
UNIT 7 PRODUCT COSTING

Structure

- 3.0 Objectives
- 3.1 Introduction
- 3.2 Basic Cost Concepts
- 3.3 Types of Costing
- 3.4 Methods of Costing
- 3.5 Classification of Costs
- 3.6 Cost Measurement
- 3.7 Case Study on Product Costing in a Dairy Plant
- 3.8 Let Us Sum Up
- 3.9 Key Words
- 3.10 Some Useful Book
- 3.11 Answer to Check Your Progress

7.0 OBJECTIVES

After reading this unit we shall be able:

- 1 to explain the importance of product costing; and
- 1 develop an understanding of product cost measurement techniques.

7.1 INTRODUCTION

In our competitive world profitability, growth and survival are the key issues confronting any business organization. No enterprise can survive and grow unless it is profitable in the long run. Profit is the result of two forces- revenue and cost. Revenue is the product of selling price and volume of output i.e., selling price multiplied by output it can sell. Selling price is influenced by market forces and is generally beyond the control of management. Similarly how much the output of a firm can be sold is again dependent upon market structure, price structure, marketing mix of the enterprise and host of other factors like government policies concerning tariffs and taxes etc. Moreover the information about demand conditions is bound to be scarce and difficult to obtain, the cost information is usually plentiful which should be made use of by the managers. The firm pursuing the goal of profit maximization should endeavor to reduce per unit cost of production. The reduction in cost can be accomplished when cost per unit is ascertained. Therefore, knowing your production cost is critical. In present day economic scenario, accurate costing and pricing are key to success. Accurate costing avoids or minimizes distortions in product costing that result from arbitrary allocations of various costs.

Managers want product costs for guiding their decisions regarding pricing and product strategies. Managers also want product cost for the purpose of inventory valuation and income determination.

The product is the smallest unit for which profitability is calculated.

It aids in arriving at profitability of the various business segments of an organization thus providing its total picture.

Product costing is the process of tracking and studying all the various costs that are incurred by the firm on its products or we can say what it costs to make the product. But before product cost is ascertained and estimated it is more relevant to define cost and other terms frequently used in costing. Cost has different meanings, differing among accounting, economics and engineering. The traditional accounting definition of cost is limited to the amount expended to acquire an asset. A more general concept equates cost with any sacrifice, past or future. In this context cost represents the resources that have been or must be sacrificed to attain a particular objective. The concept of cost is multifaceted. The cost concepts shall be more clear if the following basic terms are understood properly.

7.2 BASIC COST CONCEPTS

Cost Objective: It may be defined as any activity for which a separate measurement of costs is desired.

Cost Unit: It is defined as a unit of quantity of product, service or time (or a combination of these) in relation to which costs may be ascertained or expressed. Choice of cost unit depends upon the nature of the product manufactured, methods of production and trade practices.

Average Cost: An average cost is the cost of a product unit computed by dividing total cost by the number of units produced.

Conversion Cost: Conversion cost is the cost of production excluding direct materials, but including wastage in the direct material. It is total of direct labour, direct expenses and works overheads.

Variable Cost: If a given cost changes in total in direct proportion to changes in an activity it is variable cost.

Fixed Cost: Fixed cost remains unchanged for a given time period despite fluctuations in activity

Cost Center: Cost center has been defined as a location, person or items of equipment (or group of these) for which costs may be ascertained and used for the purpose of cost control. Cost Centre is a segment of a plant or in some case an entire plant, which is treated as functional units for the purpose of applying process overhead.

Productive Cost Center: A Productive cost center is directly engaged in productive activity and may consist of similar items of equipments.

Service Cost Center: Service cost centres are those cost centres, which are not directly engaged in productive activities, but provide services to productive cost centres so that production work may be carried out.

Cost Accumulation: It is the collection of cost data in an organized way in an accounting system.

Profit Center: Different cost centers when taken into a group headed by an individual or manager, who will be fully responsible for all cost, revenues and profitabilities of operation, the group is known as profit center.

7.3 TYPES OF COSTING

Various techniques are applied for ascertaining costs. These techniques may be used for special purposes of control and policy in any business irrespective of the method of costing being used there. These techniques are briefly explained below

- 1. Standard Costing:** Standard Costing is a system, which seeks to determine beforehand what should be the cost and then actual cost is compared. The Standard Cost is pre-determined based on technical estimates of material, labour and overhead for a selected period of time and for a prescribed set of working conditions. This is a very valuable technique to control the cost as actual cost is measured against the standard cost. The differences between actual costs and standard costs are analyzed to know the reasons for the deviations. To correct the differences, remedial measures are then taken.
- 2. Absorption Costing:** The practice of charging all costs, both variable and fixed costs to all operations, processes or products is defined as absorption costing. It is also known as traditional costing. In this method costs are ascertained after these have been incurred. Although until recently this was the only technique employed by cost accountants but now a days it is considered to have limited application as it doesn't help in exercising control over costs. However it is useful in submitting tenders preparation of job estimates etc.
- 3. Marginal Costing:** According to this technique only the variable costs are considered in calculating the cost of the product while the fixed cost is treated as period cost and no attempt is made to allocate or apportion this cost to individual cost centres or cost units. However fixed costs are charged against the revenue of the period. The revenue arising from the excess of sales over variable costs is technically known as contribution. The Marginal Cost includes direct material, direct wages, direct expenses and variable overheads. This technique helps to study the effect of changes in volume on profit and also take policy decisions such as product pricing in times of competition, whether to make or buy, selection of product mix.
- 4. Differential Costing:** The concept of differential cost is based on the fact that in the real world, it is not practicable to employ 'factors for each unit of output separately as inputs lack perfect divisibility unlike marginal costing. Differential cost is the difference in total cost between two alternatives. Differential costs arise due to the change in product lines, addition of new product or introduction of a 'new product, replacement of worn out plant and machinery replacement of old technique of production with a new one. Differential costing considers all the revenue and cost differences amongst the alternative courses of action to assist management in arriving at an appropriate decision.
- 5. Uniform Costing:** It is the use of same costing principles and or practices by several undertakings for common cost control or comparison of costs. Uniform costing provides reliable data for making inter firm comparison of cost performance. It facilitates comparison of the cost of production and the

production efficiency between one unit and another. The working of a uniform costing depends on the co-operation of constituents of the industry.

7.4 METHODS OF COSTING

The methods of analyzing and presenting the cost vary from industry to industry. However, the basic principles of ascertaining costs are the same in every system of cost accounting.

1. **Job Costing:** Job costing is used where production is not repetitive and is done against orders. The work is usually carried out within the factory. Each job is treated as a distinct unit, and related costs are recorded separately.
2. **Process Costing:** Where an article has to undergo distinct processes before completion, it is often desirable to find out the cost of that article at each process. A separate account for each process is opened and all expenditure is charged thereon. The cost of the product at each stage is, thus accounted for. The output of one process becomes the input to the next process. Hence, the process cost per unit in different processes is added to find out the total cost per unit at the end.

7.5 CLASSIFICATION OF COSTS

A useful approach for understanding the various aspects of costs consists in examining alternative cost classification schemes. Generally, costs incurred by manufacturers are classified in different ways. Three of these that we come across frequently are

1. By objects of expenditure/nature of elements.
2. By programme (such as cost of Job No.1, No. 2 etc)
3. By responsibility center (condensing & drying, packing)

Each classification serves a specific purpose. In this section we shall discuss the first one in detail

- I. **Cost classification by Objects of Expenditure/ Nature of Elements** In this classification costs are recorded according to the factors upon which expenditure is incurred viz., material cost, wages (labour cost) and expenses

Material cost: The term material refers to all those commodities that are consumed in the process of manufacture. Materials can be further classified into direct materials and indirect materials.

Direct materials are those whose consumption may be identified with specific production units. Direct materials usually become integral part of the finished product. Direct materials thus include:

All materials used in production are wholly consumed in the production processes. For example milk used in making products such as butter, ghee, cheese or Ice cream. Sugar used in Ice cream or colour used in flavoured dairy drink. The cost on those items shall form direct material cost. Component parts used in

product. Any primary packing materials such as LDPE film for packing milk or ghee.

Indirect Material: All materials which are used for purposes ancillary to the business and which can not conveniently assigned to specific physical units are known as indirect materials. Furnace oil used for boiler, grease and oil for machines, hydrochloric acid and caustic soda for house keeping in dairy industry fall under the category of indirect materials.

Material cost includes cost on direct materials and indirect materials.

Labour Cost: The cost of remuneration of the employees of an undertaking fall under this category. It includes wages, salaries, commission, bonuses etc paid to employees. As per the statistics during 2001-2002 there were 865 dairy factories functioning in the organized sector in India having 83623 employees. Their total emoluments stood at Rs. 825.87 crores for the period under consideration. These employees included workers, supervisory and managerial staff and other employees. Employees can be further bifurcated into direct labour and indirect labour and cost associated with them is known as Direct labour cost and the Indirect labour cost respectively.

Direct Labour Cost. The wages paid to workers who are directly engaged in converting raw materials into finished products come under this category. These wages can be conveniently identified with a particular product; job or process. Wages paid to a technicians manufacturing butter or ghee or skim milk powder is an example of direct labour cost.

Indirect Labour Cost: Labour employed for the purpose of carrying out tasks incidental to goods produced or services provided is called indirect labour or indirect wages. Indirect labour is not directly engaged in the production operations required for product manufacture but only to assist or help on production operations. Mechanics, boiler attendant watch & ward staff, supervisors, storekeepers are examples of indirect labour and cost on these employees constitute indirect labour cost.

Expenses

All costs other than material and labour fall under this category and are termed as expenses. Expenses may be direct or indirect.

1. Direct Expenses

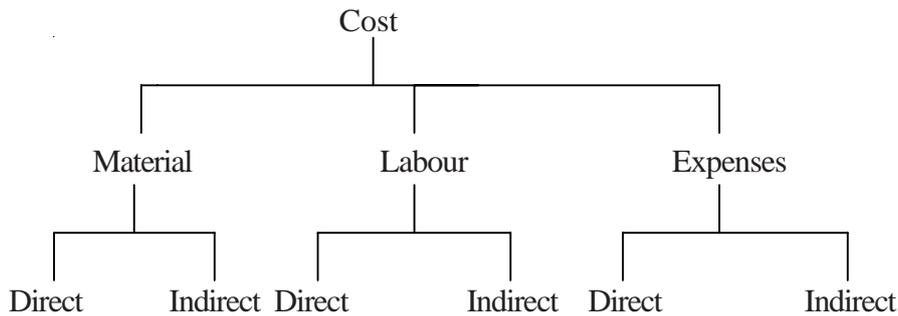
These are the expenses, which can be identified with and allocated to cost centers or units. Direct expenses can be conveniently allocated to a particular job or product or unit of service. These are also known as chargeable expenses or productive expenses. Hire of special machinery for a particular contract, cost of special drawings, designs and layout, carriage paid for materials purchased for a specific job fall under this category.

2. Indirect Expenses

Expenses which cannot be charged to production directly and which are neither indirect materials nor indirect wages are known as indirect expenses. Rent rates

and taxes, insurance, depreciation, repairs and maintenance, power, lighting and heating are few examples of indirect expenses.

The following chart shows the elements of cost mentioned above.



Overheads: Overhead costs are the indirect costs simply referred to as overhead. These cannot be directly attributed to any particular cost unit. The determination of overhead that should be properly associated with a given product is more difficult. It is because overhead costs cannot be identified with individual cost units and there are no accounting means of its exact distribution. Moreover they are generally not assumed to be directly associated with a department or product, either because there is no obvious relationship or because the cost of analysis and record keeping is considered too great.

There are three types of overheads.

1. Factory Overhead

Factory overhead includes all indirect expenses, which are incurred in connection with the manufacture of a product. They are also known as works overheads or factory burden or manufacturing overheads.

Salary of plant manager and fee paid to Directors for guidance to solve production problems. Salary and other benefits paid to the Foremen, Timekeeper, Store Keepers and clerical staff of the factory,

Cost of consumable stores,. Materials of small value such as cotton waste, small tools etc

Rent, municipal taxes, depreciation, insurance etc., of the factory land and building, insurance, depreciation etc. of the factory plant, machineries, and equipments

Factory lighting, heating and air conditioning, power and fuel (furnace oil, coal, gas, electric, etc.)

Canteen and welfare expenses, telephone charges.

Cost of training new employees, cost of experiment and research work.

Cost of designing for production and drawing office expenses.

Factory overheads may be fixed or variable.

Fixed factory overhead are those costs, which do not vary with the volume of production. Examples are rent on factory building, insurance charges, property taxes, depreciation and supervisory salaries.

Variable factory overhead vary directly with the level of production. They include cost of fuel and power, repair and maintenance, cost of supplies and most indirect labour.

2. Administrative Overhead: It includes all those indirect expenses, which are incurred in general administrative and management function of an enterprise. These overheads are of general character and are incurred for the business as a whole. Like factory overheads, administrative overheads tend to be fixed and variable.

The usual items generally included in these overheads are

Salaries to Managing Directors, Directors, Executives and their staff, fees of Directors.

Office rent and rates and repairs and depreciation of office premises, power required for office equipment

Audit fees, legal charges etc.

Stationary, postage, telephone charges, lighting and heating expenses and other utilities.

3. Selling and Distribution Overhead: Selling expenses are expenses of seeking to create and stimulate demand and of securing orders. Distribution expenses are expenses incurred in moving the goods from the company's go downs to the customers' premises. Selling and distribution expenses form no part of the cost of production but they take a considerable proportion of the price of the product. The usual items included in selling and distribution expenses are :

Fee of Sales Directors, salaries of the Sales Manager and his staff including his office staff and his salesmen.

Traveling expenses and commission payable to salesmen.

Advertising and showroom expenses including rent and lighting.

Printing of catalogues and price lists and general stationary.

Rent of finished goods go downs and their repairs, etc.

Packing and carriage outwards, insurance in transit..

Depreciation, repairs and running expenses of delivery vans.

Telephone and postage etc. of sales department. Subscriptions to different agencies and trade journals.

Bad debts, legal charges for recovery of debts.

Having known classification of cost by elements of expenditure we can now derive various other costs.

The total of the Direct Expenditure comprising of Direct Materials, Direct Labour and Direct Expenses —— is known as *Prime Cost or Flat Cost*.

Prime cost *plus* Works or Factory Expenses is known as **Works Cost or Manufacturing Cost or Factory Cost**.

Works Cost plus Office and Administrative Cost is called **Gross or Office Cost or Cost of Production**.

Cost of Production *plus* Selling and Distributive Expenses is known as **Cost of Sales**. This differs from Selling price. **Selling Price** is equal to Cost of Sales plus Net Profit (or minus loss).

Check Your Progress - 1

1. What is a cost unit and it is dependent on what factors?

.....
.....
.....
.....

2. Define average cost.

.....
.....
.....
.....

3. What is excluded from the conversion cost?

.....
.....
.....
.....

4. What do you understand by cost center. List different cost centers?

.....
.....
.....
.....

5. Explain in brief different techniques used for determining the product cost.

.....
.....
.....
.....

6. List different cost classification schemes.

.....
.....
.....
.....

7. Overhead cost is direct or indirect cost? What are three types of overheads?

.....
.....
.....
.....

7.6 COST MEASUREMENT

Product costing is the process of tracking and studying all the various costs that are incurred by the firm on its products or we can say what it costs to make the product. To determine the total cost of a product you need to calculate both the direct and indirect costs. The total cost is the sum of all costs associated with a particular unit or process or department or batch. It comprises of cost of production, selling and distribution expenses. It is also called cost of sales.

Product costs are traceable to the product and include direct material, direct labour and overheads. As already mentioned that for the purpose of formulating various strategies and policy matters, the total cost of the product must be ascertained. This means allocating the direct materials cost, direct labour cost, other direct expenses and allocation / apportionment of burden of manufacturing overheads, Office overheads and Selling and Distribution overheads to the product.

How product costing is accomplished in any manufacturing unit becomes easy if we understand what types of departments do we generally have in any organization.

In a manufacturing concern there are generally two types of departments

- i) Production Departments and
- ii) Service Departments.

A production department is one that is engaged in the actual manufacture of the product by changing the shape, form or nature of material worked upon or by assembling the parts into finished product.. In a dairy plant or dairy factory, the departments which are manufacturing ghee, butter, ice cream, flavoured milk, lassi, milk of different grades like skim milk, double toned milk, toned milk, standardized milk, full cream milk are production departments

A service department, on the other hand, is one, which is rendering a service to production departments. It contributes in an indirect manner to the manufacture of the product but it does not itself change the shape, form or nature of material that is converted into the finished product. To process milk or make butter and other dairy products we require steam, chilled water, refrigeration system, maintenance of machinery and equipments. The departments, which are providing

these services, are known as service departments. Service departments provide services to production departments and some service departments in addition to it also provide services to other service departments.

Assignment of Direct Costs to Departments and Products

The direct costs of accomplishing an activity or producing or distributing a product generally are routinely charged to that activity or product by the company's accounting system. For example, direct labour would be charged to a product if only single product is produced. However if more products are manufactured in a department, the time spent in manufacturing a particular product and its quantity produced is ascertained to work out direct labour cost. The process of estimating direct labour cost becomes easy if time cards for doing the job or activity are kept in the department. If no records of this type are maintained, time studies can be conducted and used to determine the average time that a unit or sub unit takes to process the product. Direct material costs also may be routinely charged to products.

Where a department processes only one product, the average product direct cost can be determined by dividing the total amount of direct cost of the department by the number of units produced (adjusted for work- in- process)

Allocation and Apportionment of Overhead (Primary Distribution)

The major problem arises when we are to decide how overheads ought to be allocated or apportioned among products in a multi-product firm or when joint products are produced what method should be adopted? This necessity arises as we are to consider the indirect costs' share that should go to the product in its manufacturing. In addition there is the problem of joint costs involved in some processes. How to account for such costs are some of the other relevant points.

The theory of cost accounting suggests that the basis of the apportionment of overheads to the cost center should be on equitable basis. The procedure adopted for the distribution of overheads involves the following steps.

- (i) Classification and collection of overhead.
- (ii) Allocation and apportionment of overhead to production departments and service departments
- (iii) Re-apportionment of service department costs to production departments.
- (iv) Absorption of overhead of each production department in cost units.

(i) Classification and Collection of Overhead

overheads need to be collected from various sources like i)Invoice ii)Stores requisitions iii)Wages Analysis Sheet and iv)Journal entries and classifying them where they are occurring.

(ii) Allocation and Apportionment of Overhead (Primary Distribution)

There are certain expenses which can be allocated directly to different departments or cost centers or products since these costs can easily be identified and allocated

to a cost centers. But some expenses cannot be allocated to a particular department. Such expenses require division and apportionment over two or more cost centers or cost units.

Different products pass through a number of departments and receive benefits from them in varying degrees. A Product must bear an equitable portion of expenses relating to it. These expenses might have been incurred in various production and service departments. The process of assigning the expenses to departments is known as departmentalisation.

Principles of Apportionment

Apportionment of overhead to various production and service departments is based on the following principles:

1. Service or use. This is the most common principle of apportionment of overhead costs. It is based on the theory that greater the amount of service or benefit received by a department/product, the larger should be the share of the cost to be borne by that department/ product.
2. Survey method. This method is used for those overhead costs that are not directly related to departments and survey may be conducted to find out the share of overheads to the cost centre.
3. Ability-to-pay method. This is based on canon of taxation, which holds that those who have the largest income should bear the highest proportion of the tax burden.

(iii) Re-apportionment of Service Department Costs to Production Departments

Not all items of the factory overhead are amenable to direct allocation. While some items can wholly be allocated to specific departments of cost centers, there are certain expenses, which need to be apportioned amongst different departments on an equitable basis. Costs of service cost centers (Service departments) are apportioned to productive cost-centers (Production departments) on equitable basis.

The effort related transfer price method assigns service costs to a department or product according to the amount of effort incurred.

Bases of Apportionment

The following bases are most commonly employed for apportioning items of overheads expenses among production/service departments.

Item of overheads	Bases
1. Works manager's remuneration, general overtime expenses, cost of inter-department transfers etc.	Direct labour hours
2. Group insurance, canteen expenses, general welfare expenses, compensation and other fringe benefits, supervision etc.	No. of employees or wages of each department

3. Insurance and depreciation of plants, machinery and equipments	Capital values of respective items
4. Rent, rates and taxes paid for the building, air conditioning, etc	Floor area of respective department
5. Electric power	Horse power of machines or machine hours
6. Electric light	No. of light points
7. Stores overheads	Value or weight of direct material
8. Audit fee etc	Sales or total cost
9. Delivery expenses	Weight, volume, mile
10. Building maintenance	Cubic content

(iv) Absorption of Overheads of Each Production Department in cost Units.

Absorption is the allotment of overhead to cost units, may be a product, or process or an activity. It is the charging of overhead to individual product or units. The amount of overhead allocated and apportioned to the production department is to be borne by all cost units pertaining to that department. This is known as overhead absorption. Terms such as 'recovery', 'application' are also used. For the purpose of absorption of overhead to individual jobs, process or products, overhead absorption rates are applied. The term 'overhead rate' refers to the rate at which the overheads are to be charged to different cost units. It may be in the form of a percentage or a rate per unit.

It may be based on actual cost or on the basis of estimated cost. or a pre-determined overhead rate or a blanket overhead rate for the entire factory. The blanket rate is computed as follows

$$\text{Blanket rate} = \frac{\text{Total overheads for the factory}}{\text{Base for the factory}}$$

Blanket overhead rate should not be used except when output is uniform. Otherwise it will result in over-costing or under-costing of certain cost units.

Multiple Rates also may be applied for each department, cost center etc. For instance, separate rates may be calculated for each of the these Production department, Service department, cost center, product, fixed overhead and variable overhead.

The following formula is used to calculate the multiple rates:

$$\text{Overhead rate} = \frac{\text{Overhead of department or cost center}}{\text{Corresponding base}}$$

A good absorption rate possesses the following characteristics

1. It is convenient to use and involves minimum of paper work
2. It should be according to the nature of the product.
3. It is stable so that comparisons can be made and also be flexible enough to take note of changing conditions
4. It does not bring much difference between recovered overheads and actual overheads

Methods Of Absorption of Manufacturing Overhead

There are various methods of absorbing manufacturing overhead. These methods have their own merits and demerits.

The more common of these are:

1. Percentage of direct materials cost.
2. Percentage of direct labour cost.
3. Percentage of prime cost.
4. Direct labour hour rate.
5. Machine hour rate.
6. Combined machine hour and labour hour rate.

(i) Percentage of Direct Materials Cost:

In this method the cost of direct materials used in the manufacture of a product is used as the base in absorption of factory overheads. The overhead rate is calculated on the basis of the following formula:

$$\text{Overhead rate} = \frac{\text{Factory overheads}}{\text{Direct material cost}} \times 100$$

(ii) Percentage of Direct Labour Cost:

In this method, overheads are charged as a percentage of the direct wages incurred on jobs. The formula for computing the percentage is as under:

$$\text{Overhead rate} = \frac{\text{Factory overheads}}{\text{Direct wages or labour cost}} \times 100$$

For example, when factory overheads are Rs.200000 and Direct Labour Cost is Rs.1000000

$$\text{The percentage overhead rate} = \frac{200000}{1000000} \times 100 = 20\%$$

(iii) Percentage of Prime Cost:

Here direct material cost, direct labour cost and other direct expenses, being all the constituents of prime cost are taken for calculation of the percentage. The formula is:

$$\text{Percentage on prime cost} = \frac{\text{Factory overheads}}{\text{Prime cost}} \times 100$$

For example if factory overheads amount to Rs.200000 and the prime cost is Rs.2000000,

$$\text{Prime cost percentage comes to} = \frac{200000}{2000000} \times 100 = 10\%$$

(iv) Direct Labour Hour Rate

In this method, the overheads are charged to production on the basis of number of labour hours spent on every job. The formula is

$$\text{Direct labour hour rate} = \frac{\text{Factory overheads}}{\text{Direct labour hours used for the period}}$$

Thus if total manufacturing overheads for a period are Rs.400000 and number of direct labour hours is 10000, then the labour hour rate works out to be Rs.4/- (400000/10000=Rs4/-). If a job takes 50 hours, then overheads applied will be 50×4=Rs.200/-

(v) Machine Hour Rate. It is the cost of running a machine per hour

$$\text{Machine hour rate} = \frac{\text{Factory overheads}}{\text{Machine hours during a given period}} \times 100$$

(vi) Combined Machine Hour and Direct Labour Hour Rate

A combination of machine hour rate and direct labour rate (called as dual hour rate) could also be used in those departments where work is done both manually and on the machine.

Joint Costs: In dairy industry or a dairy factory joint products and by products are obtained from the same raw material. In such cases Joint Costs of facilities or services employed in the output of two or more simultaneously produced commodities are involved. These Joint Costs are Common Costs till the point of split off when joint products and by products are obtained. The methods of apportionment of Joint Costs are based on the following bases

(i) Market Value Bases: under this method joint cost allocations are made on the basis of sale prices of the products provided the products can readily be sold in the markets without further processing. However, if further processing is required to bring the product into saleable form, value additions during further processing are to be assessed and deducted from the sale value to arrive at the basis for the apportionment of joint cost among the products.

- (ii) **Physical Unit Bases:** under this method the joint costs are allocated to individual products on some physical basis, viz weight, volume, or some other common unit used to measure output.

Methods of Absorption of Administrative Overheads

In comparison to production overheads, administrative overheads relatively constitute a small portion of the total cost. There is a popular view that these overheads should not be treated as part of the cost of production because these are the period costs and should be debited to the Cost of Sales Account wholly. The other viewpoint is that it should be apportioned between production and sales departments. In such a case administrative overheads get merged with production and selling and distribution overheads. For the purpose of absorption of these overheads a single overhead rate is computed by any of the following methods

1. **Percentage of Works Cost:** Administration overhead is generally absorbed as a percentage of works cost. It is computed as follows

$$\text{Overhead rate} = \frac{\text{Admn. Overhead}}{\text{Works Cost}} \times 100$$

2. **Percentage of Sales:** In this method, Administration overheads are absorbed as a percentage of sales which can be worked out as under

$$\text{Overhead rate} = \frac{\text{Admn Overhead}}{\text{Sales}} \times 100$$

3. **As a percentage of Conversion cost:** This method is not common and is rarely used

$$\text{Overhead rate} = \frac{\text{Admn. Overhead}}{\text{Conversion cost}} \times 100$$

Methods of Absorption of Selling and Distribution Overhead

Selling and Distribution overheads may be allocated directly where they can be identified with specific products. Where they cannot be identified with particular products, they have to be apportioned on some suitable basis, which may be one of the following.

1. **Rate per article:** Under this method, the total costs are estimated and are divided by the quantity of sales. It gives the rate per article.

$$\text{Rate per article} = \frac{\text{Totalsellingand distributbn costs}}{\text{Numberof unitssold}}$$

2. **A Percentage on Sales:** In this method on the basis of the previous year's figures, a percentage of selling and distribution overhead to the total sales is calculated and the same rate is applied to recover the overheads from the selling price.

3. **A Percentage of Works Cost:** A percentage of selling and distribution overheads to works cost is arrived at from past records. This percentage rate is applied for the absorption of selling and distribution overheads

$$\text{Overhead rate} = \frac{\text{Selling and distribution overheads}}{\text{Works Cost}} \times 100$$

An improvement in cost measurement has been made by introduction of Activity-Based Costing (ABC). It is generally used as a tool for planning and control.

ABC is an approach to solve the problems of traditional cost management systems. Traditionally cost accountants had arbitrarily added a broad percentage on to the direct costs to allow for the indirect costs. Direct labour and materials are relatively easy to trace directly to products, but it is more difficult to directly allocate indirect costs to products. However as the percentages of overhead costs has risen, this technique became increasingly inaccurate because the indirect costs were not caused equally by all the products.

As a result these traditional costing systems are often unable to determine accurately the actual costs of production and the costs of related services. Consequently managers were making decisions based on inaccurate data especially where there are multiple products.

Activity-Based Costing (ABC) is a method allocating costs to products and services on more scientific basis. Instead of using broad arbitrary percentages to allocate costs, ABC seeks to identify cause and effect relationships to objectively assign costs. Once costs of the activities have been identified, the cost of each activity is attributed to each product to the extent that the product uses the activity. In this way ABC often identifies areas of high overhead costs per unit and so directs attention to finding ways to reduce the costs or to charge more for costly products.

7.7 CASE STUDY ON PRODUCT COSTING IN A DAIRY FACTORY

A study was conducted in a dairy plant under the co-operative set-up in Erode district of Tamilnadu to estimate the cost of production of different products. The dairy plant is a feeder-balancing dairy. It collects milk from its own milk-shed area in Erode district. In addition to it, milk from other milk-producers co-operative unions and State Federations is diverted to this plant for conversion into milk and other dairy products. During the period April 99 to March 2000, 725 lakh litres of milk was received at the plant. Data on various aspects like milk inflow, raw materials consumed, expenses incurred in generation of utilities, manpower employed, products manufactured and other expenses for the financial year 1999-2000 were taken from the dairy plant. Process costing technique was applied to estimate cost of production of different products. The following criterion was adopted to allocate /apportion costs.

Cost item	Criteria
Raw materials and other direct expenses	Direct allocation to the products
Labour charges	Time spent in product transformation
Heat energy and refrigeration charges	Benefits derived by the product
Stores maintenance	Value of the items issued
Administrative expenses	Manpower employed
Repairs and maintenance	Quantity of milk used
Packaging	Direct allocation
Quality control	Number of samples analyzed
Depreciation	Value of the assets
Sundries	Quantity of milk used

Table 7.1 : Product Mix of the Dairy Plant (1999-2000)

Products	Units	Output	Value (Rs.Lakhs)	% Share in Value
Skim Milk Powder	Tonnes	4775.00	3366.38	42.93
Butter	Tonnes	3065.00	3095.65	39.48
Ghee	Tonnes	1116.00	1283.04	16.37
Standardized milk	Thousand Litres	486.20	58.35	0.74
Dudh Peda	Tonnes	45.70	31.83	0.41
Flavoured Milk	Thousand Litres	55.00	3.51	0.04
Other Products	-	-	2.49	0.03
Total	-	-	7841.61	100.00

Skim milk powder (SMP) was the highest contributor in revenue generation with 42.93 per cent share obtained from 477.5 tonnes of output. Butter and Ghee were other significant products accounting for 39.48 percent and 16.37 per cent of revenue respectively. Standardised milk, Dudh Peda, Flavoured milk and other products individually had less than 1 per cent share in total revenue.

The cost of manufacture of different dairy products is displayed in Table-7.2

Table 7.2 : Cost of Manufacture of Various Dairy Products (1999-2000)

S. No	Products	Cost Components (Rs./Kg/litre)			Total Cost
		Raw Materials Cost	Processing Cost	Packaging Cost	
1	Skim Milk Powder	58.43 (83.25)	10.78 (15.36)	0.98 (1.39)	70.19 (100.00)
2	Butter	82.65 (90.59)	7.67 (8.41)	0.91 (1.00)	91.23 (100.00)

3	Ghee	99.48 (87.92)	8.15 (7.29)	5.42 (4.79)	113.05 (100.00)
4	Standardized Milk	10.02 (91.86)	0.52 (4.75)	0.37 (3.39)	10.91 (100.00)
5	Dudh Peda	30.67 (64.68)	12.60 (26.59)	4.14 (8.73)	47.41 (100.00)

Figures in parentheses indicate percentage to total cost.

It could be easily seen that in all the products manufactured, the major item of cost was on account of raw materials followed by processing and packaging cost in that order. The cost of production of SMP worked out to be Rs.70.19 per Kg. The respective share of raw materials cost, processing cost and packaging cost in the total cost was 83.25 per cent, 15.36 per cent and 1.39 per cent.

The average manufacturing cost of Butter was Rs.91.23 per Kg.. Manufacturing activities added cost to the extent of Rs.8.58 to the raw materials worth Rs.82.65. Packaging cost constituted one per cent of the total cost.

The longer shelf-life and returns associated with Ghee manufacture has attracted many entrepreneurs, especially in Tamil Nadu to initiate dairy business with this product line .The average cost of Ghee was found to be Rs.113.05. The relative share in cost on account of raw materials processing and packaging was 87.92 per cent, 7.29 per cent and 4.79 per cent.

Standardized milk is not a major revenue-earning product of the plant. But to cater to the demand of the consumers, standardized milk is processed in the plant for sale in nearby towns. During the study period the plant processed 4,86,258 litres of standardized milk at an average cost of Rs.10.91 per litre. The cost on raw material, being 91.86 per cent of the total cost, was highest among all the products. The processing and packaging cost were 4.75 per cent and 3.39 per cent respectively.

Dudh Peda, a desiccated indigenous product is popular in the region. It commands high demand throughout the year. The plant manufactured 45700 Kg. of Dudh Peda during the period under consideration. The cost of production turned out to be Rs.47.41. Raw materials cost was Rs.30.67 (64.68%) followed by processing cost, Rs.12.60 (26.59%) and packaging cost of Rs.4.14 (8.73%)

The cost of manufacture of different dairy products has been analyzed from other angle segregating total cost into fixed and variable costs. These costs are produced below

Table 7.3 : Cost of Production of Different Dairy Products (1999-2000)

Product	Unit	Cost (Rs./unit)	Fixed Cost (Rs.)	Average Variable Cost (Rs.)
Skim Milk Powder	Kg	70.19 (100.00)	2.74 (3.90)	67.45 (96.10)
Butter	Kg	91.23 (100.00)	2.34 (2.57)	88.89 (97.43)

Ghee	Kg	113.05 (100.00)	4.76 (4.21)	108.29 (95.79)
Dudh Peda	Kg	47.41 (100.00)	5.12 (10.81)	42.29 (89.19)
Standardized Milk	Litre	10.91 (100.00)	0.10 (0.96)	10.81 (99.04)

Figures in parentheses indicate percentage to the total cost.

The above cost figures are indicative only and applicable to the case dairy plant. These cost figures may vary from plant to plant depending upon factors such as fixed costs on land and building, plant and machinery, equipments etc. Installed capacity and capacity utilized, input costs and productivity of the resources also have a strong bearing on the cost aspects and these factors should be taken into consideration while working out cost of manufacture of dairy products.

(The case study is based on research work conducted by Mr. P.Murali in partial fulfilment for the award of Degree in Master in Science in Dairying (Dairy Economics) to the N.D. R.I. Deemed University, Karnal, Haryana).

Check Your Progress – 2

1. How factory overhead is apportioned and absorbed among cost units?

.....

2. How activity based costing is better than traditional costing?

.....

7.8 LET US SUM UP

In the present day competitive economy, importance of product cost can not be undermined. It is rather a key to success. Managers want product costs for guiding their decisions regarding pricing, inventory valuation and income determination. If we can not measure product cost we can not manage it. Accurate costing avoids or minimizes distortions in product costing that result from arbitrary allocations of various costs.

Product costing is the process of tracking and studying all the various costs that are incurred by the firm on its products

Various techniques are applied for ascertaining costs. These techniques may be used for special purposes of control and policy in any business.

Basically there are two methods of costing, namely Job costing and Process costing. Generally, costs incurred by manufacturers are classified in different ways. Cost classification by objects of expenditure/nature of elements records costs according to the factors upon which expenditure is incurred viz., material cost, wages (labour cost) and expenses. In cost measurement, the allocation of direct materials, direct labour and direct expenses to the product cost pose no problem as expenditure on these can be identified to a particular cost unit. The indirect expenses or overheads need to be allocated and apportioned to the production department and cost units on equitable basis. The procedure adopted for the distribution of overheads involves these steps. i) Classification and collection of overhead. ii) Allocation and apportionment of overhead to production departments and service departments. iii) Re-apportionment of service department costs to production departments. iv) Absorption of overhead of each production department in cost units.

Factory overheads may be absorbed among products on different basis such as percentage of direct materials cost, percentage of direct labour cost, percentage of prime cost, direct labour hour rate, machine hour rate or combined machine hour and labour hour rate. Similarly administrative overheads and selling and Distribution overheads are apportioned to cost units on appropriate basis. Some organizations apply overhead absorption rate that may be based on actual cost or on the basis of estimated cost or a pre-determined overhead rate or a blanket overhead rate for the entire factory. Due to arbitrariness to apportion overheads, the traditional costing systems are often unable to determine accurately the actual costs of production especially where multiple products are involved giving rise to the need of the concept of Activity-Based Costing (ABC)

Activity-Based Costing (ABC) seeks to identify cause and effect relationships to objectively assign costs. Once costs of the activities are identified, the cost of each activity is attributed to each product to the extent that the product uses the activity.

The case study on product costing in a dairy factory shows the product –mix of the plant and how cost is worked out. It also reflects variations across different products segregating total cost into fixed costs and variable costs.

7.9 KEY WORDS

- Cost Objective** : It may be defined as any activity for which a separate measurement of costs is desired.
- Cost Unit** : It is defined as a unit of quantity of product, service or time (or a combination of these) in relation to which costs may be ascertained or expressed.
- Average Cost** : An average cost is the cost of a product unit computed by dividing total cost by the number of units produced.
- Conversion Cost** : Conversion cost is the cost of production excluding direct materials, but including wastage in the direct material. It is total of direct labour, direct expenses and works overheads.

- Variable Cost** : Cost that changes in total in direct proportion to changes in an activity .
- Fixed Cost** : Fixed cost remains unchanged for a given time period despite fluctuations in activity
- Overheads** : Overhead costs are the indirect costs. These cannot generally be directly attributed to any particular cost unit
- Cost Center** : It is defined as a location, person or items of equipment (or group of these) for which costs may be ascertained.
- Productive Cost Center** : A Productive cost center is directly engaged in productive activity and may consist of similar items of equipments.
- Service Cost Center** : Service cost centres are those cost centres, which are not directly engaged in productive activities, but provide services to productive cost centres so that production work may be carried out.
- Cost Accumulation** : It is the collection of cost data in an organized way in an accounting system.
- Departmentalisation** : The process of assigning the expenses to departments is known as departmentalisation.
- Absorption** : It is the allotment of overhead to cost units, may be a product, or process or an activity

7.10 SOME USEFUL BOOKS

M.C. Shukla, T.S. Grewal and M.P. Gupta. (2000) “Cost accounting: Text and Problems”. S. Chand & Co. New Delhi

Charles T. Horngren (1990) “Cost accounting: A managerial emphasis” Prentice Halls of India Pvt. Ltd. New Delhi

7.11 ANSWER TO CHECK YOUR PROGRESS

Your answer should include the following points.

Check Your Progress – 1

1. Unit of a quantity of product, service or time or combination thereof. Nature of product, method of manufacture and trade practices.
2. Average Cost =
$$\frac{\text{Total cost}}{\text{No of units produced}}$$
3. Direct material.

4. Cost center is the location, person or items of equipments. Product cost center and service cost center.
5. Different costing techniques are (1) standard costing system which determine the cost beforehand, (2) Absorb costing is calculating all costs to all operatives processes or product, (3) Marginal costing:- In this only variable cost is calculated while the fixed cost is treated as period cost. (4) Differential costing considers all the revenue and cost differences amongst the alternative courses of action. (5) Uniform costing is the use of same costing principles by several undertakings for comparision.
6.
 - i. By objects of expenditure/ Nature of elements.
 - ii. By programmes (such as job no. 1 and no. 2 etc)
 - iii. By responsibility center (condensing and drying packaging).

Check Your Progress - 2

1. Factory cost is calculated by calculating direct material cost, direct labour cost and overhead cost and adding them together.
2. A B C is better than traditional costing because it take into account all the activities and cost of each activity is attributed to each product to the extent the activity is used for a particular product. On the other hand, traditional method was arbitrary.