know that selling overhead is the cost incurred to create and stimulate demand and increase the sales to the existing and potential customers e.g., advertisement, free gifts, salesmen's remuneration, etc. Distribution overhead is the cost incurred to take the finished goods from the place of production to the place of resale or consumption, e.g., carriage outwards, insurance, etc.

11.3.1 Classification

Selling and distribution overheads are classified into the following sections:

- 1) **Direct Selling expenses**
 - a) Remuneration of salesmen (salaries, bonus, commission, etc.)
 - b) Remuneration of technical staff (for products like machines, television sets, etc.)
 - c) Expenses of show rooms, sales depts., branches, etc.
 - d) Expenses on sales quotations, tenders, estimating, etc.
 - e) After sales service costs
- 2) **Advertising and Sales Promotion:** These expenses include costs of advertising (by newspapers, radio, etc.) pamphlets, free gifts, samples, exhibition or display, etc.
- 3) **Transportation Expenses:** The expenses relate to transportation which include upkeep of delivery vans, salaries of running and maintenance staff of delivery vans, and insurance of goods in transit.
- 4) **Warehousing and Storage:** It includes cost of storage of finished goods like warehouse rent, salaries of warehouse staff, packing costs for storage purpose, and insurance of finished stock in warehouse.
- 5) **Credit and Collection:** Bad debts and debt collection expenses, legal expenses in connection with debt realisation. Generally these expenses are treated as selling overheads.
- 6) **Financial and general administration:** Costs such as royalty on sales, invoicing, accounts maintenance for selling and distribution sales statistics etc.

11.3.2 Distribution

The distribution of selling and distribution overhead can be discussed in three stages:

- 1) **Collection and analysis:** Firstly, the overheads must be collected under standing order numbers provided for this purpose.
- 2) **Allocation and apportionment to cost centres:** This is similar to the apportionment of production overheads to cost centres. The selling and distribution overheads are apportioned to different cost centres like warehouse, transportation etc.

Common bases for apportionment are as follows:

	Expenses	Basis
i)	Salesmen remuneration	Direct allocation
ii)	Advertising	Door to door
iii)	Radio, TV, Press	Direct allocation Space used or value of sales
iv)	Show room expenses	Floor area
v)	Insurance	Value of goods
vi)	Packing	Direct allocation
vii)	Catalogues	Direct allocation or space used

3) **Absorption of Selling and Distribution overhead:** After apportionment, these overheads must be absorbed by cost units. Selling and distribution overheads fall into two categories. These are as follows:

a) Those which are incurred only when the article is sold. They vary in direct proportion to sales value or volume of sales representing variable overheads.

They represent a definite amount per unit sold and so charged accordingly.

b) Those which are incurred whether an article is sold or not. They do not vary with units sold. They have to be absorbed in any one of the following ways:

i) **Rate per unit sold :** The total selling and distribution overheads are divided by the number of units sold to get a rate per unit. This method is followed when the units sold are uniform.

ii) **Percentage of Selling Price:** The formula for calculating percentage of selling and distribution expenses to sales is as follows:

$$\frac{\text{Selling and Distribution Overheads}}{\text{Works Cost}} \times 100$$

For example, if sales are Rs. 2,00,000 p.a. and selling costs are Rs. 50,000, then,

selling overheads to be absorbed will be 25% $\left(\frac{50,000}{2,00,000} \times 100 \right)$ of selling

price of each article sold. This method is usually followed for the absorption of selling and distribution overheads.

iii) **Percentage of works cost**

$$\frac{\text{Selling and Distribution Overheads}}{\text{Works Cost}} \times 100$$

if selling costs are Rs. 20,000 and works cost is Rs. 1,00,000 then selling costs

will be absorbed at 20% $\left(\frac{20,000}{1,00,000} \times 100 \right)$ of works cost. This method is

successful if only one type of product is sold. If there are more than one product, this method cannot be used as it does not recognise the different efforts involved in selling different products.

These rates are pre-determined and applied. As a result, there may be under or over-absorption of overheads. The treatment will be the same as discussed in Unit 8.

Illustration 1 clarifies how selling and distribution overheads are distributed over different products manufactured by an organisation.

Illustration 1 :

Show the distribution of expenses and the cost per unit of A, B, and C from the following particulars:

Overheads

	Rs.
Sales salaries	20,000
Sales Commission	12,000
Sales office expenses	4,000
Advertising — general	5,000
Advertising — specific	11,000
Packing expenses	1,500
Deliver van expenses	2,400
Warehouse expenses	1,800
Credit collection expenses	3,000
	60,700

Additional Information

	Total	Size A	Size B	Size C
1) Number of salesman (all paid same salary)	10	4	5	1
2) Units Sold	2,000	1,000	500	500
3) Number of orders	1,000	400	200	400
4) Percentage of specific advertising	100%	40%	30%	30%
5) Sales Turnover	2,00,000	1,20,000	40,000	40,000
6) Volume in cubic ft. per unit of finished product	--	15	10	5

Solution:

Statement Showing Apportionment of Selling and Distribution Overheads

Item	Basis of apportionment	Total	Sizes		
		Rs.	A Rs.	B Rs.	C Rs.
Sales salaries	Number of salesmen (4 : 5: 1)	20,000	8,000	10,000	2,000
Sales commission	Sales turnover (3: 1: 1)	12,000	7,200	2,400	2,400
Sales Office Expenses	No of Orders (4:2: 4)	4,000	1,600	800	1,600
Advertisement General	Sales Turnover (3:1:1)	5,000	3,000	1,000	1,000
Advertisement specific	Direct allocation (40%. 30%, 30%)	11,000	4,400	3,300	3,300
Packing expenses	Volume of cubic ft of products sold(3:2:1)	1,500	750	500	250
Delivery Expenses	-do- (3:2:1)	2,400	900,	800	400
Warehouse expenses	-do-	1,800	900	600	400

Credit collection expenses	No of orders (2:2:1)	3,000	1,200	600	1,200
Total		60,700	28,250	20,000	12,450
Units sold			1,000	500	500
Cost per unit (Total divided by units sold)			28.25	40	24.90

Check Your Progress A

- 1) Name the four methods of absorption of administration overheads.
- 2) Give two examples of distribution overheads.
- 3) Under what circumstances you would regard 'Rate per unit sold as the suitable method of absorption of selling and distribution overheads?
- 4) Fill in the blanks.
 - i) Selling and distribution expenses arecosts.
 - ii) Overheads are collected under.....
 - iii) Advertisement is an example ofoverheads.
 - iv) Show-room expenses are apportioned on the basis of
 - v) Bad debts are treated ascosts.

11.4 TREATMENT OF CERTAIN ITEMS IN COST ACCOUNTS

There are certain items of overheads the treatment of which vary from concern to concern depending upon the size of the concern, the method of production used and the policy followed by management. Let us examine such items more closely and study how they are to be treated in cost accounts.

11.4.1 Interest on Capital

There is a great deal of controversy regarding the inclusion of interest on capital in the cost accounts. There are arguments both in favour and against it. These are summarised below:

For inclusion

- 1) Interest is as much a production cost as wages. Wages are the reward for labour and interest is the reward for capital.
- 2) Real profit cannot be ascertained unit' interest on capital (paid or provided) is charged to cost units.
- 3) Results of different activities cannot be comparable unless interest factor is taken into account.
- 4) The true cost of maintaining stocks cannot be ascertained without taking into account the interest on capital invested in stocks.
- 5) Where management has to decide about the replacement of manual labour by machines, a true comparison cannot be made unless interest on capital investment in machine is taken into account.

Against Inclusion

- 1) The argument that wages are the reward of labour and interest is the reward of capital, holds good in economics and not in costing.

Overheads

- 2) Interest is purely a matter of finance, hence excluded from cost.
- 3) It is difficult to ascertain the fair rate if interest due to frequent changes in market rates and so also the exact amount of capital on which interest is to be calculated.
- 4) Calculated interest in cost accounts creates unnecessary complications in managerial decisions and comparisons involving interest can be done on separate statements.

After considering the above arguments both for and against the inclusion of interest in cost accounts. it can be concluded

- a) that interest need not be rewarded in cost accounts, and
- b) that it should be taken into consideration while making cost comparisons and submitting cost data for managerial decisions.

11.4.2 Depreciation

Depreciation is the diminution in the value of a fixed asset due to constant use or passage of time. In order to work out the exact cost of manufacturing, depreciation of the fixed assets like machinery and factory building must be taken into account. in order to determine the amount of depreciation chargeable to productions it is necessary to estimate the working life of the asset in terms of years or production hours and ascertain its total cost by adding installation charges to its original cost minus estimated scrap value.

There are various methods that can be used for calculating depreciation such as straight line method, written down value method, sum of years digits method, annuity method, production hours or production units method. The choice of method usually depends upon the type of asset and the nature of business. But, in cost accounts, mostly straight line method or production hours method is used because of their simplicity and convenience.

11.4.3 Research and Development Costs

The costs incurred on discovery of new product or improved product ideas or improved method are considered to be research costs. The costs incurred in implementing the decision to produce the new or improved product are considered as development costs.

If research is conducted in the methods of production, the cost is taken as production overheads and if it relates to administration, the costs are treated as administration overheads. Market research expenses are charged to selling and distribution overheads. If research in bringing a new or an improved product, the costs are charged directly to that product. In case research proves to be unsuccessful, its cost is treated as deferred revenue expenditure and charged to Costing Profit and Loss Account.

The cost of regular research and development (R&D) activity incurred out of a separate financial provision is excluded from cost accounts.

11.4.4 Royalties and Patent Fees

If royalties and patent fees are payable on the basis of output, the amount should be regarded as direct expense and, therefore, included in the prime cost of the product concerned. But, if they are payable on the basis of units sold (as in case of books), the same is treated as a selling expense and so included in selling and distribution overheads.

11.4.5 Drawing Office Expenses

Expenses on the work of drawing office is the preparation of production plans, drawing and designs. If drawings or designs are prepared for a specific job, drawing costs will be treated as direct expenses and charged to the job concerned. In case drawings are made to educate the customers or enclosed with sales tenders, the cost of drawings will be treated as selling overheads. But, if the services are of a general nature meant for the concern as a whole, the expenses are treated as production overheads and apportioned to production departments on the basis of service rendered i.e., man hours worked or number of drawings made.

11.4.6 Fringe Benefits

Besides basic wages and cash allowances like DA, HRA and CCA, some indirect monetary benefits such as medical facilities, canteen facilities, housing facilities (called fringe benefits) are enjoyed by the workers in factories. They are not related to the quantity of work done. Hence, the costs of such benefits will be treated as production overheads and allocated to different departments on the basis of number of workers employed.

11.4.7 Costing Office Expenses

They are generally charged to administration overheads. Sometimes, they may be apportioned to various functions like production, administration and selling and distribution on the basis of estimated benefits obtained by each.

11.4.8 Defective/Spoiled Work

If the defective work and spoilage is inherent in the process of manufacture, such loss should be included in the cost of production. It is treated as normal loss and charged as an overhead. If these are due to abnormal factors like fire, accident, machine break-down etc., the net loss (sale/value realised by selling the spoiled work/scrap) should be charged to Costing Profit and Loss Account.

Defective work is sometimes sent back to production department for correction. In that case, the cost of remedying the defect may be treated as production overheads.

11.4.9 Packaging Expenses

Packaging is necessary for handling the products like medicines, oil, liquid products, etc. Their packaging costs are treated as manufacturing cost and is included in direct materials. But the fancy/decorative packaging meant to attract customers is a sales promotional, activity and may be charged as selling overheads. It should be noted that packaging is not synonymous to packing. Packing is used for transportation or delivery of goods to customers' place. Hence, it is treated as distribution overhead.

11.4.10 Patterns and Dies

The patterns, moulds or dies are made for a particular job or work order. Hence their costs should be charged to that job or work order as a direct expense and included in its prime cost. However, if these are meant for production in general, their cost (or depreciation) should be treated as an item of factory overheads.

11.4.11 Idle Capacity

Normally the plant capacity should be fully utilised. But, it is difficult to achieve it in practice. In other words, some capacity may remain unutilised (idle). This may be due to a variety of factors such as defective planning and scheduling of work, Over expansion of capacity, seasonal fluctuations of demand, etc. Remedial measures are devised once the cause of idle capacity is established. The overhead costs arising from avoidable idle capacity are generally charged to Costing Profit and Loss Account. However, certain amount of other Overheads idle capacity is considered normal (set up time or maintenance period). Its overhead cost is duly taken into account while calculating the hourly rate for production overheads.

11.4.12 Cash Discount

Cash discount is the discount allowed for prompt payment by debtors. It is regarded as a financial cost and, therefore, excluded from the costs.

11.5 ITEMS EXCLUDED FROM COST ACCOUNTS

There are certain items which are excluded from cost accounts. These are:

a) **Purely financial charges**

- Loss on sale of fixed assets
- Discounts on issue of shares, debentures, etc.
- Loss on sale of investments
- Fines and penalties
- Donations
- Interest on bank loans and mortgages
- Cash discount

b) **Purely financial incomes**

- Profit on sale of fixed assets
- Interest and dividends received on investments
- Transfer fees received
- Rent received

c) **Appropriations of profit**

- Dividends paid
- Amounts written off like goodwill
- Preliminary expenses
- income tax
- Transfer to reserves

11.6 ACTIVITY BASED COST ALLOCATION

In the previous methods of overheads are absorbed based on the volume produced or cost of material consumed or Direct Wages or Machine Hour Rate and so on. These methods are termed as traditional methods. Because, there are many activities which are not related to volume in the present automation of many activities. Activity Based Costing method is a new approach of overheads absorption. It is known as ABC system.

Activity-based costing is a costing method that identifies activities in an organization and assigns the cost of each activity to all products and services according to the actual consumption by each. The model assigns more indirect costs into direct costs compared to conventional costing or Activity-based costing is a method of assigning indirect costs to products and services by identifying cost of each activity involved in the production process and assigning these costs to each product based on its consumption of each activity.

According to the traditional methods, overheads are absorbed by following three stages:

- i) Firstly, overheads are allocated or apportioned to Production and Service Departments.
- ii) Secondly, overhead costs of service departments to Production departments, and
- iii) Lastly overheads of production departments to end products by using various methods as discussed earlier.

Whereas, Activity-based costing is a more refined approach to costing products and services than the traditional cost allocation methods. Under this system, for each major activity like machine related, purchasing, storing, research, set-up and so on, separate cost centres are created. The identified activities are called activity drivers. On the basis of the benefits received by the products from the cost drivers, each activity cost is allocated to products. It is clear that the ABC system allocates the overheads to each activity based cost centres rather than to departments. It involves the following steps:

- Identification of major activities involved in the production process. For example activated related to labour, support services etc.;
- Classification of each activity according to the cost hierarchy (i.e. into unit-level, batch-level, product-level and facility-level);
- Identification and accumulation of total costs of each activity;
- Identification of the most appropriate cost driver (allocation base) for each activity;
- Calculation of total units of the cost driver relevant to each activity;
- Calculation of the activity rate i.e., the total cost of each activity per unit of its relevant cost driver;
- Application of the cost of each activity to products based on its activity usage by the product.

Cost Hierarchy

The first step in activity-based costing involves identifying activities and classifying them according to the cost hierarchy. Cost hierarchy is a framework that classifies activities based the ease at which they are traceable to a product. The levels are: (a) unit level, (b) batch level, (c) product level and (d) facility level.

Unit level activities are activities that are performed on each unit of product. Batch level activities are activities that are performed whenever a batch of the product is produced. Product level activities are activities that are conducted separately for each product. Facility level activities are activities that are conducted at the plant level.

Overheads

Under ABC system it is very important in selecting most suitable cost driver in each identified activity. Cost driver is any factor which influence the costs. For example, the following are some activities involved cost and their suitable cost drivers.

Activities Cost	Cost Drivers
1. Inspection and Issue of material	No. of purchase orders
2. Inspection of departments and verification	Time taken or no. of times taken
3. Storage of material	Value/space occupied
4. Set-up related	No. of set-ups
5. Purchase related	No. of purchase orders
6. Power	Machine working hours
7. Dispatches	No. of orders
8. Advertisement	Increase of sales

Study the following illustration to understand the allocation of overheads under traditional and ABC system of costing.

Illustration 2 :

A manufacturing firm produces X and Y products and it provided the data as below:

Product	Annual Output (units)	Machine Hours	No. of Purchase Orders	No. of Set-ups
X	10,000	20,000	160	30
Y	1,20,000	80,000	380	45

The firm identified three activities and their annual overheads are as under:

	Rs.
Volume related activity costs	6,50,000
Set-up related activity costs	10,20,000
Purchase related activity costs	6,18,000
Total	22,88,000

You are required to calculate per unit cost of X and Y products using:

- a) Traditional method of overheads absorption
- b) Activity based cost allocation

a) Statement of Overheads Allocation (Based on traditional method of absorption)

Particulars	Product X	Product Y
Product X : 20,000 (Machine Hours) @ Rs.22.88	(Rs.) 4,57,600	(Rs.) --
Product Y : 80,000 (Machine Hours) @ Rs.22.88	(Rs.) --	(Rs.) 18,30,400
	(Rs.) 4,57,600	(Rs.) 18,30,400
No. of Units	(Units)÷10,000	÷1,20,000
Per unit Overhead Cost	Rs. 45.76	Rs.15.25

b) **Statement of Overheads Allocation**
(Based on Activity Based Costing)

**Treatment of other
Overheads and Activity Based
cost Allocation**

Particulars	Product X	Product Y
Volume Related Activity Cost		
Product X : 20,000 hrs @ Rs. 6.50 per hour	1,30,000	--
Product Y : 80,000 hrs @ Rs. 6.50 per hour	--	5,20,000
Set up Related Activity Cost:		
Purchase X : 30 set ups @ Rs. 13,600	4,08,000	--
Purchase Y : 45 set ups @ Rs. 13,600	--	6,12,000
Purchase Related Activity Cost		
Product X : 160 orders @ Rs. 1,144.44	1,83,110	--
Product Y : 380 orders @ Rs. 1,144.44	--	4,34,887
Total Costs	7,21,110	15,66,887
(Units)	÷10,000	÷1,20,000
Cost Per Unit	72.11	13.06

Working Notes:

1) **Machine Hour Rate of Total Overheads**

Total Annual Overheads ÷ Machine Hours

Rs. 22,88,000 ÷ 1,00,000 hours = Rs. 22.88 per hour

2) **Volume Related Activity**

Total Annual Costs for Volume related Activity ÷ Total Machine Hours

=Rs. 6,50,000 ÷ 1,00,000 hours = Rs. 6.50 per hour

3) **Set-up Related Activity**

Total Set up Costs ÷ Total no. of Set ups

=Rs. 10,20,000 ÷ 75 set ups = Rs. 13,600 per set up

4) **Purchase Related Activity**

Total Purchase Costs ÷ Total No. of Purchase Orders

=Rs. 6,18,000 ÷ 540 purchase orders = 1,144.44 per order

Check Your Progress B

- 1) Give two reasons why interest on capital is excluded from costs.
- 2) Name two methods of computing depreciation that are commonly used in cost accounts.
- 3) State whether each of the following statements are **True** or **False** and justify your answer.
 - i) If experiment proves unsuccessful its cost is charged to Costing Profit and Loss Account.
 - ii) Royalties are treated as production overheads.
 - iii) Costing office expenses are treated as selling overheads.
 - iv) Packing is a distribution overhead.
 - iv) Cash discount allowed is not included in cost.
 - v) Fines and penalties are treated as administrative overheads.

11.7 LET US SUM UP

Administration and selling and distribution overheads are regarded as non-production costs.

Like production and sales, administration is also treated as a separate function. Hence the administration overheads are treated as a separate item of cost. Since they constitute a minor portion of the total cost, it is not considered desirable to follow a complicated method of allocation and apportionment. A blanket overhead rate is computed for the entire factory either as a percentage of works cost or as a percentage of sales.

The allocation of selling and distribution overheads are collected, allocated and apportioned to different cost centres in the same manner as the production overheads. Rate per unit sold or percentage of selling price are the two methods used for their absorption.

Depreciation of plant and machinery is included in production overheads either according to original cost method or machine hour rate method, interest on capital is normally excluded from cost accounts. Research and development costs are charged to cost of the products for which they are incurred unless these are by way of a financial provision used for regular research and development activity (R&D). Cost of fringe benefits provided to labour is an item of production overheads and is apportioned on the basis of number of employees in each department. Royalties and patents are treated as a direct cost unless paid on the basis of sale (then they are charged as selling overheads). Packing cost is a distribution overhead whereas packaging cost is a direct cost included in materials. Cash discount, being an item of purely financial nature, is excluded from costs. The overhead cost of normal idle capacity is absorbed by the cost unit, but that of abnormal capacity is charged to Costing Profit and Loss Account. Certain items of costs which are purely of a financial nature are excluded from cost accounts. Similarly, the items which are in the form of appropriation of profits are also excluded.

11.8 KEY WORDS

Appropriation of Profit: Utilisation or distribution of profit.

Defective work: Defective finished goods produced in the factory which requires correction or have to be sold at a loss.

Development Cost: Cost incurred in implementing the decision to produce new/improved product.

Idle Capacity: Unused production potential of the plant.

Research Cost: Cost incurred for experimentation on new/improved product, idea or method.

Royalties: Rent/fees paid for the use of a patent or copyright

Spoilage: Rejected units of output having little or no value.

