VIRTUAL UNIVERSITY OF PAKISTAN

Cost & Management Accounting

MGT402

Course Handouts

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MGT402 - COST & MANAGEMENT ACCOUNTING

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LESSON# 1

COST CLASSIFICATION AND COST BEHAVIOR

INTRODUCTION

Cost Accounting

Cost Accounting is an expanded phase of financial accounting which provides management promptly with the cost of producing and/or selling each product and rendering a particular service.

Management Accounting

Management accounting is application of professional knowledge and skill in the preparation and presentation of financial information in such a way as to assist management in decision making and in the planning and control of operations of the entity

Objectives

Objective of *cost accounting* is computation of cost per unit, whereas the objective of *management accounting* is to provide information to the management for decision making purposes.

Users of Cost Accounting

Users of cost & management accounting are the decision makers and the managers of the entity/organization for which all this exercise is undertaken.

Uses of Cost and Management Accounting

1. It determines total cost of production and cost of sales
2. It determines appropriate selling price
3. It discloses the profitable products, areas and activity/capacity levels
4. It is used to decide whether to manufacture or purchase for outside
5. It helps in planning and controlling the cost of production

Elements of Cost

Any product that is manufactured is the result of consumption of some resources. The management, for its planning and controlling functions, must know the cost of using these resources. The constituent elements of cost are broadly classified into three distinct elements:

1 Direct Material Cost
2 Direct Labor Cost
3 Other Production Cost
   a) Direct Cost
   b) Indirect Cost

COST CLASSIFICATION

Elements of cost (Direct Material, Direct Labor, Other Production costs) can be classified as direct cost or indirect cost.

Direct Cost

A direct cost is a cost that can be traced in full to the product or service for which cost is being determined.

Costs that can be economically identified with a specific saleable product or service (cost unit).

a) ***Direct material costs*** are the costs of materials that are known to have been used in producing and selling a product or rendering a service.

b) ***Direct labor costs*** are the specific costs of the workforce used to produce a product or rendering a service.
c) ***Other direct production costs*** are those expenses that have been incurred in full as a direct consequence of producing a product, or rendering a service.

Indirect Cost/Overhead Cost
An indirect cost or overhead cost is a cost that is incurred in the course of producing product or rendering service, but which cannot be traced in the product or service in full.
Expenditure incurred on labor, material or other services which cannot be economically identified with a specific cost product or service (cost unit).
Examples include:
Wages of supervisor, cleaning material, workshop insurance.

Material Cost	Labor Cost	Other Production Cost	*Total Production Cost*
Direct	Direct	Direct	***Prime Cost***
Indirect	Indirect	Indirect	***Factory Overhead Cost***

1. **Prime Cost**
   Direct Material
   +Direct Labor
   +Other direct production cost
   Prime cost .

2. **Total Production Cost**
   Prime Cost
   +Factory overhead cost
   Total production cost .

3. **Conversion Cost**
   Direct labor cost
   +Factory overhead cost
   Conversion cost .

COST BEHAVIOR

Cost behavior is the way in which total production cost is affected by fluctuations in the activity (production) level.

Activity level
The activity level refers to the amount of work done, or the number of events that have occurred. Depending on circumstances, the level of activity may refer to the volume of production in a period, the number of items sold, the value of items sold, the number of invoices issued, the number of invoices received, the number or units of electricity consumed, the labor turnover etc. etc.
Basic principle
The basic principle of cost behavior is that as the level of activity rises, costs will usually raise. For example; it will cost more to produce 500 units of output than it will cost to produce 100 units; it will usually cost more to travel 10 km than to travel 2 km. Although the principle is based on the common sense, but the cost accountant has to determine, for each cost elements, whether which cost rises by how much by the change in activity level.

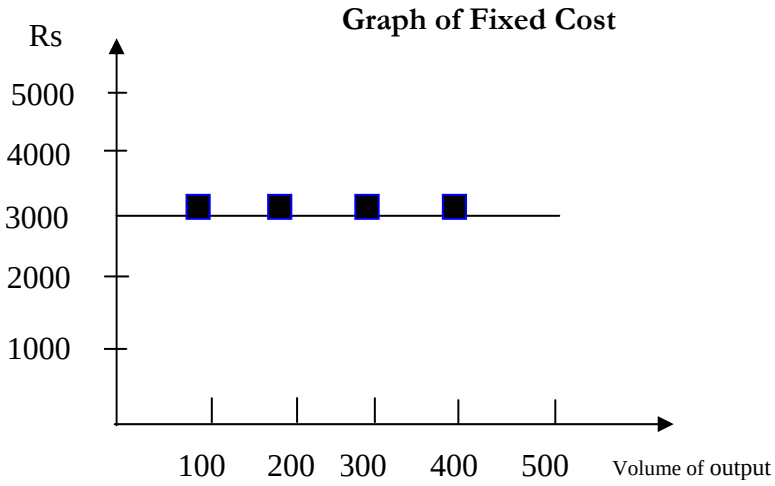
Division of cost by its behavior

Basically the cost of production has two behaviors:

1. Fixed Cost
2. Variable Cost

Fixed Cost

It is a cost which tends to be constant by increases or decreases in the activity level.

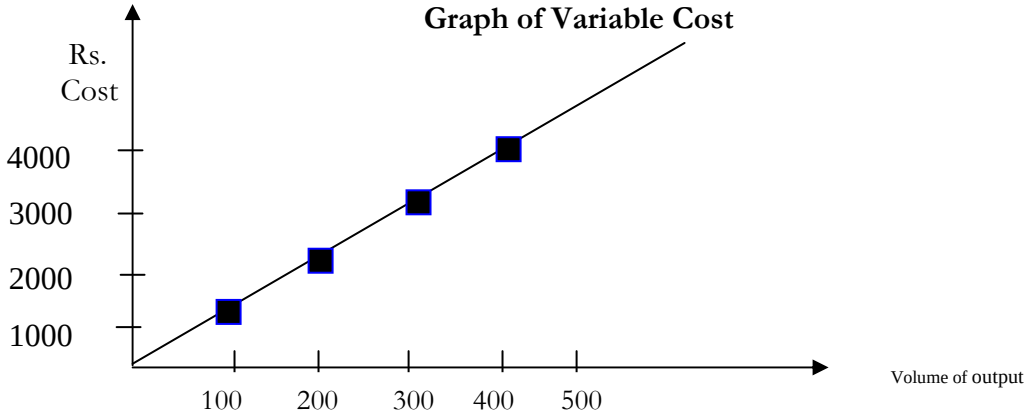


This graph shows that the cost remains fixed regardless of the volume of output.
Examples include:

a. Salary of the production manager (monthly/annual)
b. Insurance premium of factory work shop
c. Depreciation on straight line method

Variable Costs

A variable cost is a cost which tends to very directly with the change in activity level. The variable cost per unit is the same amount for each unit produced whereas total variable cost increases as volume of output increases.



This graph shows a proportionate increase in the cost by the increase in the activity level.
Examples include:

a. Cost of raw-material consumed
b. Direct labor cost
c. Selling commission

Further division of cost behavior

1. Step fixed cost
2. Semi variable cost

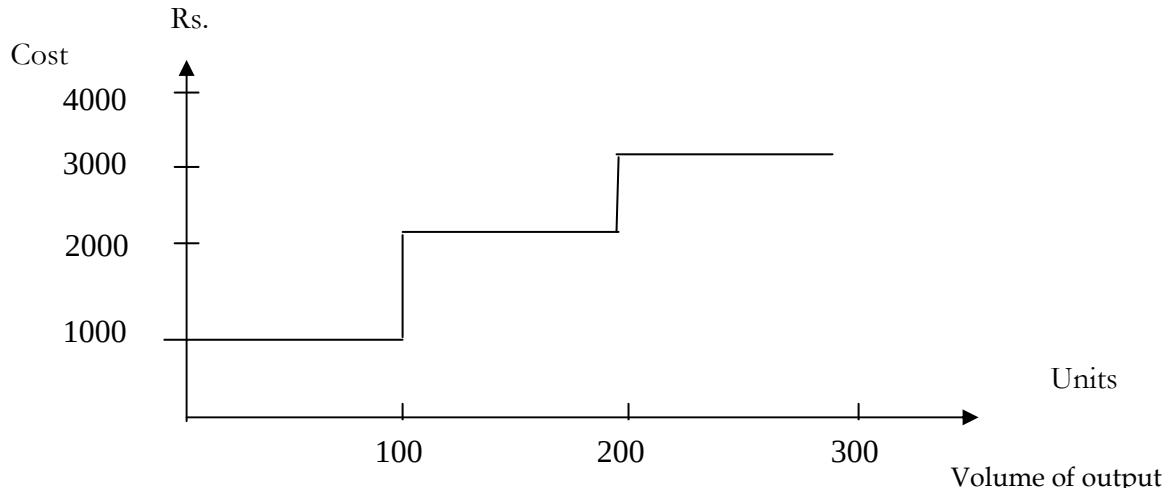
Step fixed cost

A step fixed cost is the cost which is constant for a specific range of activity and rises to a new constant level once the range exceeds. The range over which the fixed cost remains constant is known as the relevant range.

For example; the depreciation of a machine may be fixed if production remains below 100 number of units per month, but if the production exceeds 100 number of units, a second machine may now be required, and the cost of depreciation would go up a step. Other examples include:

a. Rent of workshop (in case of increase in the production one needs to rent one more workshop)
b. Salary of supervisor (increase in output will be supervised by increased number of supervisors)

Graph of Step fixed Cost



This graph shows a stepwise increase in the total cost. Relevant range in this graph is of 100 numbers of units.

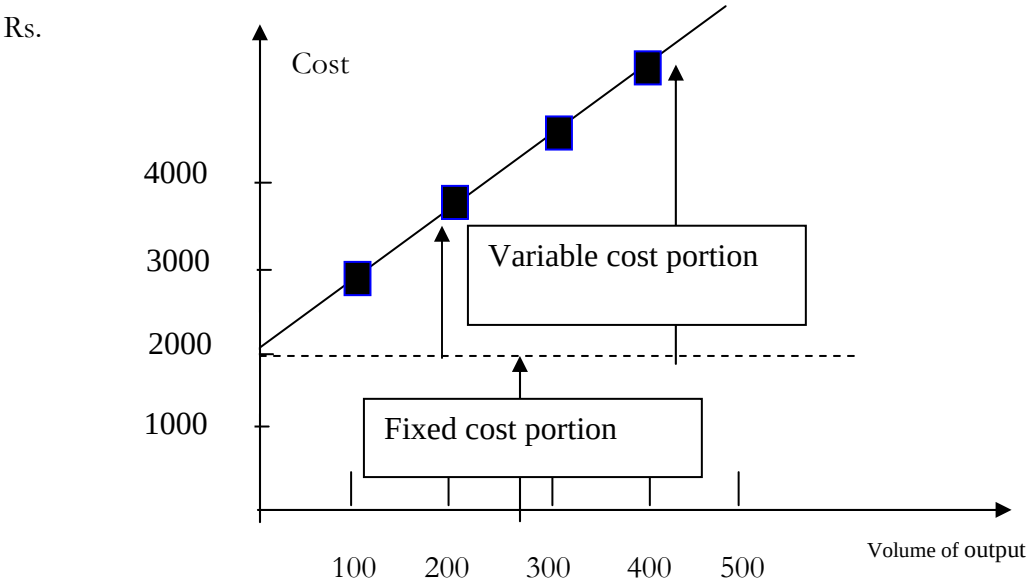
Semi Variable Cost

It is also known as mixed cost. It is the cost which is part fixed and par variable. It is in fact the mixture of both behaviors.

Examples include: Utility bills – there is a fixed line rent plus charges for units consumed.

Salesman's salary – there is a fixed monthly salary plus commission per units sold.

The graph of semi variable cost is as follow:



This graph shows a fixed cost of Rs. 2,000 and there after the cost is variable.

COST BEHAVIOR PER UNIT OF PRODUCTION

Cost Behavior Per unit of production

Cost per unit behaves differently than the total cost of production. Following tables show the difference in behavior.

Increasing Production Volume Situation

Decreasing Production Volume Situation

	Per Unit	Total
Fixed Cost	Increase	Constant
Variable Cost	Constant	Decrease
Total Cost	Increase	Decrease

Increase or decrease in production volume causes no change to the variable cost per unit it remains constant, assuming there is not rebate in case of bulk purchase and the labor receives constant rate despite change in production volume.
Whereas, increase in production volume causes a decrease in fixed cost per unit and in the same way a decrease in production volume causes an increase in fixed cost per unit.
Following example helps understanding this concept.

Total fixed cost = Rs. 4,000
Per unit variable cost = Rs. 3
Cost per unit at different activity levels 1000, 2000, 4000, and 5000 units

	1000 units		2000 units		4000 units		5000 units	
	Rs. Per Unit	Total Rs.	Rs. Per Unit	Total Rs.	Rs. Per Unit	Total Rs.	Rs. Per Unit	Total Rs.
Fixed Cost	4	4,000	2	4,000	1	4,000	0.8	4,000
Variable Cost	3	3,000	3	6,000	3	1,200	3	15,000
Total Cost	7	7.000	5	10.000	4	16.000	3.8	19.000

IMPORTANT TERMINOLOGIES

Cost Unit

It is a unit of a product or service in relation to which the cost is ascertained, i.e. it is the unit of the out put or product of the business. In simple words the unit for which cost of producing the units is identified /allocated.

Example

Ball point for a Ball point manufacturing entity
Bottle for Beverage producing entity
Fan for a Fan manufacturing entity

Cost Center

Cost centre is a location where costs are incurred and may or may not be attributed to cost units.

Examples

Workshop in a manufacturing concern
Auto service department
Electrical service department
Packaging department
Janitorial service department

Revenue Centre

It is part of the entity that earns sales revenue. Its manager is responsible for the revenue earned not for the cost of operations.

Examples

Sales department
Factory outlet

Profit Centre

Profit centre is a section of an organization that is responsible for producing profit.

Examples

A branch
A division

Investment Centre

An investment centre is a segment or a profit centre where the manager has significant degree of control over his/her division's investment policies.

Examples

A branch
A division

Relevant Cost

Relevant cost is which changes with a change in decision. These are future costs that effect the current management decision.

Examples

Variable cost
Fixed cost which changes with in an alternatives
Opportunity cost

Irrelevant Cost

Irrelevant costs are those costs that would not affect the current management decision.

Example

A building purchased in last year, its cost is irrelevant to affect management decisions.

Sunk Cost

Sunk cost is the cost expended in the past that cannot be retrieved on product or service.

Example

The entity purchase stationary in bulk last moth. This expense has been incurred and hence will not be relevant to the management decisions to be taken subsequent to the purchase.

Opportunity Cost

Opportunity cost is the value of a benefit sacrificed in favor of an alternative.

Example

An investor invests in stock exchange he foregoes the opportunity to invest further in his hotel. The profit which the investor will be getting from the hotel is opportunity cost.

Product Cost

Product cost is a cost that is incurred in producing goods and services. This cost becomes part of inventory.

Example

Direct material, direct labor and factory overhead.

Period Cost

The cost is not related to production and is matched against on a time period basis. This cost is considered to be expired during the accounting period and is charged to the profit & loss account.

Example

Selling and administrative expenses

Historical Cost

It is the cost which is incurred at the time of entering into the transaction. This cost is verifiable through invoices/agreements. Historical cost is an actual cost that is borne at the time of purchase.

Example

A building purchased for Rs 400,000, has market value of Rs. 1,000,000. Its historical cost is Rs. 400,000.

Standard Cost

Standard cost is a Predetermine cost of the units.

Example

Standard cost for a unit of product 'A' is set at Rs 30. It is compared with actual cost incurred for control purposes.

Implicit Cost

Implicit cost imposed on a firm includes cost when it foregoes an alternative action but doesn't make a physical payment. Such costs are related to forgone benefits of any single transaction, and occur when a firm:

Example

Uses its own capital or

Uses its owner's time and/or financial resources

Explicit Cost

Explicit cost is the cost that is subject to actual payment or will be paid for in future.

Wage
Rent
Materials

Differential Cost or Incremental cost

It is the difference of the costs of two or more alternatives.

Example

Difference between costs of raw material of two categories or quality.

Costing:

The measurement of cost of a product or service is called costing; however, it is not a recommended terminology.

Cost Accounting:

It is the establishment of budgets, standard cost and actual costs of operations, processes, activities or products and the analysis of variances, profitability or social use of funds. It involves a careful evaluation of the resources used within the business. The techniques employed are designed to provide financial information about the performance of a business and possibly the direction which future operations should take.

Prime Cost:

The total costs which can be directly identified with a job, a product or service is known as Prime cost. Thus prime cost = direct materials + direct labor + other direct expenses.

Conversion Cost.

This is the total cost of converting the raw materials into finished products. The total of direct labor other direct expenses and factory overhead cost is known as conversion cost

Cost Accumulation

Cost accumulations are the various ways in which the entries in a set of cost accounts (costs incurred) may be aggregated to provide different perspectives on the information.

Methods of cost accumulation

Process costing

It is a method of cost accounting applied to production carried out by a series of operational stages or processes.

Job order costing

Generally, it is the allocation of all time, material and expenses to an individual project or job.

Assignment Questions

Answer to each of the following question should not exceed five lines.

1. Define Cost Accounting
2. What are the three broad elements of cost?
3. Give any five examples of factory overhead cost. Also explain.
4. Give any two examples of distribution overheads.
5. Give any two examples of office overheads
6. Define direct cost and give two examples.
7. What is indirect cost? Give three examples.
8. What is meant by step fixed cost and semi-variable cost? Also show graphs.
9. What is fixed cost? Give three items of fixed cost, also show its graph.

Exam Type Questions

1. What is a cost unit? Give two example
2. Define cost centre. How does it differ from cost unit
3. What is the difference between direct and indirect materials? Give two examples of each.
4. Fixed cost per unit remains fixed. Do you agree?
5. How variable cost per unit behaves? Give two examples.
6. What are semi-variable costs? Draw graph for such costs

Multiple Choice Questions

Choose the correct answer in each of the following MCQ.

1. The main purpose of cost accounting is to
    a Maximize profits
    b Help in inventory valuation
    c Provide information to management for decision making
    d Aid in the fixation of selling price;
2. Fixed cost per unit increases when
    a Variable cost per unit increase
    b Variable cost per unit decreases
    c Production volume increases
    d Production volume decreases
3. Variable cost per unit
    a Varies when output varies
    b Remains constant
    c Increases when output increases
    d Decrease when output decreases
4. Which of the followings is the reason of increase in total variable cost:
    a Increase in fixed cost
    b Rise in interest on capital
    c Increase in direct material cost
    d Depreciation of machinery
5. Which of the followings is an example of fixed cost:
    a Direct material cost
    b Works manager's salary
    c Depreciation of machinery
    d Chargeable expenses

6. Cost accounting concepts include all of the following except
    a Planning
    b Controlling
    c Sharing
    d Costing
7. The three elements of product cost are all but
    a Direct material cost
    b Factory overhead cost
    c Indirect labor cost
    d Direct labor cost

Answers:

Q1	Q2	Q3	Q4	Q5	Q6	Q7
c	**d**	**b**	**c**	**c**	**c**	**c**

LESSON#2

IMPORTANT TERMINOLOGIES

Cost Unit

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LESSON# 3

FINANCIAL STATEMENTS

Purpose of preparing financial statements

Financial statements are prepared to demonstrate financial results to the users of financial information. These are the reports, which are prepared by the accounting department and are used by the different people inclusive of the management.

According to IASB framework:

"Financial statements exhibit its users the financial position, financial performance, and cash inflow and outflow analysis of an entity."

Components of Financial Statements

According to IASB framework there are five components of financial statements:

Balance Sheet:	Statement of financial position at a given point in time.
Income Statement:	Incomes minus expenses for a given time period ending at a specified date.
Statement of changes in Equity:	Also known as Statement of Retained Earnings or Equity Statement.
Cash Flows Statement:	Summarizes inflows and outflows of cash and cash equivalents for a given time period ending at a specified date.
Notes (to the accounts):	Includes accounting policies, disclosures and other explanatory information.

It is not possible for all the business entities to prepare all of the components of the financial statements, it depends upon the size, nature and statutory requirements of each of the entities that whether all components are to be prepared or not.

For example a small business entity (like a washer man) does not need to prepare statement of changes in equity or notes to the accounts as the size of information is very little and not complex

Financial statements prepared by the Cost Accountant

Cost accounting department prepares reports that help the accounting department in preparing final accounts, these include;

- Cost of goods manufactured statement
- Cost of goods sold statement

Both of the statements represent production cost function or the function of expenses that are incurred to make the goods or services available for sale. It depends upon the form of the business entity whether what should be disclosed in these statements and what should be the extent of the details to be given into these statements.

Forms of business entities

<u>Manufacturing Entities</u>

Manufacturing entities purchase materials and components and convert them into finished

Costing department of these entities works very much efficiently, a complete cost accounting system is followed in manufacturing concerns in which procedures of cost accumulation, methods of product costing, process of calculating per unit cost and determining the cost of inventories are defined.

Trading Entities

Trading entities purchase and then sell tangible products without changing their basic form.
Costing department of these entities is not involved in that much minute calculations and procedures. It simply has to keep records of the cost of goods purchased and cost of inventory.

Servicing Entities

Servicing entities provide services or intangible products to their customers.
Costing department of these entities is also concerned with calculation of the cost of service provided. Inventory of service is also determined in this type of concerns.

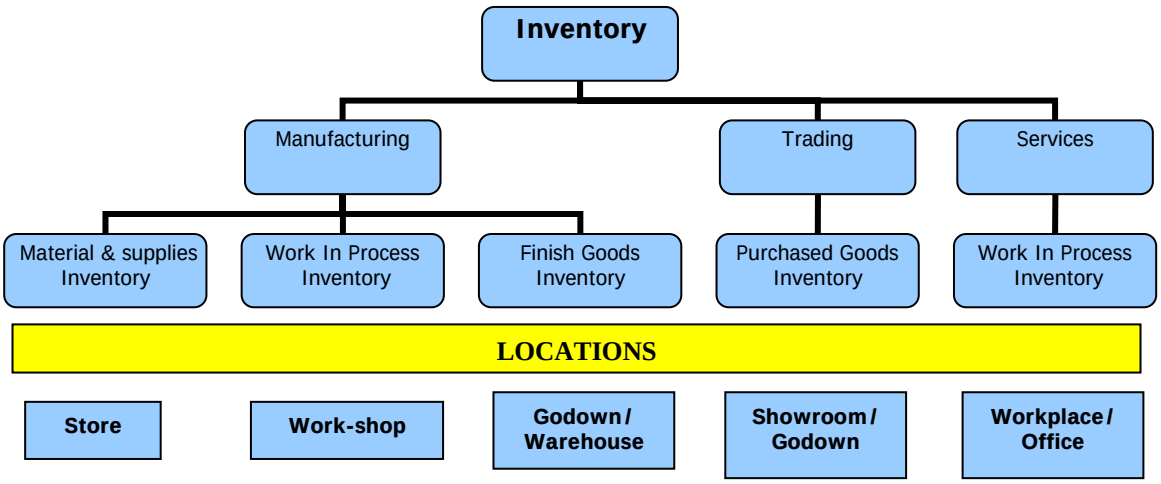
Inventory

It is the cost held in material & supplies, work in process and finished goods that will provide economic benefits in future, it is also known as stock.
Adjustment for inventories is pivotal in calculation of cost of goods sold. The basic reason for its adjustment is that profit and loss account is prepared on the basis of accrual concept. Adjustments of opening and closing inventories in the cost of production (for manufacturing entities), cost of purchases (for trading entities) is essential to match the cost with its revenue.

For manufacturing entities inventories are classified into three categories:

1. Material and supplies inventory
2. Work in process inventory
3. Finished goods inventory

Following is a self explanatory chart for different categories of inventories.



Standard format of the cost of goods sold statement:

Entity Name
Cost of Goods Sold statement
for the year ended_____

	Rupees
Direct Material Consumed	
Opening inventory	10,000
Add Net Purchases	100,000
Material available for use	110,000
Less Closing inventory	20,000
Direct Material used	90,000
Add Direct labor	60,000
Prime cost	150,000
Add Factory overhead Cost	80,000
Total factory cost	230,000
Add Opening Work in process	30,000
Cost of good to be manufactured	260,000
Less Closing Work in process	50,000
Cost of good manufactured	210,000
Add Opening finish goods	100,000
Cost of good to be sold	310,000
Less closing finish goods	10,000
Cost of good to sold	**300,000**

(Important tip for students)
To prepare cost of goods sold statement, firstly one needs to collect six elements. Three of these belong to the cost and three belong to the inventory.

Six Elements of Cost of Goods Manufactured and Sold Statement

Cost	**Inventory**
Material & Supplies	Material & Supplies
Labor	Work in Process
FOH	Finished goods

Following is the stepwise calculation of the information that is produced in the cost of goods sold statement:

Material Consumed	Rupees
Direct material opening inventory	10,000
Add Net purchases	100,000
Material available for use	110,000
Less raw material closing stock	20,000
	90,000

Note: Amount of net purchases comes up with the help of following calculation:

Purchases of direct material
Less trade discounts and rebates
Less purchases returns

Add other receiving and handling cost

Prime Cost		
Direct material Consumed		90,000
Add Direct labor		60,000
		150,000
Total Factory Cost		
Prime cost		150,000
Add Factory Overhead		
Indirect material	30,000	
Indirect labor	20,000	
Electricity bill	15,000	
Rent of factory	10,000	
Depreciation of plant	5,000	80,000
		230,000

Note: Factory overhead cost includes all production costs except direct material, direct labor and other direct costs, it is completely indirect production cost.

PRACTICE QUESTIONS

Q. 1

Following data relates to Zain & Co,

	Rupees
Opening stock of raw material	80,000
Opening stock of work in process	51,000
Purchases of raw material	230,000
Direct labor cost	94,000
Factory overheads	79,000
Closing stock of raw material	66,000
Closing stock of work in process	44,000

Required:

1) Prime cost
2) Total Factory cost

SOLUTION:

1) Prime cost:	**Rupees**
Opening stock of raw material	80,000
Add: Purchases of raw material	230,000
Less: Closing stock of raw material	(66,000)
Cost of raw material consumed	244,000
Add: Direct labor cost	94,000
Prime cost/Direct cost	338,000
2) Total Factory Cost:	
Prime cost	338,000
Add: Factory overheads	76,000
Total Manufacturing cost/Factory cost	407,000

Q. 2

Usama manufacturing company submits the following information on June 30,2005.

Raw material inventory, July 1, 2004	25,000
Purchases	125,000
Power, heat and light	3,500
Indirect material purchased and consumed	5,500
Administrative expenses	24,000
Depreciation of plant	18,000
Purchases returns	7,000
Fuel expenses	29,000
Depreciation of building	8000
Carriage inwards	3,500
Bad debts	2,500
Indirect labor	4000
Other manufacturing expenses	15,000
Raw materials inventory, June 30,2005	26,000

Required:

1)Cost of raw material consumed.

2) Factory overhead cost

SOLUTION:

1) Cost of raw material consumed:

Raw materials inventory, July 1 2004		25,000
Add: purchases of materials	125,000	
Less: purchase returns	(7,000)	118,000
Add: carriage inwards		3,500
Less: materials inventory, June 30,2005		(26,000)
Cost of materials consumed		120,500

3) Factory overhead cost:

Power, heat and light	3,500
Indirect material purchased and consumed	5,500
Depreciation of plant	18,000
Indirect labor	4,000
Fuel expenses	29,000
Other manufacturing expenses	15,000
Total Factory cost	75,000

Q. 3 Following data relates to Qasim & Co,

Opening stock of raw material	52,000
Opening stock of work in process	46,000
Purchases of raw material	255,000
Direct labor cost	85,000
Factory overheads	76,000
Closing stock of raw material	61,000
Closing stock of work in process	36,000

Required: Prepare a statement showing total manufacturing cost.

Qasim & Co.
Cost of goods manufactured statement

Opening stock of raw material	52,000
Add: Purchases of raw material	255,000
Less: Closing stock of raw material	(61,000)
Cost of raw material consumed	246,000
Add: Direct labor cost	85,000
Prime cost/Direct cost	331,000
Add: Factory overheads	76,000
Manufacturing cost/Factory cost	407,000

Q. 4

FNS manufacturing company submits the following information on June 30,2005.

Sales for the year	450,000
Raw material inventory, July 1,2004	15,000
Finished goods inventory, July 1,2004	70,000
Purchases	120,000
Direct labor	65,000
Power, heat and light	2,500
Indirect material purchased and consumed	4,500
Administrative expenses	21,000
Depreciation of plant	14,000
Selling expenses	25,000
Depreciation of building	7,000
Bad debts	1,500
Indirect labor	3,000
Other manufacturing expenses	10,000
Work in process, July 1,2004	14,000
Work in process, June 30,2005	19,000
Raw materials inventory, June 30,2005	21,000
Finished goods inventory, June 30,2005	60,000

Required

2) Calculate cost of raw-material consumed
3) Calculate prime cost
4) Calculate total factory cost

SOLUTION:

FNS manufacturing company
Cost of goods manufactured statement
For the year ended June 30, 2005

Raw materials inventory, July 1 2004		15,000
Add: purchases of materials		120,000
Less: materials inventory, June 30,2005		(21,000)
Cost of materials consumed		114,000
Add: direct labor		65,000
Prime cost/Direct cost		179,000
Factory overheads:		
Power, heat and light	2,500	
Indirect material purchased and consumed	4,500	
Depreciation of plant	14,000	
Depreciation of plant	3,000	
Other manufacturing expenses	10,000	34,000
Total Manufacturing cost/Factory cost		213,000

LESSON# 4

FINANCIAL STATEMENTS (Contd)

Cost of Goods Manufactured	**Rupees**
Total factory Cost	230,000
Add Opening Work in process inventory	30,000
Cost of goods to be manufactured	260,000
Less Closing Work in process	50,000
Cost of goods manufactured	**210,000**

Note: Cost of the work that was in process in the last year (Closing WIP inventory) becomes Opening WIP inventory of the current year.

Cost of Goods Sold	
Cost of goods manufactured	**210,000**
Add Opening finished goods inventory	100,000
Cost of goods to be sold	310,000
Less Closing finished goods	(10,000)
Cost of goods sold	**300,000**

Note: Cost of the goods that were in process in the last year (closing finished goods inventory) becomes opening finished goods inventory of the current year.

Standard format of the cost of goods manufactured and sold statement:

Entity Name
Cost of Goods manufactured statement
for the year ended_____

	Rupees
Direct Material Consumed	
Opening inventory	10,000
Add Net Purchases	100,000
Material available for use	110,000
Less Closing inventory	(20,000)
Direct Material used	90,000
Add Direct labor	60,000
Prime cost	150,000
Add Factory overhead Cost	80,000
Total factory cost	230,000
Add Opening Work in process	30,000
Cost of good to be manufactured	260,000
Less Closing Work in process	50,000
Cost of good manufactured	210,000

Entity Name
Cost of goods sold statement
For the year ended_____

	Rupees
Add Opening finish goods	100,000
Cost of goods manufactured	210,000
Cost of good to be sold	310,000
Less closing finish goods	10,000
Cost of good to sold	**300,000**

Standard format of the Income Statement:

Entity Name
Income Statement
For the year ended_____

		Rupees
Sales		600,000
Less Cost of goods sold		(300,000)
Gross profit		300,000
Less Operating expenses		
Selling and marketing	50,000	
Distribution	30,000	
Administrative	20,000	
		(100,000)
Operating profit		200,000
Less Financial Expenses		
Interest on loan		(50,000)
Profit before tax		150,000
Less Income Tax		(60,000)
Net profit		**90,000**

Applied Factory Overhead Cost

Often at the end of the accounting period total FOH cost is not known in actual because of the specified nature of expenses in the list of indirect cost.

For this reason, the third element of cost "FOH" is included in the total factory cost based on predetermined FOH cost rate; such cost is known as Applied FOH Cost.

Predetermined (FOH cost) rate

Factory overhead rate is determined on the basis of normal activity level. Normal activity level means the capacity level at which the business can operate in normal circumstances. Capacity level can be in terms of:

Direct Labor Cost
Direct Material Cost
Direct Labor Hours
Machine Hours
Prime Cost

Selection of capacity level depends upon the nature of the business, if its inclination is towards machine hours then machine hours will be taken as a base as capacity level. It is also known as overhead absorption rate (OAR).

Calculations pertaining to the overhead application rate will not be discussed here, in this chapter we will use pre-calculated overhead application rate.

Details of the topic will be covered in a LESSON relating to Factory Over Head.

Total Factory Cost based on Applied FOH Cost

Assume applied factory overhead rate is 150% of direct labor cost.

	Rupees
Direct material Consumed	90,000
Add Direct labor	60,000
Prime Cost	150,000
FOH Applied **(150% of Rs. 60,000)**	90,000
Total Factory Cost	**240,000**

The cost of goods sold in which factory overhead cost is included on the basis of predetermined rate is termed as "Cost of Goods Sold at Normal"

Entity Name
Cost of Goods Sold statement
At normal
for the year ended_____

	Rupees
Direct Material Consumed	
Opening inventory	10,000
Add Net Purchases	100,000
Material available for use	110,000
Less Closing inventory	20,000
Direct Material used	90,000
Add Direct labor	60,000
Prime cost	150,000
Add Factory overhead Cost **(60,000 x 150%)**	90,000
Total factory cost	240,000
Add Opening Work in process	30,000
Cost of good to be manufactured	270,000
Less Closing Work in process	50,000
Cost of good manufactured	220,000
Add Opening finish goods	100,000
Cost of good to be sold	320,000
Less closing finish goods	10,000
Cost of good to sold at normal	**310,000**

Variance

Difference between the actual cost and applied cost is calculated by subtracting actual cost from the applied cost. Where the applied cost is greater than the actual cost it is favorable variance, but where the applied cost is lesser than the actual cost it is unfavorable variance.

Under/Over applied FOH cost

Applied FOH Cost	90,000
Less Actual FOH Cost	80,000
Over applied FOH cost	10,000

Adjustment of Under/Over applied FOH cost

Such variance should be eliminated form the financial statements through adjustment.
Under/Over applied FOH cost can be adjusted in following costs/profit figures:

1. Entire Production
   a) work in process inventory
   b) finished goods inventory
   c) cost of goods sold
2. Cost of Goods Sold
3. Net profit

Adjustment in the Entire Production

Work in process Cost	(50,000 - 1,350)	48,650
Finished goods Cost	(10,000 - 270)	9,730
Cost of goods sold	(310,000 - 8,380)	301,620

The concept of addition to and subtraction from the relevant amount is that because there is a favorable variance i.e. the applied factory overhead cost is more than the actual cost therefore, to make correction in the information containing cost items (entire production) there must be subtraction equal to the amount which was over added.
Obviously the difference will be added if there is an unfavorable variance i.e. the applied factory overhead cost is less than the actual cost. This is so because the cost charged is lesser than the actual, and to make the cost items (entire production) equal to their actual figures we need inclusion of further amount.

Entire production includes three items; work in process inventory, finished goods inventory, and cost of goods sold. These three items are the three parts in which total cost of production (either finished or semi finished) has been divided.

Adjustment in the Cost of Goods Sold

Some times it is required to adjust all of the variance in the cost of goods sold, here the same principle of addition or subtraction will be followed which has already been discussed in the above paragraphs. This is so because the cost of goods sold is also a cost item. The amount of cost of goods sold before adjustment is known as cost of goods sold at normal and after adjustment is known cost of goods sold at actual.

Cost of goods sold at normal	310,000
Add over applied FOH	(10,000)
Cost of goods sold at actual	300,000

Adjustment in the Income Statement

Entity Name
Income Statement
Based on applied FOH cost
For the year ended_____

		Rupees
Sales		600,000
Less Cost of goods sold (at normal)		(310,000)
Gross profit		290,000
Less Operating expenses		
Selling and marketing	50,000	
Distribution	30,000	
Administrative	20,000	
		(100,000)
Operating profit		190,000
Less Financial Expenses		
Interest on loan		(50,000)
Profit before tax		140,000
Less Income Tax		(60,000)
Net profit		**80,000**
Add over-applied FOH cost		**10,000**
Net profit		**90,000**

Principle of addition or subtraction of factory overhead variance is reverse in income statement. This is so because here the amount of net profit is adjusted for the variances, which is income in nature.
Over-application of factory overhead cost causes an increase in the cost of goods sold which reduces the gross profit and also the net profit, so to bring the amount of net profit at its actual amount we need to add over-applied factory overhead cost in the net profit. Obviously in case of under application of factory over head cost the variance will be subtracted from the amount of net profit.

PRACTICE QUESTIONS

Q. 1 Following data relates to Qasim &Co,

	Rupees
Opening stock of raw material	52,000
Opening stock of work in process	46,000
Purchases of raw material	255,000
Direct labor cost	85,000
Factory overheads	76,000
Closing stock of raw material	61,000
Closing stock of work in process	36,000

Required: Prepare Cost of Goods Manufactured Statement.

SOLUTION:

Qasim & Co.
Cost of goods manufactured statement

	Rupees
Opening stock of raw material	52,000
Add: Purchases of raw material	255,000
Less: Closing stock of raw material	(61,000)
Cost of raw material consumed	246,000
Add: Direct labor cost	85,000
Prime cost/Direct cost	331,000
Add: Factory overheads	76,000
Manufacturing cost/Factory cost	407,000
Add: Opening stock of work in process	46,000
Less: Closing stock of work in process	(36,000)
Cost of goods manufactured	417,000

Q. 4

Ayesha Products Limited purchased materials of Rs. 440,000 and incurred direct labor of Rs. 320,000 during the year ended June 30, 2006. Factory overheads for the year were Rs.280,000. The inventory balances are as follows:

	July 1, 2005 Rupees	**June 30, 2006 Rupees**
Finished goods	90,000	105,000
Work in process	121,000	110,000
Materials	100,000	105,000

Required:

1) Cost Of Goods Manufactured Statement.
2) Cost Of Goods Sold Statement.

SOLUTION:

1)

Ayesha Products Limited
Cost of goods manufactured statement
For the year ended June 30, 2006

Materials inventory, July 1 2005	100,000
Add: purchases of materials	440,000
Less: materials inventory, June 30, 2006	(105,000)
Cost of materials consumed	435,000
Add: direct labor	320,000
Prime cost/Direct cost	755,000
Add: factory overheads	280,000
Manufacturing cost/Factory cost	1,035,000
Add: Inventory of work in process, July 1, 2005	121,000
Less: Inventory of work in process, June 30, 2006	(110,000)

2)

Ayesha Products Limited
Cost of goods sold statement
For the year ended June 30, 2006

Cost of goods manufactured	1,046,000
Add: inventory of finished goods, July 1, 2005	90,000
Less: inventory of finished goods, June 30, 2006	(105,000)
Cost of goods sold	1,031,000

Q. 5

FNS manufacturing company submits the following information on June 30, 2005.

Sales for the year	450,000	
Raw material inventory, July 1, 2004	15,000	
Finished goods inventory, July 1, 2004	70,000	
Purchases	120,000	
Direct labor	65,000	
Power, heat and light	2,500	
Indirect material purchased and consumed	4,500	
Administrative expenses	21,000	
Depreciation of plant	14,000	
Selling expenses	25,000	
Depreciation of building	7,000	
Bad debts	1,500	
Indirect labor		3,000
Other manufacturing expenses		10,000
Work in process, July 1, 2004		14,000
Work in process, June 30, 2005		19,000
Raw materials inventory, June 30, 2005		21,000
Finished goods inventory, June 30, 2005		60,000

Applied factory head rate is 20% of the prime cost

Required

1) Cost Of Goods Manufactured Statement.
2) Cost Of Goods Sold Statement at normal and at actual
3) Income statement.

SOLUTION:

FNS manufacturing company
Cost of goods manufactured statement
For the year ended June 30, 2005

Raw materials inventory, July 1 2004	15,000
Add: purchases of materials	120,000
Less: materials inventory, June 30, 2005	(21,000)
Cost of materials consumed	114,000
Add: direct labor	65,000
Prime cost/Direct cost	179,000
Factory overhead applied (179,000x20%)	35,800
Manufacturing cost/Factory cost	214,800

Less: Inventory of work in process, June 30, 2006	(19,000)
Cost of goods manufactured	209,800

2)

FNS manufacturing company
Cost of goods sold statement
For the year ended June 30, 2006

Cost of goods manufactured	209,800
Add: inventory of finished goods, July 1, 2004	70,000
Less: inventory of finished goods, June 30, 2005	(60,000)
Cost of goods sold at normal	219,800
Less: over-applied factory overhead (working)	1,800
Cost of goods sold at actual	218,000

3)

FNS manufacturing company
Income statement
For the year ended June 30, 2006

Sales		450,000
Less: cost of goods sold		(218,000)
Gross profit		232,000
Less: operating expenses		
Bad debts	1,500	
Depreciation of building	7,000	
Selling expenses	25,000	
Administrative expenses	21,000	(54,500)
Net profit		177,500

Working

Applied factory overhead cost	35,800	
Actual factory overheads		
Power, heat and light	2,500	
Indirect material purchased and consumed	4,500	
Depreciation of plant	14,000	
Indirect Labor	3,000	
Other manufacturing expenses	10,000	34,000
Over-applied factory overhead		1,800

LESSON# 5

PROBLEMS IN PREPARATION OF FINANCIAL STATEMENTS

Income Statement Ratios

Cost accountants are also required to analyze the results gathered from the financial statements. These ratio analyses help the management to take certain decisions. These ratios do not include complex ratios like financial ratios or investment ratio. Cost accountants are concerned about the ratios relating to the profits and manufacturing cost. These might include:

1. Gross margin rate
2. Gross markup rate
3. Net profit ratio
4. Cost of goods sold to sales ratio
5. Inventory turnover ratio
6. Inventory holding period

These ratios will be calculated based on the information in the following cost of goods sold statement and income statement.

Entity Name
Cost of Goods manufactured statement
for the year ended_____

	Rupees
Direct Material Consumed	
Opening inventory	10,000
Add Net Purchases	100,000
Material available for use	110,000
Less Closing inventory	(20,000)
Direct Material used	90,000
Add Direct labor	60,000
Prime cost	150,000
Add Factory overhead Cost **(60,000 x 150%)**	90,000
Total factory cost	240,000
Add Opening Work in process	30,000
Cost of good to be manufactured	270,000
Less Closing Work in process	50,000
Cost of good manufactured	220,000
Add Opening finish goods	100,000
Cost of good to be sold	320,000
Less closing finish goods	10,000
Cost of good to sold at normal	**310,000**

Income Statement

		Rupees
Sales		600,000
Less Cost of goods sold (at normal)		(310,000)
Gross profit		290,000
Less Operating expenses		
Selling and marketing	50,000	
Distribution	30,000	
Administrative	20,000	

Operating profit	190,000
Less Financial Expenses	
Interest on loan	(50,000)
Profit before tax	140,000
Less Income Tax	(60,000)
Net profit	**80,000**
Add over-applied FOH cost	**10,000**
Net profit	**90,000**

Gross Profit Margin Rate

Gross Profit margin rate = Gross Profit x 100 = %
Sales

This ratio identifies the ratio of gross profit over sales. In this ratio sale is held equal to 100%. The %age of cost of goods sold is 100 – the %age margin. It means that if margin is 25% then %age cost of goods sold will be 75%

Example: 290,000 x 100 = 48.33%
600,000

Gross Profit Markup Rate

Gross Profit markup rate = Gross Profit x 100 = %
Cost of goods sold

This ratio identifies the ratio of gross profit over cost of goods sold. In this ratio cost of goods sold is held equal to 100%. The %age of sales is 100 + the %age of markup. It means that if markup is 25% then %age of sales will be 125%

Example: 290,000 x 100 = 93.5%
310,000

These ratios are also known as cost structure ratios. The cost structure can best be explained as below:

	Incase of Margin	**Incase of Markup**
Sales	100%	125%
Cost of goods sold	75%	100%
Gross profit	25%	25%

As shown above in both of the cases gross profit is 25% but the base is different. Where the sale is 100% the cost of goods sold is 75%, where the cost of goods sold is 100% the sales is 125%.
At this stage some times sales figure is missing and it is required to calculate gross profit using the margin rate (based on sales). The given information in this case is cost of goods sold. Most of the students make a common error, they straight away calculate gross profit %age on the figure of cost of goods sold, this is wrong in this situation as the base is the figure of sales which is not given. Here the following formula will be used to calculate gross profit:

Required information = given information x ***%age of required information***
%age of given information

In the above situation where cost of goods sold is given and gross profit is to be calculated using

Gross profit = Cost of goods sold (absolute amount) x 25%
75%

Same concept is followed where cost of goods sold figure is missing and it is required to calculate gross profit using the markup rate (based on cost of goods sold). The given information in this case is that of sales. Most of the students make a common error, they straight away calculate gross profit %age on sales, this is wrong, as the base should be cost of goods sold where markup rate is to be used. Here again the above formula will be used to calculate gross profit:

Required information = given information x %age of required information / %age of given information

In the above situation where sales is given and gross profit is to be calculated using the markup rate (based on cost of goods sold), following calculations will be followed:

Gross profit = Sales (absolute amount) x 25%
125%

Net Profit Ratio

Net Profit ratio = Net Profit x 100 = %
Sales

This ratio identifies the ratio of net profit over sales.

Example: 290,000 x 100 = 15%
600,000

Inventory turnover ratio

Inventory turnover ratio = Cost of goods sold
Average inventory

Average inventory = Opening Inventory + Closing Inventory
2

Inventory turnover ratio = 310,000 = 5.54 times
55,000

Average inventory = 100,000 + 10,000 = 55,000
2

This ratio is expressed in times. It shows that, for how many time the inventory is turning over towards cost of goods sold.

Inventory holding period

Inventory holding period in days = Number of days in a year
Inventory turnover ratio

Alternatively = Average inventory x 365
Cost of goods sold

If this ratio is to be calculated in number of months then number of days will be replaced by number of months in year.

Inventory holding period in months = $\frac{12}{5.54}$ = 2.17 months

This ratio tells the period for which the inventory will remain in store/godown.

PRACTICE QUESTIONS

Q. 1
Sales = 800,000
Markup = 25% of cost
Calculate = COGS and Gross profit margin.

Hint:

	Incase of Margin	**Incase of Markup**
Sales	100%	125%
Cost of goods sold	75%	100%
Gross profit	25%	25%

Gross profit = Sales (absolute amount) x $\frac{25\%}{125\%}$

Q. 2
COGS = 50,000
GP Margin = 25% of sales
Calculate = Sales and gross profit margin

Hint:

	Incase of Margin	**Incase of Markup**
Sales	100%	125%
Cost of goods sold	75%	100%
Gross profit	25%	25%

Gross profit = Cost of goods sold (absolute amount) x $\frac{25\%}{75\%}$

Q. 3
Gross profit = 40,000
GP Margin = 25% of sales
Calculate = Sales and cost of goods sold

Hint:

	Incase of Margin	**Incase of Markup**
Sales	100%	125%
Cost of goods sold	75%	100%
Gross profit	25%	25%

Sales = Gross profit (absolute amount) x $\frac{100\%}{25\%}$

Cost of goods sold = Gross profit (absolute amount) x $\frac{75\%}{25\%}$

Q. 4 Gross profit = 60,000
GP Markup = 25% of cost
Calculate = Sales and cost of goods sold

Hint:

	Incase of Margin	**Incase of Markup**
Sales	100%	125%
Cost of goods sold	75%	100%
Gross profit	25%	25%

Sales = Gross profit (absolute amount) x $\frac{125\%}{25\%}$

Cost of goods sold = Gross profit (absolute amount) x $\frac{100\%}{25\%}$

Q. 5	Rupees
Sales	300,000
Direct Material purchased	100,000
Direct Labor	80,000
FOH	70,000
Increase in material inventory	10,000
Decrease in WIP inventory	5,000
Increase in finish goods inventory	30,000

Prepare cost goods sold statement and calculate the following ratios

1. Gross profit markup ratio
2. Gross profit margin ratio
3. Net profit ratio
4. Finished goods inventory turnover ratio
5. Finished goods inventory holding period in months
   (Opening inventory Rs. 60,000 and Closing inventory Rs. 90,000)

Hint: Increase in inventory means closing inventory is greater than the opening inventory.
Decrease in inventory means closing inventory is lesser than the opening inventory.
Where the inventory is increased by a figure say Rs. 100, assume that the opening inventory was zero and closing inventory is Rs. 100.
Where the inventory is decreased by a figure say Rs. 100, assume that the closing inventory is zero and opening inventory was Rs. 100.

Q. 6

Total factory cost	?
WIP opening	20,000
WIP closing	10,000
Finish goods opening	30,000
Finis goods closing	50,000
Cost of goods sold	190,000

Hint:
Total factory cost will be calculated through a reverse calculation. Here cost of goods sold is given this will be adjusted in reverse order for changes in finished goods inventory to get the figure of cost of goods manufactured. The cost of goods manufactured will be adjusted in reverse order for changes in work in process inventory to get the figure of total factory cost.

Q. 7

Opening material inventory	Rs. 10,000
Closing material inventory	5,000
Direct Labor	30,000
FOH	20,000
Total factory cost	80,000

Calculate the value of material purchased during the year.

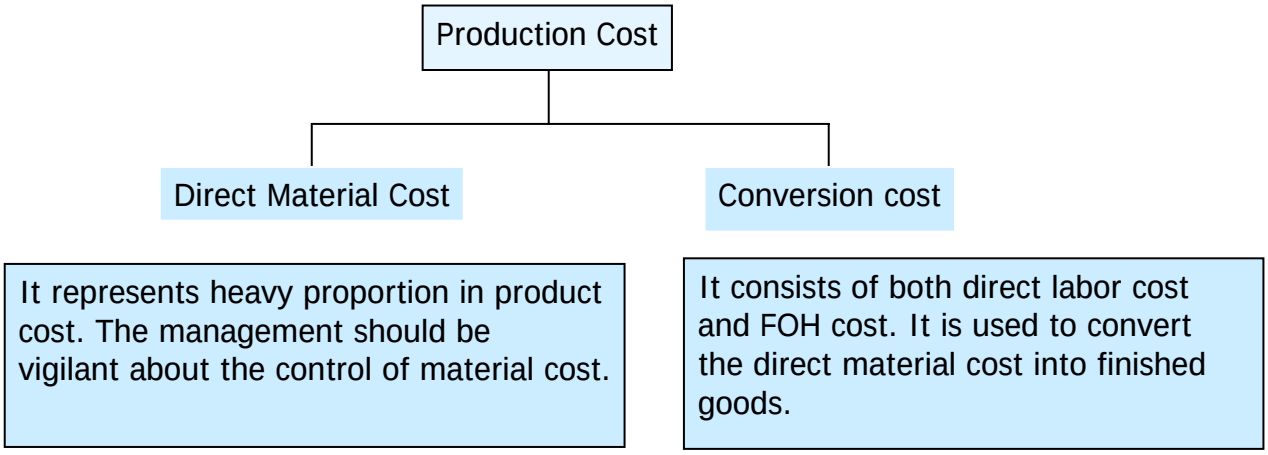
Hint:
Cost of material consumed will be calculated through a reverse calculation starting from total factory cost in which factory overhead cost and direct labor cost will be added, thereafter the cost of material consumed will be adjusted in reverse order with the changes in material inventory to know the amount of material purchased during the year.

LESSON# 6

PREPARATION OF FINANCIAL STATEMENTS (Contd.)

Conversion Cost

Most of the times during solving the problems direct labor cot and factory overhead costs are not given, instead an amount named as conversion cost appears in the question. Conversion cost is combination of these two costs i.e. Conversion Cost = Direct labor + Factory overhead cost.
These are the two costs which converts the raw material into the finished goods therefore these are named as conversion cost.



Valuation of Closing Finish Goods inventory

Another problem that students often face while solving questions of cost of goods sold is non availability of cost of finished goods inventory.
Cost of finished goods inventory is calculated by multiplying units of finished goods inventory with the cost per unit. So to calculate cost of closing finished goods inventory following formula is used:

Closing finished goods units x cost per unit

Some times cost per unit is not given in the question, the question becomes more complex. In this situation some information will be given that can be used to find out the cost per unit.
Cost per unit is calculated through the following formula:

$$\frac{\text{Cost of goods manufactured}}{\text{Number of units manufactured}} = \text{cost per unit}$$

This is also known as per unit manufacturing cost. There are two components to this formula which need to be determined before its application.

1. Cost of goods manufactured
2. Number of units manufactured

Cost of goods manufactured is calculated in the way as we have already discussed. Where as number of units manufactured will be obtained through the following working:

	Units sold	****
Add	Units closing finished goods inventory	****
Less	Units opening finished goods inventory	****
	Units manufactured	****

This can also be understood through the following algebraic manner:

Opening finished goods units + ***Units produced*** – *Closing finished goods units* = ***Units sold***
Units produced = *Units sold* + *Closing finished goods units* - *Opening finished goods units*

PRACTICE QUESTIONS

Q. 1
The information relating to cost department of BETA Corporation is as follows

Inventory	Jan 1	Dec 31
Material	34,000	49,000
Work in process	82,000	42,000
Finish goods	48,000	?

Finish goods inventory	Jan 1	300 units
	Dec 31	420 units

Sold during the year 3,380 units at Rs. 220 per unit.

	Rupees
Material Purchased	360,000
Conversion cost	214,400
Freight In	8,600
Purchase discount	8,000
Opening material inventory	34,000
Closing material inventory	49,000

Prepare Cost of Goods Sold Statement from the above information

Solution

			Rupees
Direct material opening inventory			34,000
Add Net purchases			
Material Purchased	360,000		
Add Freight Inward	8,600		
Less Purchase discount	8,000		
			360,600
Material available for use			394,600
Less raw material closing stock		49,000	
Direct Material consumed		**345,600**	
Add Conversion cost		214,400	
Total factory cost		**560,000**	
Add Opening Work in process inventory		82,000	
Cost of goods to be manufactured		642,000	
Less Closing Work in process		42,000	
Cost of goods manufactured		**600,000**	

Cost of Goods Sold

Cost of goods manufactured		600,000
Add Opening finished goods inventory		48,000
Cost of goods to be sold		648,000
Less Closing finish goods	*(working)*	63,000
Cost of goods sold		**585,000**

	Units sold	3,880
Add	Units closing finished goods inventory	300
Less	Units opening finished goods inventory	420
	Units manufactured	**4,000**

This can also be understood through the following algebraic manner:

Opening finished goods units + ***Units produced*** – *Closing finished goods units* = *Units sold*

300 + X – 420 = 3880

Units produced = *Units sold* + *Closing finished goods units* - *Opening finished goods units*

X = 3,880 + 420 – 300 = **4,000**

Cost per unit = Cost of goods manufactured / Number of units manufactured

= 600,000 / 4,000

= **150**

Value of Closing Finish Goods Inventory

Closing finish goods = Closing finish goods units *X* Cost Per unit

= 420 x 150

= **63,000**

ASSIGNMENT QUESTIONS

Q. 1

Following is the information pertaining to the production cost of Revolving Chair Company for the year ending on March 31 2006;

Direct material consumed		440,000
Direct labor		290,000
Indirect labor		46,000
Light and power		4,260
Depreciation		4,700
Repairs to machinery		5,800
Other factory expenses		29,000
Work in process inventory; April 1, 2005		41,200
Finished goods inventory; April 1, 2005		34,300
Work in process inventory; March 31, 2006		42,500
Finished goods inventory; March 31, 2006	31,500	

During the year 18,000 units were completed.

Factory overhead cost is applied @ 30% of the direct labor cost.

Required:

1. Cost of goods manufactured statement
2. Cost of goods sold statement identifying at normal and at actual
3. Cost per unit

Q. 2

Records of Younas Fans show the following information for the first quarter of the year 2006:

Direct material purchased	1,946,700
Direct labor	2,125,800
Factory overhead (40% variable and 60% fixed)	764,000
Marketing expenses (80% fixed)	516,000
Administrative expense (100% fixed)	461,000
Sales (12,400 Fans)	6,634,000
Inventory opening	
Finished goods (100 fans)	43,000
Direct material	268,000
Inventory closing	
Finished goods (200 fans)	not known
Direct material	167,000

There was no opening and closing work in process inventory.

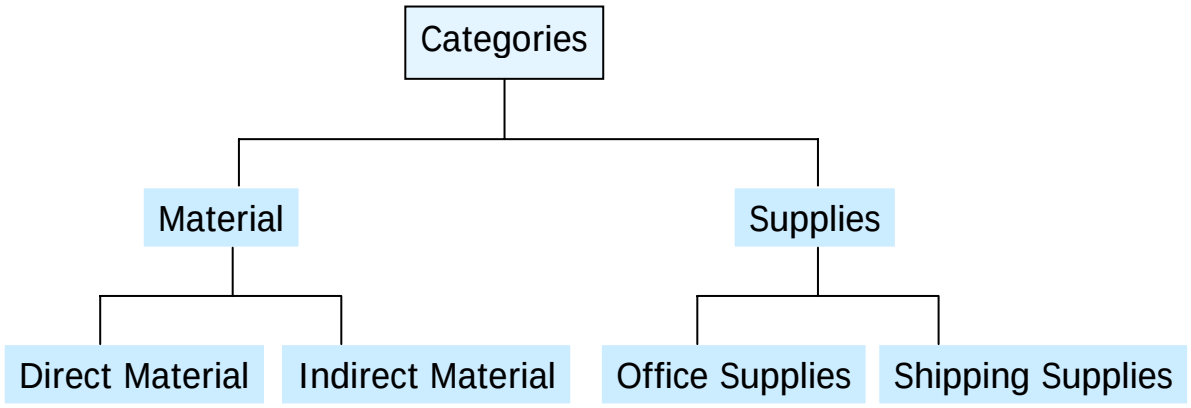
Required:

1. Number of units manufactured during the quarter
2. Cost of goods manufactured statement for the quarter
3. Value of closing finished goods inventory
4. Income statement for the quarter
5. Gross profit per unit
6. Net profit per unit
7. Gross profit to sales ratio
8. Cost of goods sold to sales ratio
9. Fixed production cost per unit
10. Variable production cost per unit
11. Fixed expenses per unit sold
12. Variable expenses per unit sold

LESSON# 7

MATERIAL

Material means the inventory that is used as input for production of finished output or rendering of services or for office use and packaging.



Categories of Material & Supplies

1. Direct Material
2. Indirect Material
3. Office Supplies
4. Shipping Supplies

Direct Material costs are those cost of material that are traceable in full in the cost of a product or services. For example: cost of wood in production of table.

Indirect Material/Factory Supplies is the cost that is incurred in producing product but which can not traced in full in the cost unit. For example: polishing material in production of furniture.

Office Supplies: This is the cost of those items/goods which are used in the offices for administration purposes. For example: stationery items.

***Shipping Supplies*:** This is the cost of the material which is used in packaging of the finished product.

Accrual Concept/Matching Concept

All of the cost of material and supplies purchased is not charged to the production. Only that much cost is charged which matches the revenue earned in the period. This concept of accounting is known as accrual concept.

Following the accrual concept will leave a stock of unused/unconsumed supplies and unsold finished in the stores or warehouses.

Inventory

Inventory is an asset that is held:

- as material and supplies; or
- in the production process as semi finished goods; or
- as finished goods.

Inventory Maintenance Systems

1. **Periodic Inventory System:**
2. **Perpetual Inventory System:`**

Perpetual Inventory System

Under this system, a complete and continuous record of movement of each inventory item is maintained. Perpetual records are useful in preparing monthly quarterly or other financial statement. Record used is normally a "store ledger card" specifying quantity wise receipt, issue and balance together with values in chronological sequence.

Advantages:

1) It protects materials from theft or loss.
2) It helps in reducing wastages and spoilages.
3) Inventory levels can be fixed and observed.
4) It serves as a moral check.
5) It helps in highlighting slow moving and obsolete inventory.
6) It helps in frequent physical counting.

Disadvantages:

1) It is very complex.
2) It is costly.
3) Complex calculations are required.
4) Sufficient technical knowledge is required.

Periodic inventory System or Physical system

Under this system, the value of inventory is determined at the end of the year through a physical count of inventory in store/warehouse. It does not maintain a continuous record of movement of each inventory item.

Advantages

1) It is very simple.
2) It is very cheap.
3) No calculations required.
4) No technical knowledge required.

Disadvantages

1) It does not protect materials from theft or loss.
2) No help in reducing wastages and spoilages.
3) Inventory levels cannot be fixed and observed.
4) It does not help in highlighting slow moving and obsolete inventory.
5) No help in frequent physical counting.

Inventory costing methods

1. **First In First Out (FIFO)**
2. **Last In First Out (LIFO)**
3. **Weighted Average (W.Avg)**

First in First out (FIFO):

This method assumes that the goods firstly received in the stores or produced firstly are the first ones to be delivered to the requisitioning department.

For example a bakery produces 200 loaves of bread on 1st of January at a cost of Re.1 each, and 200 more on 2nd. at Rs. 1.25 each. FIFO states that if the bakery sold 100 loaves on 3rd., the cost of consumption is Re.1 per loaf (recorded on the income statement) because that was the cost of each of the first loaves in inventory. The 100 at Re. 1 and 200at Rs.1.25 loaves would be allocated to ending inventory (appears on the balance sheet).

Features

- FIFO gives us a better indication of the value of ending inventory (on the balance sheet)
- It also increases net income because inventory that might be several years old is used to value the cost of goods sold.
- Increasing net income sounds good, but do remember that it also has the potential to increase the amount of taxes that a company must pay.

Advantages:

1) It is the method that most people feel logically as correct since it assumes that the stock issues are made in the order in which they are received.
2) Issue prices are based on the prices actually paid for the stock.
3) It is an acceptable method for the purposes of financial reporting.

Disadvantages:

1) FIFO complicates stock records as issues have to be analyzed by delivery.
2) Issues from stock are not recorded at the most recent prices paid. This could influence costing of work done and may ultimately affect the revenue.

Last In First Out (LIFO):

This method assumes that the goods received most recently in the stores or produced recently are the first ones to be delivered to the requisitioning department.
The older inventory, therefore, is left over at the end of the accounting period.

For the 200 loaves sold on 3rd. January, the same bakery would assign Rs. 1.25 per loaf to cost of consumption while the remaining 200 at Re.1 and 100 at Rs.1.25 loaves would be used to calculate the value of inventory at the end of the period.

Features

- LIFO is not a good indicator of ending inventory value because the left over inventory might be extremely old and, perhaps, obsolete.
- LIFO results in a valuation that is much lower than today's prices. LIFO results in lower net income because cost of goods sold is higher.

Weighted Average Method* (W.Avg)*:

This method recalculates the average cost of inventory held each time a new delivery is received. Issues are then recorded at this weighted average price.
It takes the weighted average of all units available for sale during the accounting period. The formula to calculate the weighted average rate is:

$$\frac{\text{Total Cost}}{\text{Total Units}} = \text{weighted average rate per unit}$$

Weighted Average cost is used to determine the value of cost of consumption and ending inventory.
In our bakery example, the weighted average cost for inventory would be Rs. 1.125 per unit, calculated as $\frac{[(200 \times \text{Rs. } 1) + (200 \times \text{Rs. } 1.25)]}{400}$

Features

- Weighted Average cost produces results that fall somewhere between FIFO and LIFO.

PRACTICE QUESTION

Q. 1

Periodic System

Date	Units		Total
1 Jan	100	@ 10	Rs. 1,000
5 Jan	100	@ 11	1,100
10 Jan	150	@ 12	1,600

During the period 300 unit were sold

Required: Calculate cost of inventory under each of the costing methods.

Solution

Cost of inventory:

As per FIFO	50 @ 12	= 600
As per LIFO	50 @ 10	= 500
As per W.Avg	50 @ 10.5714	= 529

Q. 2

Perpetual System

100 units of material "M" costing Rs. 8.00 per unit were in stores on January 1, 2006. Following are the receipts and issues during January.

Jan.	1	Received	100 units @ 8.50
Jan.	5	Issued	100 units
Jan.	8	Received	200 units @ Rs. 8.85
Jan.	15	Received	100 units @ Rs. 9.25
Jan	25.	Issued	220 units
Jan.	31	Issued	80 units

Required: Prepare Materials Ledger card based on the above information using each of the following methods:

- FIFO Method
- LIFO Method
- Weighted Average cost Method

Solution

Materials Ledger Card
FIFO
Material –M

Date	Received			Issued			Balance		
	Units	Units Cost	Amount	Unit	Unit Cost	Amount	Units	Unit Cost	Amount
19xx		Rs.	Rs.		Rs.	Rs.		Rs.	Rs.
Jan 1							100	8.00	800
Jan 1	100	8.50	850				100	8.00	800
							100	8.50	850
Jan 5				100	8.00	800	100	8.50	850
Jan.8	200	8.85	1,770				100	8.50	850
							200	8.85	1,770
Jan15	100	9.25	925				100	8.50	850
							200	8.85	1,770
							100	9.25	925
Jan25				100	8.50	850	80	8.85	708
				120	8.85	1062	100	9.25	925
Jan31				80	8.85	708	100	9.25	925

Materials Ledger Card
FIFO
Material –M

Date	Received			Issued			Balance		
	Units	**Units Cost**	**Amount**	**Unit**	**Unit Cost**	**Amount**	**Units**	**Unit Cost**	**Amount**
19xx		**Rs.**	**Rs.**		**Rs.**	**Rs.**		**Rs.**	**Rs.**
Jan 1							100	8.00	800
Jan 1	100	8.50	850				100	8.00	800
							100	8.50	850
Jan 5				100	8.50	850	100	8.00	800
Jan.8	200	8.85	1,770				100	8.00	800
							200	8.85	1,770
Jan15	100	9.25	925				100	8.00	800
							200	8.85	1,770
							100	9.25	925
Jan25				100	9.25	925	100	8.00	800
				120	8.85	1062	80	8.85	708
Jan31				80	8.85	708	100	8.00	800

Materials Ledger Card
Weighted Average
Material –M

Date	Received			Issued			Balance		
	Units	Units Cost	Amount	Unit	Unit Cost	Amount	Units	Unit Cost	Amount
19xx		Rs.	Rs.		Rs.	Rs.		Rs.	Rs.
Jan 1							100	8.00	800
Jan 1	100	8.50	850				200	8.00	1,650
Jan 5				100	8.25	825	100	8.25	825
Jan.8	200	8.85	1,770				300	8.65	2595
Jan15	100	9.25	925				400	8.80	3520
Jan25				220	8.80	1,936	180	8.80	1584
Jan31				80	8.80	704	100	8.80	880

A comparison, based on above illustration, of cost of materials issued and cost of ending inventory obtained under the three methods is presented below:

	FIFO	Average Cost	LIFO
Cost of materials issued	Rs. 3,420	Rs. 3,465	Rs. 3,545
Ending inventory	925	880	800

It is clear that FIFO gives the lowest cost of materials issued and the highest cost of ending inventory, consequently the highest gross profit. On the other hand LIFO gives the highest cost of issues and lowest cost ending inventory, consequently the lowest gross profit. Whereas, the cost and as a result the gross profit, calculated under average cost method are in between FIFO and LIFO. The illustration demonstrates a period of rising prices. In a period of falling prices, naturally, the results would have been reverse.

ASSIGNMENT QUESTIONS

Q. 1
Jamshed & company is a manufacturing concern. Following is the receipts & issues record for the month of January, 2006

Date	Receipts	Issues
Jan 1	Opening Balance 50 @ 40	
Jan 8	200 units @ Rs. 50/unit	
Jan 11		60 units
Jan 13	150 units @ Rs. 60/unit	
Jan 18	100 units @ Rs. 75/unit	
Jan 20		150 units

Prepare Inventory sheets under:
- FIFO Method
- LIFO Method
- Weighted Average cost Method

Q. 2

Assuming nil opening stocks prepare store ledger cards and calculate the value of the closing stock from the data provided below using each of the following methods:

- FIFO
- LIFO
- W.Avg

Receipts

Date	Units	Rate
October 1	100	12.50
October 8	85	15.00
October 16	95	11.95
October 20	115	13.00

Issues

October	55
October	65
October	50
October	25
October	115

Q. 3

Following transaction appeared in the books of accounts of a trading concern.

PURCHASE

Month	Quantity (Units)	Cost per unit (Rs)
Jan	100	41
Feb	200	50
April	400	51.87

SALES

Month	Quantity (Units)	Cost per unit (Rs)
March	250	64
May	350	70
June	100	

There was an opening balance of 100 units for Rs 3,900.

From the information given above, for the six month ended June 30, show the store ledger records including the closing stock balance and stock evaluation by using weighted average and FIFO methods of costing under periodic and perpetual system of accounting.

Q. 4

Receipts	1-12-1993 80kg @ Rs. 5 per kg
	10-12-1993 80 kg @ Rs. 6 per kg
Issued	2-12-1993 60 kg
	11-12-1993 60 kg

What is the value of 40 units of closing stock under each of the methods? Using the periodic and perpetual accounting system.

FIFO	Rs._____
LIFO	Rs._____
Weighted average price	Rs._____

MULTIPLE CHOICE QUESTIONS

1) In most of the industries, the most important element of cost is
   a) Material
   b) Labor
   c) Overheads
   d) Prime cost
2) According to which of the following method of pricing, issue; are close to current economic values?
   a) Last in first out price
   b) First in first out price
   c) Highest in first out price
   d) Weighted average price

3) In which of the following of pricing, costs lag behind the current economic values?
   a) Last in first out price
   b) First in first out price
   c) Replacement price
   d) Weighted average price

4) Which of the following items of cost should not be treated as direct material?
   a) Electricity representing 90% of the total cost
   b) Stand paper used in production
   c) Thread used in stitching garments
   d) All of the above

5) When prices fluctuate widely, the method that will smooth out the effect of fluctuation is
   a) Simple average
   b) Weighted average
   c) FIFO
   d) LIFO

Data for MCQ No. 6 to 9

Given-opening stock on 1-1-1994 -200 kg @ Rs. 4 per kg.

- Purchase on 4-1-1994 - 300 kg @ Rs. 5 per kg
- Issued on 8-1-1994 - 350 kg
- Market price on8-1-1994 = Rs. 5 per kg
- On the basis of above information, select the correct answer in each of the following:

6) At what amount materials issued on 8-1-1994 will be charged if FIFO method is used?

a) 1,100
b) 1,550
c) 1,700
d) 1,750

7) At what amount materials issued will be charged if LIFO method is used?
a) 1,550
b) 1,575
c) 1,700
d) 1,750

8) At what amount materials, issued will be charged if simple average price is used?
a) 1,550
b) 1,575
c) 1,610
d) 1,700

9) What amount materials issued will be charged if weighted average price is used?
a) 1,575
b) 1,610
c) 1,625
d) None of these

LESSON# 8

CONTROL OVER MATERIAL

Control over material is essential for different reasons By and large, materials are the equivalent of cash and therefore pilfering and theft may occur quite often if effective control is not exercised.

Prevention of material from deterioration and waste is also necessary. It is also important to eliminate obsolete stocks with the consequence easing of storage space and storage costs- Moreover, control over materials is necessary to prevent extra expenditure on excessive purchase of materials and improper use of material. And above all, regular supply of materials to the production departments would help production on schedule. It will also ensure preparation of accurate statements of the value of material consumed by each department/job and final statements prepared according to their needs.

From the accounting point of view, the following are some important requirements of the effective material control;

1. That no material is purchased without proper authority.
2. That the quantity of material purchased is in fact received.
3. That there are proper storage facilities.
4. That no material is issued without proper authorization and the purpose for which the material is required is recorded.
5. That the accounts provide a running balance of the value of the materials on hand.

Replenishment of Stock

Materials are received and issued by the storekeeper to different production departments. One important duty of a storekeeper is the restocking of stores in order to ensure efficient functioning of the stores department and steady flow of materials to the production departments. The inflow and outflow of materials has to be regulated in such a manner that neither production is adversely effected due to want of materials nor there unnecessary blocking of capital funds due to overstocking of raw materials.

This implies that there is always a limit to the minimum and maximum quantity of materials or stock in the store. The storekeeper is to requisition for stock for replenishment in time so as to ensure honoring of requisition slips from production departments. Replenishment of stock therefore implies as 'taking steps for the fresh purchase of those stocks which have been exhausted and for which requisitions are to be honored in future'.

In order to ensure that the optimum quantity of materials is purchased and stock—neither less nor more, the storekeeper applies scientific techniques of materials management. Fixing of certain levels for each item of materials is one of such techniques.

The following levels are generally fixed.

1. Order level.
2. Maximum level.
3. Minimum level.
4. Danger level.

Order Level

It is also known as Re-ordering level in relation with an item of stock. It is the point at which it becomes essential to initiate purchase orders for its fresh supplies.

Normally, re-ordering level is a point between the maximum and the minimum stock levels. Fresh orders must be placed before the actual stocks touch the minimum level, so as to take care of lapse in time the placing of the order and the receipt of materials in stores.

Following are the factors that are taken into account for fixing re-order level.

1. The maximum consumption.

This is the maximum quantity of the material that is expected to be consumed in a day or in a week or in a month time.

2. Lead time.

   This is the estimated time period in number of days or in weeks or in months, which is necessarily required for placing an order and finally receiving it in the stores.

   There might be different lead times for different consumptions. For example; more time will be required for maximum consumption comparing with the time required for minimum or average consumption.

3. Economic order quantity.

   Details of the economic order quantity will be covered in the next lesson; here this will be sufficient to learn that it is the level where the ordering quantity will be most economical.

   Although EOQ is not required while calculating the order/re-order level but one must keep in mind the EOQ of the item for determining the order level.

   Most of the times where purchases are made according to the EOQ, the order level is half or the EOQ.

Formula

Order Level/reorder level /Reorder point = Maximum Consumption x Lead Time (maximum)

Maximum Stock Level

The maximum stock level indicates the maximum quantity of an item of material which can be held in stock at any time. The maximum stock level is fixed by taking into consideration the following factors:—

1. Minimum rates of consumption.

   This is the minimum quantity of the material that is expected to be consumed in a day or in a week or in a month time.

2. The lead time.

   This is the estimated time period in number of days or in weeks or in months, which is necessarily required for placing an order and finally receiving it in the stores.

   There might be different lead times for different consumptions. For example; more time will be required for maximum consumption comparing with the time required for minimum or average consumption.

3. Economic ordering quantity.

   Details of the economic order quantity will be covered in the next lesson; here this will be sufficient to learn that it is the level where the ordering quantity will be most economical.

4. Availability of funds,
5. Availability of storage space.
6. Risk of obsolescence, depletion, evaporation and material waste,
7. Future fluctuations of price of materials.
8. Cost of storage and insurance.

9. The nature of material—seasonal supplies etc.
10. Any restrictions imposed by the government or restrictions in respect of import of materials.

The maximum stock can be calculated by applying the following formula.

Formula

Reorder level – (Minimum consumption* x *Lead time) + EOQ

Putting the formula elements of reorder level over here the result will be like this:

(Maximum consumption x Lead time) – (Minimum consumption x Lead time) + EOQ

[(Maximum consumption - Minimum consumption) Lead time]+ EOQ

Minimum Level;

This represents the quantity below which the stock of any item should not be allowed to fall. In other words, an enterprise must maintain minimum quantity of stock so that the production is not adversely affected due to non-availability of materials.

The minimum stock level is fixed by taking into account:

1. Re-order level.
2. Lead time.

   This is the estimated time period in number of days or in weeks or in months, which is necessarily required for placing an order and finally receiving it in the stores.

   There might be different lead times for different consumptions. For example; more time will be required for maximum consumption comparing with the time required for minimum or average consumption.
3. Average rate of consumption.

   This is the minimum quantity of the material that is expected to be consumed in a day or in a week or in a month time.

Formula

Reorder level— (Average consumption* x *lead time)

Putting the formula elements of reorder level over here the result will be like this:

(Maximum Consumption – Average Consumption) x Lead time

Danger Level

The danger level is below the minimum level and represents a stage where immediate steps are taken for getting stock replenished. When the stock reaches danger level it is indicative that if no emergency steps are taken to restock the materials, the stores will be completely exhausted and normal production stopped. Generally, the danger level of stock is fixed above the minimum level.

The danger stock level is fixed by taking into account:

1. Average Consumption.
2. Emergency Lead Time.

Formula

Average consumption* x *Emergency time

PRACTICE QUESTIONS

Q. 1

Following is the information provided by the concerned departments about two components FRAME and VASE regarding their replenishment and usage:

Minimum usage 25 units per week each

Average usage	50 units per week each	
Re-order quantity	*Frame*	300 units
	Vase	500 units
Re-order period	*Frame*	4 to 6 weeks
	Vase	2 to 4 weeks
Emergency lead time	*Frame*	2 weeks
	Vase	1 week

Calculate for each component:

1. Re-order level,
2. Maximum stock level, and
3. Minimum stock level,
4. Danger stock level.

Solution

Re-order level:

Maximum consumption x Lead Time [maximum]

Frame	75x6	450 units
Vase	75x4	300 units

Maximum stock level:

Reorder level – (Minimum consumption* x *Lead time [minimum]) + EOQ

Frame	450 + 300 – (25 X4)	650 units
Vase	300 + 500 – (25x2)	750 units

Minimum stock level:

Reorder level – (Average consumption* x *lead time [Average])

Average lead time = $\frac{\text{Maximum + Minimum}}{2}$

Frame	450 – (50X5)	200 units
Vase	300 – (50X3)	150 units

Danger stock level:

Average consumption* x *Emergency lead time

Frame	50 x 2	100 units
Vase	50 x 1	50 units

Q. 2

From the following information calculate the Maximum stock level, Minimum stock level, Re-ordering level and Danger stock level;-

(a) Average consumption	330 units per day
(b) Maximum consumption	420 units per day
(c) Minimum consumption	240 units per day
(d) Re-order quantity	3,600 units
(e) Re-order period	10 to 15 days
(f) Emergency Re-order period	12 days

Solution :

Re-ordering level:

Maximum consumption x Lead Time [maximum]

420x15 6,300 units.

Maximum stock level:

Reorder level – (Minimum consumption x Lead time [minimum]) + EOQ

6,300 – (240 x 10) + 3,600 7,500 units

Minimum stock level:

Reorder level – (Average consumption x lead time [Average])

Average lead time = *Maximum + Minimum* = *15+10* = *12.5*
2 *2*

6,300 - 330 x 12.5 2,175 units

Danger stock level:

Average consumption x Emergency lead time

330 x 12 3,960 units

PROBLEMS

Q. 1

From the following particulars, calculate: —
Re-order level, Minimum level, Maximum level, and Danger level.

Average usage	400 units per day
Minimum usage	60 units per day
Maximum usage	130 units per day
Economic order quantity	5000 units
Re-order period	25 to 30 days

Q. 2

In manufacturing its Products, a Company uses three raw materials. A, B and C, in respect of which the following apply:

Raw material	Usage per unit of Product kg.	Re-order Quantity kg.	Price Per kg.	Delivery Period			Re-order level kg,
				Min	Avg	Max	
A	10	10,000	0.10	1	2	3	8,000
B	4	5,000	0.30	3	4	5	4,750
C	6	10,000	0.15	2	3	4	2,000

Weekly production varies from 175 to 225 units, averaging 200 units.
What would you expect the quantities of the following to be:

(a) Minimum stock of A
(b) Maximum stock of B
(c) Re-order level of C
(d) Danger stock level of A

Q. 3

Two components of A and B are used as follows:—

Normal usage	50 units per week each
Minimum usage	25 units per week each

Maximum usage 75 units per week each
Re-order quantity—A : 400 units ; B : 600 units.
Re-order period— A : 4 to 6 weeks : B : 2 to 4 weeks.

Calculate for each component;

(a) Re-order level
(b) Minimum level
(c) Maximum level
(d) Danger stock level.

Q. 4

What do you understand by maximum stock level, minimum stock level, and reorder level? Calculate the above from the following data:

Re-order quantity	1,500 units
Re-order period	4 to *6* weeks
Maximum consumption	400 units per week
Average consumption	30 units per week
Minimum consumption	250 units per week

Q. 5

The following information is available in respect of component FS-6:

Maximum stock level	8,400 units
Budgeted consumptions:	
Maximum	1,500 units per month
Minimum	800 units per month
Estimated delivery period	
Maximum	4 months
Minimum	2 months

You are required to calculate:

(i) Re-order level
(ii) Economic Order Quantity

LESSON# 9

ECONOMIC ORDERING QUANTITY

Economic order quantity refers to that number (quantity) ordered in a single purchase so that the accumulated costs of ordering and carrying costs are at the minimum level.

In other words, the quantity that is ordered at one time should be so, which will minimize the total of (i) Cost of placing orders and receiving the goods, and (ii) cost of storing the goods as well as interest on the capital invested.

The economic order quantity can be determined by the following simple formula:

$$EOQ = \sqrt{\frac{2xRUxOC}{UC \times CC\%}}$$

Where;

EOQ = Economic Order Quantity.
RU = Annually Required Units.
OC = Ordering Costs for one order.
UC = Inventory Unit Cost.
CC = Carrying Cost as %age of Unit Cost.

This formula is based on three assumptions:

1. Price will remain constant throughout the year and quantity discount is not involved.
2. Pattern of consumption, variable ordering costs per order and variable inventory carrying charge per unit per annum will remain the same throughout, and
3. EOQ will be delivered each time the stock balance is just reduced to nil.

The Economic Order Quantity can be determined by applying the formula as under:

Suppose; the
Annual consumption is 80,000 units,
Cost to place one order is Rs. 1,200
Cost per unit is Rs. 50
Carrying cost is 6% of Unit cost

$$EOQ = \sqrt{\frac{2xRUxOC}{UC \times CC\%}}$$

$$EOQ = \sqrt{\frac{2 \times 80{,}000 \times 1{,}200}{50x6\%}}$$

EOQ = 8,000

As stated above this formula holds good if changes in price are not likely in the near future and consumption is regular. Otherwise, placing orders according to this formula may become expensive.

Carrying cost of inventory consists of (i) the costs of physical storage such as cost of space, handling and upkeep expenses, insurance, cost of obsolescence, etc., and (ii) interest on capital invested (the opportunity cost of the capital blocked up). All these costs are expressed in %age of the cost per unit.

Table of EOQ

Economic order quantity can also be proved through a table, by calculating total cost at different order quantities.

Following is a table that is showing total cost at five different order quantities, assuming that the annual requirement of the units to be consumed remains the same. Here the total cost comprises of ordering cost and carrying cost.

Total Ordering cost

Ordering cost is arrived by multiplying the number of orders in a year with the cost per order. Number of order is calculated by dividing annually required units by the order quantity.

Step I: $\frac{\text{Required Units}}{\text{Order Quantity}} = \text{Number of orders}$

Step II: Number of orders x Cost per order

Total Carrying Cost

Carrying cost is arrived by multiplying the average ordering quantity with the carrying cost per unit. Average ordering quantity is calculated by dividing the ordering quantity by 2. *(It is assumed that half of the ordering quantity is always kept into the store, this is the reason the ordering quantity is divided by 2)*

Step I: $\frac{\text{Ordering Quantity}}{2} = \text{Average ordering quantity}$

Step II: Carrying cost per unit = Unit Cost x CC %age

Step III: Average ordering quantity x Carrying cost per unit

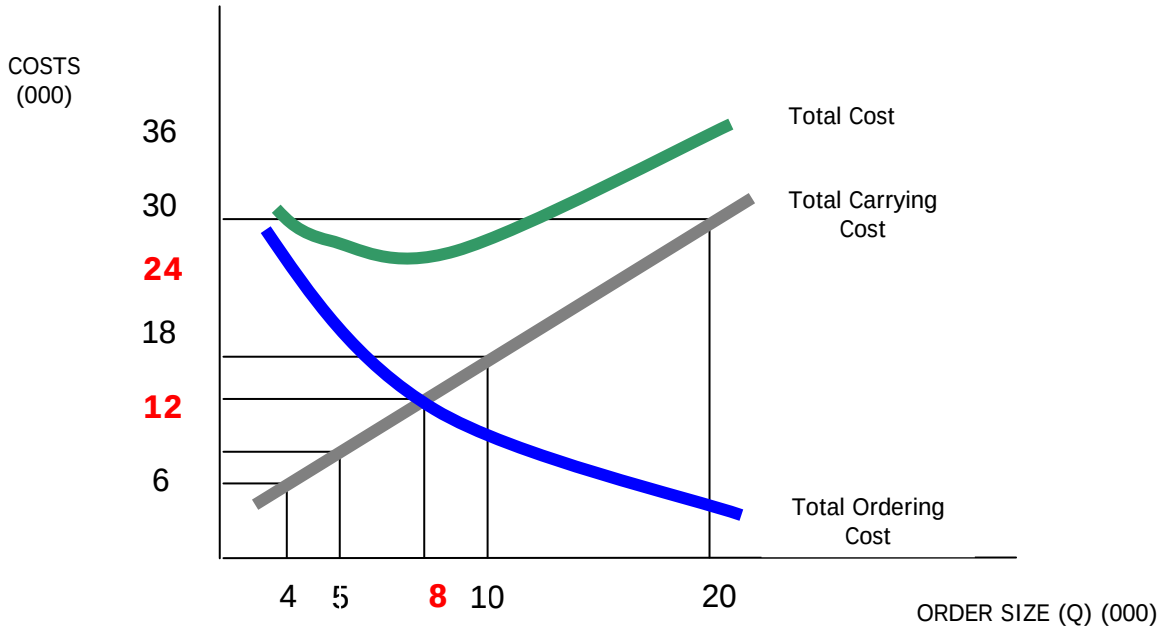
Applying these steps at different presumed order quantities (inclusive of the Economic Order Quantity) we can develop a table.

Order Quantity	Required Units	Number of orders	Total Ordering Cost *Number of orders* x *Rs. 1,200*	Total Carrying Cost *Avg Order qty* x *Rs.3*	Total cost
20,000	80,000	4	4,800	30,000	34,800
10,000	80,000	8	9,600	15,000	24,600
8,000	*80,000*	*10*	*12,000*	*12,000*	*24,000*
5,000	80,000	16	19,200	7,500	26,700
4,000	80,000	20	24,000	6,000	30,000

The above table shows that 8,000 is the economic order quantity because at this point total cost is the minimum. At this point total ordering cost is equal to the total carrying cost.
If the order quantity is increased it will although result in reducing the total ordering cost but at the same time more carrying cost will be incurred to store the inventory.
Whereas if the order quantity is decreased it will although result in reducing the total carrying cost but at the same time more ordering cost will be incurred as the number of orders will increase.

EOQ Graph

Economic order quantity can also be determined through a graph. Here the above information is plotted in a graph for total ordering cost, total carrying cost and total cost at different ordering quantities.
The point at which the line of total ordering cost intersects with the total carrying cost is the EOQ. At this point the line of total cost will give a bend that shows the minimum cost.



In the above graph line of total carrying cost intersects line of total ordering cost at 8,000 order quantities, where both of the costs are Rs. 12,000. At this order quantity the total cost is Rs. 24,000 which is the minimum most.
If the order quantity is increased or decreased the total cost will be more than the cost at EOQ. This is also evident from the above graph.

PROBLEMS

Q. 1

From the following data, you are required to determine the Economic Order Quantity.

Annual usage	8,000 units
Cost per unit	Rs. 30
Ordering cost	Rs. 7 per order

Storage and carrying cost as percentage of average inventory holding 15%

Q. 2

What is Economic Order Quantity (EOQ)? Should the quantity ordered be always equal to EOQ? Calculate EOQ from the following:

(a) RU 600 units
{*b)* Ordering cost Rs, 12 per order
(c) Carrying cost 20%
(d) Price per unit Rs. 20.

Q. 3

Annual requirement of Glass Limited is 100,000 units of product 10mm glass. Per unit cost of the product is Rs. 10 and cost for each new order is Rs. 100. Carrying cost is 50%.

Required: Calculate EOQ by table and by graph.

MULTIPLE CHOICE QUESTIONS

Q. 1

The demand for a product is 12,500 units for a three month period. Each unit of product has a purchase price of Rs.15 and ordering costs are Rs.20 per order placed.
The annual holding cost of one unit of product is 10% of its purchase price.
What is the Economic Order Quantity (to the nearest unit)?

A 1,577
B 1,816
C 1,866
D 1,155

Q. 2

A company determines its order quantity for a raw material by using the Economic Order Quantity (EOQ) model.
What would be the effects of a decrease in the cost of ordering a batch of raw material on the *ordering quantity* and the *total carrying cost*?

	Ordering quantity	***Total carrying cost***
A	Higher	Lower
B	Higher	Higher
C	Lower	Higher
D	Lower	Lower

Q. 3

A company uses the Economic Order Quantity (EOQ) model to establish reorder quantities.
The following information relates to the forthcoming period:

Order costs	Rs.25 per order
Carrying costs	10% of purchase price
Annual demand	20,000 units
Purchase price	Rs.40 per unit
EOQ	500 units

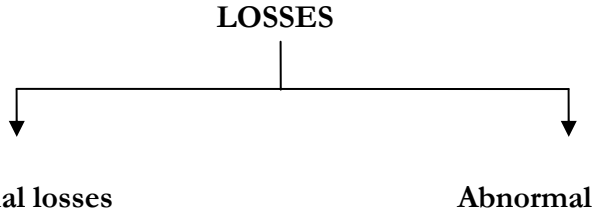
What are the total annual costs of stock (i.e. the total purchase cost plus total order cost plus total holding cost)?

A Rs. 22,000
B Rs. 33,500
C Rs. 802,000
D Rs. 803,000

LESSON # 10

ACCOUNTING FOR LOSSES

There is always a chance of occurrence of losses during the manufacturing process and even in the finished goods godown. Such losses are classified as normal loss and abnormal loss:



Normal loss

Occurrence of this type of loss is always expected. It is unavoidable loss and is inherent in the manufacturing process or its chances of happening are more likely than not. For example; while transporting petrol, it is normal that a little quantity will be evaporated.

Abnormal loss

It is an unexpected loss. Measures are always taken to avoid abnormal losses. For example; security system is installed to secure loss by theft from godown of finished goods. Safety measures are undertaken during manufacturing process against any loss of breakage of the output. Special care is taken during transportation of petrol to avoid its leakage.

Normal and abnormal losses are treated differently in the financial accounting and in the cost accounting as well. Following is the self explanatory chart that will help in understanding the difference between accounting treatment of the two different types of losses.

Treatment in Financial Accounting	
Normal loss	**Abnormal loss**
1. Ignored (no treatment).	**1.** Specifically recorded
2. Per unit cost increases.	**2.** Inventory per unit cost remains same
3. Normal losses are absorbed by the good units.	

Treatment in Cost Accounting	
Normal loss	**Abnormal loss**
1. Charged to FOH account.	**1.** Charged to specific WIP account.
2. Overall per unit cost increases	
3. No impact on individual job cost.	

In manufacturing process there are two types of distortions that can be identified as losses:

1. Defective output/work
2. Spoiled output

Defective output/work

At the end of or during the manufacturing process the inspection or quality control department tells about the defective output/work. This can be made good by adding further cost into it. For example; in a winding department, 10 of the capacitors were found improperly wound up. A further cost of material, labor and FOH will be required to re-wind these capacitors. Doing this

Spoiled output

This is cost of the goods that have been destroyed because of any reason. This can not be made good and therefore are sold as scrap inventory.

LOSSES			
Types of losses	**Defective Output/Work**	**Spoiled Output**	
		Having some recoverable value	**Having no recoverable value**
Cost of loss charged as expenses	**Additional cost (Material, Labor, FOH)**	**Total cost of production (less) recoverable value**	**Total cost of production**
Accounting Entries Normal losses	**(entire production or not charge to job)** FOH control A/C Material Payroll FOH applied/(items)	Scrap inventory FOH control A/c WIP or Job A/c	FOH control A/c WIP or Job A/c
Accounting Entries Abnormal losses	**(Not Same job)** WIP or Job A/C Material Payroll FOH applied/(items)	Scrap inventory WIP or Job A/c	No Entry

Accounting treatment

Normal loss

Normal losses are charged to factory overhead control account and thence become part of the total production/manufacturing cost.

The additional cost incurred ***to remove the defect*** is charged to the factory overhead cost, as it is explained in the accounting entry shown in the above table.

Whereas, the total cost of ***spoiled output*** is taken out of the cost already charged to the job and is then split into to two; scrap inventory and factory overhead cost. Scrap inventory shows the amount recoverable from the spoiled output through its disposal and the balancing amount that is estimated to be irrecoverable is charged to the factory overhead cost. Where nothing is expected to be recovered from the scrap inventory, total cost of the spoiled output is taken out of the job and charged to the factory overhead.

Abnormal loss

Abnormal losses are charged to the specific job/work in process account and thence become part of the cost of the specific job. This treatment causes an increase in the cost of the job.

The additional cost incurred ***to remove the defect*** is charged to the work in process account, as it is explained in the accounting entry shown in the above table.

Whereas, a part of the cost of ***spoiled output*** that is expected to be recoverable (scrap inventory), is taken out of the cost charged to the job. The estimated irrecoverable cost (loss portion) remains a part of cost of the job, which means that the loss has been charged to the job.

Scrap inventory shows the amount recoverable from the spoiled output through its disposal. Where nothing is expected to be recovered from the scrap inventory, no accounting entry in this case is required to be passes, as total cost of the spoiled output is irrecoverable and should remain in the cost of the job.

Practice Question

Q. 1

A & Co manufactured 500 ceiling fans to fill an order by incurring:

Direct material	Rs.	150,000
Direct labor cost		100,000
F.O.H **(60% of labor cost)**		60,000
Total production cost		310,000

Some of the work was found defective, to make good such loss, following cost was incurred:

Rework cost on defective work

Material	Rs. 10,000
Labor	30,000
F.O.H **(60% of Labor cost)**	18,000

Required: Pass accounting entries to record the cost incurred along with the adjusting entry for re-work cost, treating the loss as:

a) Normal
b) Abnormal

Solution

a) Normal loss

Work in process A/C	310,000	
Material		150,000
Payroll		100,000
F.O.H applied		60,000
FOH – Control A/C	58,000	
Material		10,000
Payroll		30,000
F.O.H applied		18,000
Finished goods A/C	310,000	
Work in process A/C		310,000

Cost per unit = 310,000/500 = Rs. 620 per unit

b) Abnormal loss

Work in process A/C	310,000	
Material		150,000
Payroll		100,000
F.O.H applied		60,000
Work in process A/C	58,000	
Material		10,000
Payroll		30,000
F.O.H applied		18,000
Finished goods A/C	368,000	
Work in process A/C		368,000

Q. 2

Using the data in Q. 1, now suppose the spoiled output is 50 fans, which can be sold as scrap for Rs. 200 each.

Cost of spoiled output = Rs. 310,000 / 500 x 50 = Rs. 31,000

Estimated recoverable amount = Rs. 200 x 50 = Rs. 10,000
Cost of loss Rs. 21,000

Solution

a) Normal loss

Work in process A/C	310,000	
Material		150,000
Payroll		100,000
F.O.H applied		60,000
Scrap inventory	10,000	
FOH – Control A/C	21,000	
Work in process A/C		31,000
Finished goods A/C	279,000	
Work in process A/C		279,000

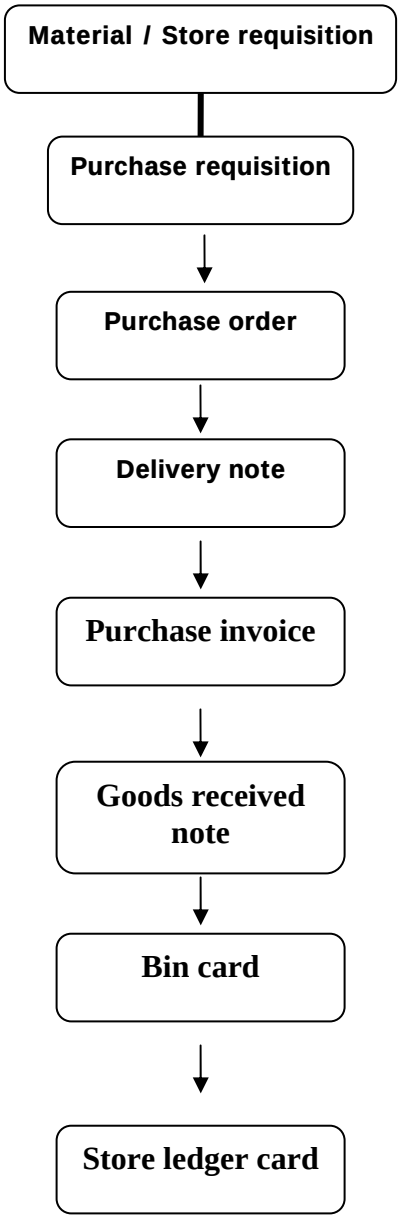
Cost per unit = 279,000/450 = Rs. 620 per unit

b) Abnormal loss

Work in process A/C	310,000	
Material		150,000
Payroll		100,000
F.O.H applied		60,000
Scrap inventory	10,000	
Work in process A/C		10,000
Finished goods A/C	300,000	
Work in process A/C		300,000

Cost per unit = 300,000/450 = Rs. 667 per unit

Different documents are used in the process of requisition, purchasing, production and for procurement of material. These are used in sequence presented in the following diagram:


Material / Store requisition
Purchase requisition
Purchase order
Delivery note
Purchase invoice
Goods received note
Bin card
Store ledger card

Material/Store Requisition
It is a document through which work station incharge requires/receives material from the store. It is sent to the store incharge duly approved by the production manager, stating the number of units required for consumption based on which the store incharge issues the required material to the work shop.

Purchase Requisition
It is forwarded by the store department to the purchase department, indicating the maximum and minimum stock levels, it also states the reorder level along with the economic order quantity. It is used to require further purchase to be made by the purchase department. It also indicates the current position of the material in the store.

Purchase Order
It is used to place order to the supplier for purchase of further material. This document contains information regarding the quantity, specification, rate, discount, settlement term, time of delivery, and dealing person. Based on the purchase order the supplier manages to deliver material to the ordering entity.

Delivery Note
It is issued by the supplier/seller to the purchaser, mentioning the quantity and specification of the material dispatched. On receipt of the material the recipient acknowledges by the signing the delivery note and returns it back to the supplier

Purchase Invoice
It is the document that evidences the transaction of purchase of material. It is issued by the seller stating quantity, rate, discount, and amount of the purchased material. Settlement terms are also stated at bottom of the invoice. Receiving an invoice means that money is payable to the supplier.

Goods Received Note
It is prepared by the inspection department after verifying the quantity and quality of the material received. Received material along with the goods received note is sent to the store incharge.

Bin Card
Store incharge after receiving the material as per the goods received note, places the material at its location and makes an entry in the bin card. Bin card is used to maintain physical record of the material received in and issued from the store. It updated for balance in the store after each transaction. It also contains information regarding reorder level, economic order quantity, maximum and minimum stock levels, maximum and minimum daily consumption, and lead time. It is placed at the location where the material is stored.

Store Ledger Card
It is maintained by the accounting department, more precisely stating it is maintained by the cost accounting department that is concerned about the calculation of cost per unit. It is similar to the bin card as far as receipt and issue of the quantity of material is concerned, but the main purpose of maintaining the store ledger card is to know the cost of material consumed and material in store along with the cost per unit of the material. Store ledger card is maintained using the FIFI, LIFO and W Avg methods.

Inventory Turnover Ratio
Inventory Turnover ratio shows the stock position of the store room. In how many times

Inventory Turn over Ratio

$$\frac{\text{Cost of goods sold or Material consumed}}{\text{Average Inventory}} = \text{times}$$

Average Inventory

$$\frac{\text{Opening Inventory} + \text{Closing Inventory}}{2} = \text{Average inventory}$$

Stock holding period

$$\frac{\text{Number of days in a year}}{\text{Inventory turnover ratio}} = \text{number of days}$$

PRACTICE QUESTION

Opening stock	1,000 units
Material Purchase	7,000 units
Closing Stock	500 units
Material consumed	Rs. 7,500

Solution

Inventory Turn over Ratio

$$\frac{\text{Material consumed}}{\text{Average Inventory}}$$

$$\frac{7500}{(1000+500)/2} = 10 \text{ times}$$

Inventory holding period

$$\frac{\text{No of days in a year}}{\text{Inventory Turn over Ratio}}$$

$$\frac{360}{10} = 36 \text{ days}$$

MULTIPLE CHOICE QUESTIONS

The following information is to be used for questions 1 and 2

A national chain of tyre fitters stocks a popular tyre for which the following information is available:

Average usage: 140 tyres per day
Minimum usage: 90 tyres per day
Maximum usage: 175 tyres per day
Lead time: 10 to 16 days
Re-order quantity: 3,000 tyres

1 Based on the data above, at what level of stocks should a replenishment order be issued?

A 2,240

C 3,000
D 5,740

2 Based on the data above, what should be the maximum level of stocks possible?
A 2,800
B 3,000
C 4,900
D 5,800

3 Moura uses the economic order quantity formula (EOQ) to establish its optimal reorder quantity for its single raw material. The following data relates to the stock costs:
Purchase price: £15 per item
Carriage costs: £50 per order
Ordering costs: £5 per order
Storage costs: 10% of purchase price plus £0.20 per unit per annum
Annual demand is 4,000 units.

What is the EOQ to the nearest whole unit?
A 53 units
B 170 units
C 485 units
D 509 units

4 Which of the following statements is correct?
A store ledger account will be updated from goods received note only.
A. A stores requisition will only detail the type of product required by a customer.
B. The term 'lead time' is best used to describe the time between receiving an order and paying for it.
C. To make an issue from stores authorization should be required.

5 What would be the most appropriate cost unit for a cake manufacturer?
Cost per:
A Cake
B Batch produced
C Kilogram produced
D Production run

The following information relates to questions 6 and 7
Turner Limited has the following stock record:

Date		*Number of units*	*Cost (Rupees)*
1 March	Opening stock	100 units	at 3.00/unit
3 March	Receipt	200 units	at 3.50/unit
8 March	Issue	250 units	
15 March	Receipt	300 units	at 3.20/unit
17 March	Receipt	200 units	at 3.30/unit
21 March	Issue	500 units	
23 March	Receipt	450 units	at 3.10/unit
27 March	Issue	350 units	

6 What is the valuation of closing stock using LIFO at each issue?
A Rs. 460

C Rs. 467
D Rs. 469

7 What is the valuation of issues using the weighted average method of stock valuation at each issue?
A Rs. 3,248
B Rs. 3,548
C Rs. 3,715
D Rs. 4,015

LESSON# 11

LABOR

There are three elements of cost:

- Material
- Labor
- FOH

Labor costs constitute an important part of production cost. Labor cost is and element of total payroll expense of an entity. Payroll expense consists of:

- Labor cost
- Administrative staff expenses
- Selling and distribution staff expenses

The total labor cost incurred by a manufacturing entity includes four separate elements:

- Direct labor cost (this is expensed on production and it is traceable in the cost unit)
- Indirect labor cost (this is also expensed on production but it is not traceable in the cost unit)
- Abnormal labor cost (this is the labor cost that is lost because of break-down of power and machinery etc.)
- Labor related cost (this includes overtime pay, bonus pay, shift allowances, and other benefits)

From the cost and management accounting point of view, the distinction between direct labor cost and indirect labor cost is very essential.

Direct Labor Cost

Direct labor cost is that portion of salaries and wages which can, as a practical matter, be traced with and charged to a cost unit. Thus the wages paid to employees/workers engaged in manufacturing of a job or process like bricks, spinning and weaving, are direct labor cost.

Broadly speaking, labor costs will be direct if:

a. There is a direct relationship to the product through a process,
b. The labor cost can be measured in the light of this relationship, and
c. The labor cost is sufficiently material (significant) in amount.

However, the main criterion of determining the direct labor cost is that if it is economically and conveniently be identified /traced with a product, it is a direct labor cost.

Indirect Labor Cost

These are the costs which are not identifiable with or incurred directly in the production of a specific goods or services but are applicable to manufacturing activities generally, salaries and wages paid to supervisors, foremen, storekeepers, clerical staff member will constitute the indirect labor costs. Mostly costs of service departments, supervisory and engineering departments are indirect labor costs.

Salaries & Wages

Salary is a fixed amount of remuneration paid to the employees after a month or a year.

Wage is remuneration of the employees/workers who work on hourly or unit produced basis.

Determining Wage Rates

Wage rates are determined on the basis of requirements of a job. ***Job analysis*** is breaking up of a job into basic elements or operations and studying them in detail to find out the duties, responsibilities and skills involved in it.

It is a process of determining the contents and characteristics of a job, the conditions under which performance is to be carried on, the qualifications required in the worker, methods and techniques used and other conditions and skills involved. This basic object of job analysis is to ascertain the relative worth of each job through an objective evaluation so that suitable remuneration can be fixed for each Job and worker.

Advantages of Job Analysis

a. Job analysis

b. facilitates selection of right type of workers according to the job requirements. It helps in training the workers accordingly.

c. Job analysis helps in fixing suitable wage rates for different jobs according to their characteristics, skills required and hazards involved.

d. It helps in Job evaluation and merit rating thereby improving the decision making ability of the supervisory staff in regard to transfer, promotion and placement.

e. Job analysis facilitates the settlement of disputes with workers in regard to duties-wages, transfer and other disciplinary action by providing complete requirements of different jobs.

f. It helps in placing employees on the most suited jobs and thus increasing their satisfaction and morale. It helps in reducing labor turnover, absenteeism and removes inequalities in wages and salaries.

Time-Keeping

In an industrial enterprise accurate time keeping is very essential, normally, recording of time is done for two purposes:

a. For administrative and payroll purposes, and

b. For cost analysis and apportionment of overhead among different departments.

Wages to casual and temporary workers are paid on time basis while others are paid on piece rates with minimum guaranteed wages. Payment of wages to such categories of workers is dependent on the proper recording of total time spent by a worker in the factory and on the Job.

Purposes of Time-Keeping

Recording of time is essential for the following purposes:

a. Preparation of Pay Rolls, where the workers are paid on time basis.

b. .Meeting the statutory requirements.

c. For internal administration, like increments, pension, provident fund, gratuity and leave benefits.

d. For proper distinction between direct and indirect costs, normal time and overtime, and regular and late comers.

e. For overhead rates, if based on labor hours.

f. For enforcing regularity, discipline and ensuring daily requirement of labor force in the factory.

Methods of Time-keeping or Recording:

Following are the usual methods of recording attendance of workers at the gate of a factory.

1)Manual Methods:

- **A.** Attendance Register, and
- **B.** Token system

2) Mechanical Methods:

- **A.** Time recording clock, and
- **B.** Dial Time Recorders

A. Smart card

Manual Methods

Attendance Register method (Hand written record):

Under the method a register with necessary columns like name, identity no. of the employee and arrival and departure time is maintained.

In a large factory, separate registers may be maintained for each department but in a small factory one register may serve the needs of the entire factory.

The practice of recording attendance or roll calls may conveniently be adopted depending upon the nature of employees and their number. As soon as a worker enters into the premises of the factory the necessary entries in the attendance register are completed either by calling the name of each worker or by some other physical method.

Disk or Token or Check method:

Under this method each worker is allotted a metal disk or token bearing his identification. On each disk the name and number of the worker is engraved or painted. All the tokens or disks are hung on a board serially note the arrival time of the workers.

As soon as a worker reports for duty on the appointed time he/she removes his/her disk from the board and puts into a box. Immediately after the scheduled time for entering into the premises of the factory the board is removed and a list is prepared of all such disks or tokens not collected and dropped into the box by the workers. The late comers collect their disks and hand over personally to the time keeper. The list of late comers is prepared separately. The tokens not removed from the boards represent the absentee workers.

Mechanical Methods

Different mechanical devices have been designed for recording the exact time of the workers. These include:

a. Clock Card

b. Dial Time Records.

Clock Card

The attendance of workers in this system is marked by a time recording clock on a card each worker is given a clock card usually for one week duration. These clock cards are serially arranged and kept in a tray at the gate of the factory and as the worker enters into the gate he picks up his/her clock card from the tray, puts it in the time recording clock that records the exact arrival time at the space provided on the card against the particular day.

This process is repeated where the worker leaves the factory after his/her day's work. Other particulars of time in respect of lunch, late arrivals, early leaving and overtime are printed in red so as to distinguish these from normal period spent in the factory. This is very popular method of recording the attendance of workers. The format of clock card is given below:

FUTURE SHINE CO. LTD
Clock Card

***Worker's Name*_____ *Department*_____ *Token #*_____**
***Week*_____**

Days	Time	Regular-time		Over-time		Total-time	
		In	Out	In	Out	Normal time	Over-time
Monday	A.M.						
	P.M.						
Tuesday	A.M.						
	P.M.						
Wednesday	A.M.						
	P.M.						
Thursday	A.M.						
	P.M.						
Friday	A.M.						
	P.M.						
Saturday	A.M.						
	P.M.						
Sunday	A.M.						
	P.M.						
Calculations of		Normal	Over-	Rate	Amount	Deductions	Net
		Hours					payable
		Worked					

***Time keeper*_____ *Foreman*_____ *Payroll Clerk*_____**
***Worker*_____**

Electronic Methods

In the era of Information Technology wastage of time is considered as a sin. Although manual and mechanical methods produce accurate results but both are time consuming methods. Same results with less time consumption and lesser chance of errors can be obtained with the application of electronic devices. Now a days clock cards have been substituted with the smart cards.

Smart Card

Clock cards may be replaced by smart cards. These record the same information, but it is recorded on the magnetic strip on the card. Smart cards may also be used for other purposes not related to the payroll.

Job Time Sheets

For proper labor cost analysis, it is essential that the worker records, in details, his/her activities of production and time he/she spends on each job correctly. Time spent by a worker on the job, process or activity may be recorded manually, mechanically or electronically depending upon the nature and size of the enterprise. Recording of time spent by the worker on the job is better known as time booking. The objects of time booking are:

1. To ensure that the time paid for is properly utilized.
2. To ascertain the labor cost for each individual job and the cost of work done
3. To determine the rate of absorption of overhead expenses based on direct labor and machine hour methods against each job.
4. To ascertain and minimize idle time.
5. To evaluate each employee's performance by comparing the actual time taken with the budgeted time.

For achieving these objectives it is very important that clear instructions should be issued and proper forms are designed for recording work time.

FUTURE SHINE CO. LTD.
Daily Time Sheet

***Worker's Name*_____ *Department* _____ *Token #*_____**
***Date*_____**

Job or work order.	Work done	Description of work	Time		Total Hours		Cost	
			On	Off	Ordin	Overti	Rate	Amount

Total hours_____ Workers_____
Total cost_____ Fore man_____

PAYROLL SYSTEM

The payroll is a list of the employees of the organization and the money due to each. A payroll list is produced each time that employees are paid.

- Wage earners are paid weekly.
- Salary earners are paid monthly.

Sometimes, employees earn a fixed amount every week or every month. Sometimes there are variations in the amount employees earn, due to overtime payments or bonuses or commissions which add to their pay.

GROSS PAY AND NET PAY

DEDUCTIONS

The total amount earned in a week or month by an employee is called his or her gross pay.
This is not the amount of money that the employee receives, because deductions are taken away from the gross pay, and the employee receives just the gross pay less deductions. This is known as the employee's net pay.
The deductions from pay are usually a combination of:

- Statutory deductions and
- Non-statutory or voluntary deductions.

Statutory deductions are deductions from pay that are made by law. In the Pakistan income tax is taken away from gross pay and paid to Income Tax Department, which is the main tax-collecting department of the government.

Income tax is collected from employees every time they are paid, and this system of tax payment is therefore known as Pay As You Earn or PAYE. An employer is required by law to deduct income tax from the wages and salaries of all their employees.
The employer in effect acts as an unpaid tax collection agent for Income Tax Department.
Non-statutory deductions are voluntary deductions from pay that the employee chooses to make. Examples of these are:

- Subscriptions to a trade union
- Contributions by the employee to a pension scheme.

Rupees	
Gross pay	***
Less:	
Statutory deductions	(***)
Non-statutory deductions	(***)
Net pay or take home" pay	***

What this means is that when an employee is paid, he or she receives the net pay or take home pay, and the employer pays the other amounts to other organisations ('external agencies') such as Income Tax Department, a trade union and a pension scheme organisation.

COST OF LABOR TO THE EMPLOYER

Although the employee only receives the net pay, all the deductions have to be paid to other organisations, and it is the employer who has to pay them. Therefore, you might think that the total cost of wages and salaries to the employer is the total of gross wages. In fact the total cost of wages and salaries to an employer is higher than the total gross wages and salaries. This is because there are two elements in Provident Fund Contributions.

- There are employees' provident fund contributions. These are a part of the statutory deductions from gross pay,
- There are also employer's provident fund contributions. These are additional payments that the employer has to pay the government.

The amount payable is related to the amount earned by the employees, but it is nevertheless an additional labor cost for the employer.
To an employer, the total cost of wages and salaries is therefore:

- Gross wages and salaries, plus
- Employer's provident fund contributions.

OTHER DEDUCTIONS

The employer and employee may agree that other deductions should be made from the employee's salary. Examples are:
(a) Pension contributions.
(b) Deductions under the payroll giving scheme (charity giving).
(c) Deductions under a payroll savings scheme,
(d) Trade Union subscriptions.
(e) Deductions under Holiday Pay schemes,
(f) Certain other voluntary deductions agreed by the employer (for example, fees for use of the company sports club).

PRACTICE QUESTION

The following figures have been extracted from a trader's records in respect of wages and salaries for July.

		Rupees
(i)	Wages and salaries (gross)	6,300
(ii)	Income tax	1,600
(iii)	Employees' pension contributions	600
(iv)	Employer's pension contributions	700

1 What is the total amount the trader will have to pay for wages and salaries for July?

A 4,100
B 4,800
C 6,300
D 7,000

2 What is the net pay received by employees?

A 4,100
B 4,200
C 4,800
D 5,600

PROCESSING THE PAYROLL

To process the payroll, an employer must, for each employee:

1. Calculate the ***gross wage*** or salary for the period.
2. Calculate the ***income tax*** payable out of these earnings.
3. Calculate the ***employee's state benefit contributions*** that are deductible.
4. Calculate the ***employer's state benefit contributions***. For all employees collectively, the employer must:
5. Calculate any ***non-statutory deductions***.
6. Prepare a ***payslip*** showing the gross pay, deductions and net pay.
7. Make the payment of ***net pay*** to the employee.
8. Make the ***payments of all the deductions*** from pay and the employer's state benefit contributions to the appropriate other organisations.
9. ***Record the payroll costs*** in the accounting system.

PAYSLIPS

A payslip will accompany each payment of salary or wages to an employee. It shows how the amount paid has been arrived at, how much income tax and state benefit contributions has been deducted. The provision of a payslip detailing the income tax and provident deductions is another responsibility of an employer as required by the national law. Other deductions will also be shown on the payslip.

Getting a payslip means that even if the employee receives wages or salary payments directly into his bank account, he is notified of the payment and how much it is by receiving the payslips, Payslips might be distributed to employees at work, or posted to their home address.

A payslip must show details of:

- Gross pay
- Deductions (itemized separately)
- Net pay (Net pay is sometimes called ***'take home pay'***).

However, there isn't a standard layout for a payslip and so payslips of different employers can look very different.

An example is shown below.

Silver Glass Manufacturers PAYSLIP				
Employee: *Syed Imam Din*			**Employee #.** *256*	
National Tax Number: 7296849-5	**Social Security**: Y 45		**Date**: 08-10-06	**Tax period**: week 40
Pay For Week Ending: October 8th.	**Hours**	**Rate Rs.**	**Amount Rs.**	**Year To Date Rs**.
Basic Pay	40.0	7.50	300.00	
Overtime	5.0	15.00	75.00	
Shift Allowance	2	10.00	20.00	
Gross Pay			395.00	
Pension (Employer's pension contribution Rs.25.00)			15.00	
Trade union subscription			10.00	
Total Pay			370.00	16,605.00
Income Tax			57.92	2.711.32
Provident Fund (Employer's Cont Rs.36,71)			30.85	
NET PAY			**281.23**	

Content of the Payslip

A payslip must show certain items, by law. Compulsory items in the UK are:

- The employer's name
- The employee's name
- The date
- The total gross pay, showing the calculation where it comprises different elements such as bonuses, overtime etc
- The employee's pension contribution (if there is any)
- Other deductions from, or adjustments to, pay. If a set amount is deducted each pay day the breakdown need not be shown, provided the employee was given the details earlier
- Total gross pay to date for PAYE purposes
- Total tax paid to date in the current tax year and tax due this pay day
- National Insurance contributions due this pay day
- Net pay.

The payslip may also show additional information (and often does), such as:

- the employee's Payroll Number
- the employee's Social Security Number
- the employee's National Tax Number
- the total provident fund contributions paid by the employee in the tax year to date
- the method of payment, such as 'paid through cheque or cash etc.'

- employer's provident fund contribution for the current period
- employer's provident fund contribution for the tax year to date

MAKING PAYMENTS TO EMPLOYEES

Most employers will have a set day on which employees should be paid, and it is the payroll department's responsibility to ensure that wages are paid on the correct due days.
Weekly paid employees will be paid at least once a week, normally on the same day each week. Usually the pay day will be either Thursday or Friday.

Monthly paid employees will be paid once a month, and there will be a formula for determining the pay day. For example, this may be:

- the last day of the calendar month
- the last Friday or Saturday of the calendar month
- the same date each month, such as the 26th.

Employees may be paid their wages in several ways:

- in cash (but this is now very uncommon)
- by cheque
- by bank transfer
- through the Banks Automated Clearing System (BACS).

PRACTICE QUESTIONS

1 Which of the following does not appear on a payslip?

A. Gross weekly wage for the employee
B. Tax paid to date by the employee in the tax year
C. Deductions paid by the employee
D. Details of the employee's expected pension.

2 Which is the most convenient way for a large employer to pay salaries electronically?

A. BACS
B. Bank transfer
C. By cash
D. By cheque.

Elements of Gross Pay

The amount of pay to which an employee is entitled may be earned in a variety of different ways. These include:

(A) Basic pay, such as:
   a. wages paid according to the number of hours worked
   b. Wages paid according to the output of the employee.
   c. salaries, for salaried staff

(B) Other pay, such as:
   a. overtime pay, for extra hours worked by the employee
   b. shift pay, to compensate for unsocial hours.

(C) Bonuses and commission, such as:
   a. bonuses paid under bonus schemes, based on productivity, or profitability
   b. commission paid, normally based on sales.

Basic Pay	****
+ Bonus	****
+Overtime payment	****
+Other allowance	****
Gross pay	****
-Statutory deduction	(***)
-Non Statutory deduction	(***)
Net Pay	****

Payroll Entries

Payroll Preparation

	Payroll expenses	100	
	Deduction of income tax		5
	Payroll Payable		95

Payroll Distribution

	Work in process	20	
	FOH	30	
	Administrative expense	40	
	Selling expenses	10	
	Payroll expenses		100

Payment

	Accrued payroll	95	
	Bank		95

PRACTICE QUESTION

Direct Labor	15,000
Indirect Labor	10,000
Sales Salaries	7,000
Administrative Salaries	8,000
Total	**40,000**
Deductions	
Income tax	4,000
Group insurance	1,000

Required: Pass journal entries to record Payroll expense and its payment

Solution

1-	Payroll expense		40,000	
	Income tax (Payable)			4,000
	Group insurance (Payable)			1,000
	Payroll Payable			35,000
2-	Payroll payable		35,000	
	Voucher payable			35,000
3-	Voucher payable		35,000	
	Bank			35,000
4-	Work in process	15,000		
	FOH	10,000		
	Selling expense	7,000		
	Administrative	8,000		
	Payroll expenses			40,000

LESSON # 12

PAYROLL AND INCENTIVES

Wages are paid to the workers as the reward of their labor and service. Different systems of remuneration have been devised for meeting the requirements of both employees and employers. Usually the employer makes a specified monetary payment to workers for a specified work or job done. The specified monetary payment or minimum wages could either be related to a particular hours of attendance or to the quantum of work.

Thus the wages are paid to the workers either for the ***time*** spent by them in an organisation or the ***goods or services*** produced for it. So there are two basic systems of remunerating labor. One is related to the time and the other relates to the quantum of work.

In between these two basic or extreme systems of labor remuneration there are a number of variants in vogue in many industries. Organized trade unions and state regulatory measures have significantly contributed to the introduction of various bonus and incentive schemes for the labor.

Demand for increased wages is a natural consequence on the part of labor while the employer tends to resist this demand. However, it must be borne in mind that high wages do not necessarily results in higher cost of production.

If labor is satisfied with high wages it may ultimately lead to increased production and productivity. The increased production and productivity will in return results in reduced labor and overhead cost per unit. It is also essential requirement of a good wage system.

The aims of a wage system should be the introduction of a fair wage. A good wage system should have, among others, the following features:

1. The system of wage payment should be fair to all workers
2. A guaranteed minimum wage should be assured to all workers.
3. The system should be acceptable to workers so as to avoid the work to rule, stoppage of work and slow-downs.
4. It should have the elements of simplicity, certainty and flexibility.
5. It should provide adequate incentives to workers.
6. It should be in conformity of various labor laws and regulations both local and national.
7. It should invariably contain an increment clause providing for an automatic rise in wages and attendances as cost of living index number increases.
8. The wage system should be simple and practicable so as to keep its operational and administrative cost at a minimum.

Systems of Wages

Basically there are two principal systems of wages. They are:

(i) Time wage

(ii)Piece rate or Piece work

1. Time base wage

Under this system, wages to a worker are paid on time basis irrespective of the quantum of production. The wage is measured on the basis of unit of time i.e. hourly, daily, weekly or monthly. The formula is:

Hours worked x *Rate per hour.*

Assuming a worker is paid Rs. 110 per hour and he has spent 200 hours during a particular month in a factory, his wages will be:

Rs. 22,000 i.e. (Time x *Rate i.e. 200* x *Rs.110).*

2. Piece Rate wage

Under this method of remuneration a worker is paid on the basis of production and not time taken

schemes. The rate is expressed in terms of certain sum of money for every unit produced, e.g. Rs 2 per unit. The formula is:
Units produced x *Rate per unit.*
Suppose a worker is paid Re. 50 per unit and he has produced 20 units in 7 hours. His total wages will be:
Rs. 1,000 i.e. (Units x *Rate i.e. 20* x *Rs.50)*
However, a well regulated piece rate system has a guaranteed minimum wage. A well regulated piece rate system, with a guaranteed minimum wage rate of compensation is much superior over the time rate system.

Piece rate with guaranteed wage rate
Under this system a worker receives the straight piece rate for the number of pieces he produces, provided that his total remuneration is more than his earnings on a time rate basis. If the piece rate earnings fall below the minimum level of his earnings then he is paid on the time rate basis per hour/per day).

Premium Plans
In between the two principal systems of remuneration described above, there are a variety of bonus and premium plans of compensating workers for their extra efforts and skills. The basic objectives of various bonus and premium plans are:

a. to induce the workers to increase the production and productivity,
b. to provide them additional wages for their skill and efforts,
c. to raise the morale of the labor high,
d. to reduce the cost of production,
e. to retain the services of good workers,
f. to induce the workers to serve the organisation with loyalty and sincerity, and
g. to establish better labor-management relations.

Essential futures of sound wage incentive plan:
Various incentive wage schemes have been designed to overcome the drawbacks of two principal systems of labor compensation. A system of wage payment that would ensure both quality and quantity of product is known as Incentive or Bonus or Premium plan. Essentially, all incentive plans are a combination of the two basic wage plans, i.e., time rate and piece rate.
The following are some essential features of an incentive plan:

1. The plan should be acceptable to the workers, trade unions and management.
2. The incentive should be related to the efforts involved and should be sufficiently high so as to provide inducement to greater effort.
3. It should be simple and should be understood by all workers easily.
4. The standard time or norms upon which wage incentive is based should be determined on the basis of lime and motion studies.
5. Standards once fixed should not be changed unless it is necessitated by the change in the method of work. Likewise unilateral and unwarranted rate cuttings should be avoided.
6. No upper limit should be placed upon the amount of individual earnings.
7. The incentive plan should be aim at increasing production, reducing cost, and should influence the workers morale.
8. The scheme should be operated without excessive and operative cost.
9. It should be consistent and incentive should be based on properly assessed lime values of respective jobs.

10. The scheme should motivate the employees towards attainment of management objectives by means of coordinated efforts of all concerned.
11. The grievances of the workers especially in respect of work standard and incentive rates should be removed at once.

The success of an incentive plan largely depends on the mutual co-operation and understanding between employer and employees and immediate removal of workers' grievances. And above all, the payments of incentive or bonus should be made as soon as possible after the work is completed.

Some Important Incentive Wage Plans:

Some of the important incentive wage plans are briefly discussed here with practical examples. These are:

Time Rate Based Premium Plan

(1) Halsey Premium Plan.
(2) Halsey-Weir Premium System.
(3) Rowan Plan.

Piece Rate Based Premium Plan

(4) Taylor's Differential Piece Rate System.
(5) Merrick Differential Piece Rate Plan-

While calculating total earnings of a worker under different incentive wage schemes, the following four elements must be taken into account: ***(i) Unit of output, (ii) Standard time, (iii) Time worked, and (iv) Time saved.***

Time Rate Based Premium Plans

Halsey Premium Plan

Under this system, a standard time is fixed for each job or operation. Time rate is guaranteed to a worker and if he completes the job within standard time or more than the standard time, he is paid standard rate.

But if the Job is completed in less than the standard time fixed for the job, he is given wages for the actual hours taken plus bonus equal to one half of the wage of the time saved.

Gross Wages = (Time worked x wage rate) + ½ (Time saved x wage rate)

PRACTICE QUESTION

Q. 1

Wage rate per hour	Rs. 1.50
Time allowed for the job	16 hours
Time taken	12 hours.

Required:

1. Calculate the Gross earnings of the worker.
2. Find out effective "rate of earnings"

Solution*: (Halsey premium plan)*

Gross Earnings

Basic Pay	12 x 1.5	=	18
Bonus Pay	½ (4)x 1.5	=	3
			21

Effective rate of earning Rs21/12 hours **= Rs. 1.75**

Halsey-Weir Premium Plan

Under this method, other things being the same as Halsey Plan, the rate of premium usually applied is 33.33: 66.67 sharing plan basis. In practice the bonus is on a 50: 50 sharing scheme.

Q. 2

Calculate the total earnings and effective rate of earning per hour from the practice question given above, if the worker is paid according to Halsey-Weir premium plan.

Solution*: (Halsey-Weir premium plan)*

Gross Earnings

Basic Pay	12 x 1.5	=	18
Bonus Pay	33.33% of (4) x 1.5	=	2
			20

Effective rate of earning Rs20/12 hours **= Rs. 1.67**

Rowan Premium Plan

This system is similar to the above two plans. The worker is guaranteed at ordinary rate of wages and bonus is paid in respect of time saved.

Under the Rowan system the bonus hours are calculated as the proportion of the time taken which the time saved bears to the standard time allowed.

Thus under this system a different method of calculating bonus is applied.

Step I

The bonus rate is calculated *as*:

$$\frac{\text{Time allowed} - \text{Actual time taken}}{\text{Time allowed}} \times 100 = \%$$

Step II

This bonus rate is then applied on the basic pay to calculate the bonus pay.

Basic Pay* x *bonus rate = bonus pay

Q. 3

Calculate the total earnings and effective rate of earning per hour from the practice question given above, if the worker is paid under Rowan bonus plan.

Solution*: (Rowan premium plan)*

Bonus rate = $\frac{16 - 12}{16} \times 100 = 25\%$

Gross Earnings

Basic Pay	12 x 1.5	=	18.00
Bonus Pay	18 x 25%	=	4.50
			22.50

Effective rate of earning Rs 22.5/12 hours **= Rs. 1.875**

OVERTIME

Normally an employee is required to work for a set number of hours every week. There may however be occasions where the employer will ask the employee to work for longer hours. Overtime is the time worked over and above the employee's basic working week.

Overtime must not be confused with flex-time. In a flex-time system an employee is allowed to work extra hours earlier in the week or month, in return for which he will work fewer hours later on. His overall number of hours worked remains constant.

Overtime is time that is paid for, usually at a premium, over and above the basic hours for the period.

Overtime by direct workers might be incurred for two reasons:

- Either to make up for lost time earlier in the production process or
- In order to produce more of the product than was originally anticipated.

Overtime being worked means that more units of a product are produced. However, if the overtime is being worked to make up for lost production earlier in the process then the units produced in the overtime may simply be enough to bring production back up to its anticipated level.

Overtime that is being worked in order to make up for unnecessarily lost production time is avoidable and should not have occurred.

Overtime that is necessary in order to fulfill customer orders is unavoidable overtime.

Calculating Overtime Pay

Hourly Paid Workers

Hourly paid workers may be paid overtime at various different rates. For example, the hourly rate of overtime may be the same as the basic rate of pay or higher than the basic rate of pay.

It may either be expressed as a higher monetary amount, or as a proportion of basic pay, such as 'time and a half.

The hourly rate of overtime may vary according to when the overtime is worked. For example the evening rate may be 'time and a half, whereas the weekend rate may be 'double time'.

The hourly rate may vary with the number of overtime hours worked. For example the first 5 hours may be at 'time and a half, and additional hours at 'double time'.

Weekly Paid Workers

The overtime pay is the number of hours of overtime worked, multiplied by the rate at which overtime is paid.

PRACTICE QUESTION

S normally works a 35 hour week, and is paid Rs.5 per hour. In one week she works 12 hours of overtime, one hour each week day, and 7 hours on Saturday.

How much is her overtime-pay if:

(a) She is paid time and a half for all overtime hours?

(b) She is paid time and a half for evening overtime and double time for weekend overtime?

(c) She is paid time and a half for the first 8 hours overtime and double time thereafter?

Solution

S's overtime pay is:

(a) Basic rate of pay Rs. 5 per hour
Overtime rate of pay Rs. 5 x 1 ½ times = Rs. 7.50 per hour
Overtime pay 12 hours @ Rs.7.50 per hour = Rs. 90.00

(b) Basic rate of pay Rs. 5 per hour
Overtime rate of pay evenings Rs. 5 x 1 ½= Rs. 7.50 per hour Overtime rate of pay weekends Rs. 5 x 2 = Rs. 10.00 per hour

Overtime pay 5 hours @ Rs. 7.50 per hour		37.50
7 hours @ Rs. 10.00 per hour		70.00
		107.50

(c) Basic rate of pay Rs. 5 per hour
Overtime rate of pay -first 8 hours Rs. 5 x 1 ½ = Rs. 7.50 per hour
Overtime rate of pay-excess hours Rs. 5x2 = Rs. 10.00 per hour

Overtime pay 8 hours® Rs. 7.50 per hour	60.00	
4 hours® Rs. 10.00 per hour		40.00
		100.00

Salaried Staff

Not all salaried staff will be paid overtime. If they are, the rate at which overtime is paid may vary according to when the overtime is worked, in precisely the same way as for weekly paid employees. The difference is that the pay of salaried staff is usually expressed as an annual rate, and this must be converted to an hourly rate before the overtime can be calculated.

This is done by dividing the annual salary by 52 to give the weekly salary, and further dividing this by the number of hours an employee is contracted to work for.

It should be noted that the contract of employment may override this calculation, setting a rate of overtime pay.

PRACTICE QUESTION

Alee works a 35 hour week for an annual salary of Rs.18,200. He is expected to work up to 5 hours of overtime for no extra pay, but thereafter will be paid overtime pay at the rate of time and a half. One week he works 8 hours of overtime. What is his overtime pay?

Solution

Hint: *There are 52 weeks in a year and there are 35 working hours in a week*

Alee's basic hourly rate of pay is:

Rs.18,200 x 1/52 x 1/35 =Rs.10

The hourly rate of overtime pay, at time and a half is:

Rs.10 x 1 ½ =Rs.15.00

Alee will not be paid for the first 5 hours of overtime so his overtime pay is:

(8 - 5) hours = 3 hours @ Rs.15 = Rs.45.00

COMMISSION

In some jobs, employees may be remunerated by a basic salary, plus an additional amount specifically related to that employee's performance.

Commission is an amount paid to an employee based on that employee's performance.

Commission is most commonly paid to salesmen, based on the volume of sales that they have achieved in a given period. In some cases they may have a very low basic salary, so that commission forms the largest part of their pay.

In its simplest form, commission will usually be expressed as a percentage of sales achieved in the previous period e.g. 1% of sales.

Commission may also be paid at different scales, so that the higher the sales, the higher the commission. For example, a salesman may be paid 2% commission on the first Rs.10,000 of sales, 2.5% on the next Rs.10,000, and 3% on any additional sales.

This basis may be appropriate where an employee sells a large number of small value items. If he sells instead higher value contracts, the level of commission may vary with the value of the contract. For example the rate of commission may be 2% for contracts worth up to Rs.10,000, 2.5% for contracts worth up to Rs.20,000, and 3% for larger contracts.

Since the incentive is for the employee to make a large volume of sales, it is important for the employer to ensure that the salesman is only rewarded for good sales. The commission scheme may contain a proviso that the commission will only be paid once the customer has paid up, or once the customer's creditworthiness has been checked.

PRACTICE QUESTION

Haroon is a salesman, selling machinery. He receives a commission of 2% on all sales, with an additional 0.5% for any item of machinery selling for more than Rs.10,000. In addition he receives a further 0.5% on sales in excess of Rs.100,000 per month.

During July his total sales amounted to Rs.110,000. Included in this were two expensive machines, one selling for Rs.12,000, and the other for Rs.17,000.

How much commission does Haroon earn?

Solution

Haroon earns commission of:

	Rs.
Basic commission Rs.110,000 x 2%	2,200
Expensive machines Rs. (12,000 + 17,000) x 0.5%	145
Sales over Rs.100,000 Rs.(110,000-100,000) x 0.5%	50
Total commission	**2,395**

PROBLEM QUESTIONS

Q. 1

From the information given below calculate the earnings of each employee, under the following methods of wage payment.

(i) Halsey Premium Bonus Scheme.
(ii) Halsey-Weir Premium Bonus Scheme.
(iii) Rowan Premium Bonus Scheme.

Employee	**A**	**B**	**C**
Time allowed hours per 100 units	35	40	42
Wages per unit Rs.	2	3	4
Hourly rate Rs.	7	8	10
Actual time taken in hours	50	48	46
Actual units produced	200	150	125

Q. 2

Ten men work as a group. When the weekly production of the group exceeds standard (200 pieces per hour) each man in the group is paid a bonus for the excess production in addition to his wages at hourly rates. The bonus is computed thus:

The percentage of production in excess of the standard amount is found and one half of this percentage is considered as the men's share. Each man in the group is paid as a bonus this percentage of a wage rate of 50 paisa per hour. There is no relationship between the individual work man's hourly rate and the bonus rate. The following is one week's record:

Days	**Hours worked**	**Production**
Monday	90	22,100
Tuesday	88	20,600
Wednesday	90	24,200
Thursday	84	20,100
Friday	88	20,400
Saturday	40	10,200
Total	***480***	***117,600***

(i) Compute the rate and amount of bonus for the week.
(ii) Compute the total pay of "A" who worked 41 hours and was paid 35 paisa per hour basic and of "B" who worked 44 hours and was paid 30 paisa per hour basic.

Q. 3 Using the information given below you are required to calculate the amounts earned by each employee under each of the following remuneration methods:

(i) Piece work (with guaranteed hourly rates)
(ii) Hourly rate;
(iii) Bonus system (under which the employee receives *50% of* time savings).

Also calculate the gross wages paid to each employee under each of the above method.

	Employee A	Employee B	Employee C
Time allowed:			
Hours per 100 units	23	32	38
Price per unit in Paisa	12	20	15
Guaranteed hourly rate	Re. 0.60	Re. 0.75	Re. 0.50
Actual time taken in hours	40	42	39
Actual units produced	200	125	150

Q. 4

(a) How is incentive wages calculated under (i*)* Halsey and (ii) Rowan incentive schemes of wages payment? Explain the difference between them and the advantage to the worker under these two methods of incentive payment.

(b) From the following data tabulate the total earnings per hour of each worker separately under (i) Halsey and *(*ii*)* Rowan schemes of incentive payment.

(a) Worker	A	B	C	D	E	F
(b) Time allowed hrs.	3	4	5	6	7	8
(c) Actual time hrs.	5	3	4	5	3	3
(d) Basic wages per hrs. in Rs. 2	2	2	2	2	2	

Q. 5

Kirn is paid commission of 5% on the first Rs.20,000 of sales, and 7,5% on any sales in excess of this amount. However she is only paid the commission when either the customer has paid for the order, or has taken out a financing agreement.

In October she made sales of Rs.35,000, However two customers refused to pay or take out a financing agreement. One had ordered goods costing Rs.1,500, and the other goods costing Rs.2,500.

How much commission will Kirn receive?

LESSON # 13

PIECE RATE BASE PREMIUM PLANS

Piece Rate Wages

Under this method of remuneration a worker is paid on the basis of production and not lime taken by him to perform the work. This is one of the simplest and most commonly used of all incentive schemes. The rate is expressed in terms of certain sum of money for every unit produced, e.g. Rs 2 per unit. The formula is:

Units produced x *Rate per unit.*

Suppose a worker is paid Rs. 0.50 per unit and he produces 18 units in 7 hours. His total wages would be: 18 x Rs. 0.50 = Rs. 9.
However, a well regulated piece rate system has a guaranteed minimum wage.

Advantages of piece rate or piece work system:

1. There is a direct connection between effort and reward. Efficient workers are paid according to their performance and hence a sense of competition is created among workers.
2. Since there is a direct incentive to work there is always a tendency on the part of worker to produce more by adopting correct procedure and techniques of production.
3. The increased volume of production results in decreased cost of production specially overhead cost per unit.
4. Since the cost per unit is fixed computation of labor costs of production in advance is possible.
5. Under this system every worker assumes the responsibility of his time and output so there is considerable scope of reduction in managerial cost.
6. Since the payment is linked with results the idle time costs are reduced to minimum.

There are certain disadvantages of piece rate system:

1. At the initial stage, setting of piece rates or standard hours involves lot of difficulties and a considerable amount of expenditure has to be incurred- It is difficult to establish fair standard- If high standard or rates arc established, it is very difficult to reduce them subsequently.
2. Quality of work is another casualty of this system. Since the payment is made on the basis of output, every worker tempts to produce more and more irrespective of quality of product. This results in production of substandard items, high rate of rejection and ultimately increased cost of production per unit.
3. For the maintenance of quality of standards a rigid system of supervision and inspection is necessary.
4. The workers tend to work for longer hours in temptation to earn more- This leads to excessive fatigue, ill-health and risk of accident.
5. There is always danger to the flow of production and regularity of minimum wage to the workers. For some time a worker works with great zeal and enthusiasm to earn more and then absents himself from work or comes late. In all these cases not only the flow of production is adversely affected but also there is no certainly of regular payment of wages to the worker.
6. This system is unsuitable where the quality of work is given the lop preference.
7. Under this system a uniform rate is paid regardless of quality and quantity of work. There is no special incentive for exceptionally good workmanship and expertise, likewise, no

8. The system does not provide security of minimum payment of wages to the worker. Hence it is opposed by the trade unions on the ground that frequently workers are laid off or their remuneration is reduced due to lack of work or inefficiency of management.

These drawbacks are associated with the straight piece rate method, A well regulated piece rate system, with a guaranteed minimum wage rate of compensation is much superior over the time rate system. An improved version of straight piece rate is piece rate with guaranteed day rate. Under this system a worker receives the straight piece rate for the number of pieces he produces, provided that his total remuneration is more than his earnings on a time rate basis. If the piece rate earnings fall below the minimum level of his earnings then he is paid on the time rate basis. (per hour/per day).

Suitability of Piece Rate System

Piece rate system also known as 'payment by results' can be suitably applied under the following conditions:

(i) The amount of work can be precisely measured and standardised.
{ii) The work is of repetitive nature.
(iii) If the productivity is closely related to skill and efforts.
(iv) The unit cost can be easily determined and controlled.
(v) If it is possible to fix a fair and acceptable piece rate.
(vi) Where lime cards are maintained for ensuring, regularity and punctuality of workers and uninterrupted flow of production.
(vii) If there is no fear of unwarranted rate cutting by the management and the management realizes the significance of the system.

Differential Piece Rates:

There are various differential piece rate plans. The differential piece rate plans aim at maximum production by giving an additional incentive to increase output just at the stage at which the worker would otherwise begin to feel that further efforts was not worthwhile. These schemes are devised in such a manner that with the increase in efficiency of a worker his wages are automatically increased. Some of the differential schemes are:

(1) Taylor Differential Piece Rate Plan
(2) Merrick Differential Piece Rate Plan

Taylor's Differential Piece Rate Plan:

This system was originated by W.F. Taylor, the father of scientific management. It is based on the assumption that the degree of efficiency varies from worker to worker and hence the worker must be paid according to their degree of efficiency.

Under this system ***two piece rates are fixed***, one lower rate applicable to worker whose production is below standard and another higher rate and is applicable to a worker whose production is above the standard.

The efficiency of a worker may be determined as a percentage, either:

(i) of the time allowed for a job to the actual time taken, or
(ii) of actual output to the standard output, within a specified time.

For Example;

1.	Standard time allowed for a job	15 hours
	Actual time taken for the job	20 hours.
2.	Standard output	5 units per hr
	Actual output	6 units per hr

Efficiency under: (1) 15/20 x 100 = 75%

(2) 6/5 x 100 = 120%

Under this system no guaranteed time rate is given. Moreover, the difference between the two rates is very wide. The slow worker is penalized while the efficient worker is duly rewarded.

PRACTICE QUESTION

From the following particulars, calculate the earnings of workers under straight piece basis and Taylor's Differential Piece Rate Plan.

Standard Time per piece 20 minutes
Normal rate per hour Rs. 0.90
In a 9 hour day;
A produces 25 units
B produces 35 units
Differential to be applied 80% of piece rate below standard. 120% of piece rate at or above standard.

Solution:

Standard production per hour 60 min/20 min = 3 units
Standard production per day 3units x 9 hours = 27 units
Per Piece rate Rs. 0.90/3 units = Rs. 0.30

Efficiency of:
Worker "A" is less than 100%
Worker "B" is more than 100%

Wages under Straight Piece Rate Basic:

Earnings of A

No. of units X Rate per unit
25 x 0.30 = Rs. 7.50

Earnings of B
30 x 0.30 = Rs. 9.00

Wages Taylor's differential piece rate basis:

Efficiency of A 92.25%
Efficiency of B 111%
Low piece rate in case of A =80% of Rs. 0.30 =Rs. 0.24
High piece rate in case of B = 120% of Rs. 0.30 =Rs. 0.36

Earning of A 25 x 0.24 =Rs. 6-00
Earning of B 30 x 0.36 =Rs-10.80.

It is clear from the above results that worker with low efficiency gets less wages under Taylor's Differential Piece Rate System as compared to straight piece rate method.
The Taylor's Differential system is very beneficial to the efficient worker and is simple to understand and operate. However, it penalizes the inefficient workers.

Merrick Differential Piece Rate System:

Merrick Differential system is a slight modification of the Taylor's system and ***uses three rates*** instead of two. Under this system the worker is not penalized even if his performance does not exceed 80 per cent of the High Task. The three rates are as under:

Efficiency	upto 80%	Normal Piece rate applicable
	Upto 100%	10% above normal rate
	Above 100%	20% above normal rate

Under this system also day wages are not guaranteed. The following illustration makes the working of this system clear.

PRACTICE QUESTION

From the following particulars calculate the total earnings of the three workers who are paid wages under the Merrick Differential System.

Normal piece rate (upto 80% of High Task Output) Rs. 5 per unit
High Task 40 units per week
Output of the workers for the week.

A	32 units
B	37 units
C	42 units

Also find out their wages if they are paid on the straight piece rate basis.

Solution

Efficiency level:

A. 32/40 x 100 = 80%
B. 37/40 x 100 = 92.5%
C. 42/40 x 100 = 105%

Wages of A at normal rate (since his efficiency is below standard)
=32 x Rs.5=Rs 160.
Wages of B at normal rate plus 10% above normal rate (since his efficiency is above 80% of High Task but below 100 %.)
= 37x Rs. 5.50 = Rs. 193.50
Wages of C at normal rate plus 20% of normal rate (since his efficiency is above 100%)
= 42 x Rs.6 = Rs.252.

If Straight piece rates are paid:
Wages of A=32 x Rs.5 = Rs. 160
Wages of B=37 x Rs.5 = Rs. 185
Wages of C=42 x Rs.5 = Rs. 210
Thus it is very clear that even if the output of a worker is below standard, he is paid at normal rate of wages. Under this scheme bonus is within the reach of every worker since it is paid just at 80 per cent of the efficiency and is step-up after 10 per cent increase in output.

GROUP BONUS SYSTEMS

It is impossible for a worker of assembly line or manufacturing concern to increase his output without the assistance and co-operation of the entire group of workers. In such situations companies have successfully introduced group incentive schemes.

Common characteristics of group bonus schemes

(a) A standard time is set for the completion of a job.
(b) If the time taken is greater than the time allowed, the workers in the group receive time

(c) If the time taken is less than the time allowed, the group receives a bonus on time saved.

Advantages of group bonus systems

(a) Encouraging team spirit. Mutual dependence engenders mutual trust.

(b) Good group incentive plans assist in the reduction of labor turnover, accidents, spoilage, waste and absenteeism.

(c) Good output will qualify for bonus and this can be earned only if each member has performed his/her task satisfactorily. There is therefore a built-in system of inspection and such a scheme reduces the amount of supervision necessary.

(d) High output should result as the slower workers in the group follow the example of faster workers. The cost per unit should decrease as the fixed overhead will be spread over a greater number of units.

Disadvantages of group bonus schemes

(a) A faster worker in the group may real dissatisfy with his earnings; this may cause dissension within the group. In such cases he may be paid a higher rate;

Alternatively, he may be transferred.

(b) Sickness of members may cause the output of the group to suffer. For the incentive scheme to be successful, it is necessary lo have able substitutes to cover sickness, holidays and other absences.
(c) Additional administrative costs may result.

(d) In attempting to produce greater output, quality of the work may deteriorate and there could be excessive material wastage.

Total Wages

The total wages of a worker includes among others basic pay, dearness allowance, employer's contribution to provident fund and state insurance, and other benefits.

Some of these benefits are treated as part of ***direct labor costs*** while others are treated as ***indirect* labor costs**.

For the purposes of charging a particular job or jobs, the wage rate is to be ascertained. For this the total of all wages and benefits is found out and then divided by the effective hours worked. The wages rate thus derived would be labor cost per hour and the job should be charged accordingly. The operative part is explained with the help of the following practice question.

PRACTICE QUESTION

Q. 1

Calculate labor cost per man-day of 8 hours from the following particulars.

1. Basic Salary	Rs. 4 per day
2. Dearness Allowance	25 paisa, per every point over 100 cost of living index for working class. Current cost of living index is 500 points
3. Leave Salary	10% of (1) and (2)
4. Employer's contribution to provident fund	8% of (1) (2) and (3)
5. Employer's contribution to Pension fund	2.5% of (1) (2) and (3)
6. Labor amenities	Rs. 20 per head per month
7. Number of working days in a month	25 days of 8 hours each.

Solution

Statement of Labor Cost (per man-day of 8 boors)

Basic Salary	4.00
Dearness Allowance	4.00
Leave Salary-10%	0.80
Employer's contribution to Provident Fund	0.70
Employer's contribution to Pension Fund	0.22
Labor amenities	0.80
Total	**10.52**

Q. 2

The Lemon Car Company operates two shifts. The company's day shift pay rate is Rs. 15.00 per hour and the night shift pay rate is Rs. 15.50 for the same work (Rs.0.50 more per hour).

Pass appropriate accounting entry to record payroll of a night shift worker who works in 35 hours in the week.

LESSON # 14

LABOR TURNOVER AND LABOR EFFICIENCY RATIOS & FACTORY OVERHEAD COST

Labor Turnover:

Labor turnover may be defined as the rate of change in the composition of the labor force of an organisation high rate of labor turnover denotes that labor is not stable and there is frequent change in the labor force in the organisation. The high labor turnover rate is an important indication of high labor cost. It is therefore not desirable.

Measurement of Labor Turnover:

There are various methods for the measurement of labor turnover. The choice of method of measurement would depend on the organisation. But, however, once a particular method is adopted for it, it should be followed for quite some times, so that a clear and comparative picture is obtained. The methods of measurement are:

(1) Separation method;

Labor turnover is measured by dividing the total number of separations (workers left the organisation) during a period by the average number of workers on the pay roll.

Labor turnover

$$\frac{\text{Number of separations in a period}}{\text{Average number of workers in a period}} \times 100$$

(2) Flux method:

Labor turnover is measured by dividing the total number of separations and replacements by the average number of workers.

Labor turnover

$$\frac{\text{Number of separations + number of replacement}}{\text{Average number of workers during the period.}} \times 100$$

(3) Replacement method:

Labor turnover is measured by dividing the number of replacements during a period by the average number of workers employed in that period.

Labor turnover

$$\frac{\text{Number of workers replaced during the period}}{\text{Average number of workers during the period.}}$$

Average workers employed = Number of workers at the beginning of the period + Number of workers at the end of that period divided by 2.

PRACTICE QUESTION

The personnel department of a company has supplied the following information relating to its work force during the month of June, 2006.

Number of workers:

1st. June	1900
30th. June	2100

During the month 60 persons were discharged and 20 left the company. During the month 200 workers were engaged out of which only 40 workers were appointed against the vacancy caused by the number of workers separated and the remaining on account of an expansion scheme of the company.

Calculate labor turnover rate and equivalent rate under different methods.

Solution:

Average number of workers $\frac{1900 + 2100}{2} = 2{,}000$

1. Separation Method:

Labor turnover ratio $\frac{80 \times 100}{2{,}000} = 4\%$

Equivalent annual turnover $\frac{4 \times 365}{30} = 48.67\%$

2. Flux Method:

Labor turnover $\frac{80 + 40}{2{,}000} \times 100 = 6\%$

Equivalent annual turnover $\frac{6 \times 365}{30} = 73\%$

3. Replacement Method:

Labor turnover $\frac{40 \times 100}{2{,}000} = 2\%$

Equivalent annual turnover $\frac{2 \times 365}{30} = 24.33\%$

The working results of the above practice question reveals wide fluctuations among the different annual labor turnover rates obtained by different methods of measurement.
The flux method of labor turnover denotes the total change in the composition of labor force. While replacement method takes into account only workers appointed against the vacancy caused due to discharge or quitting of the organisation. This method does not take into account the workers employed under the expansion schemes of the company.
However, it must be noted that if a department is closed and workers retrenched, it would not be a case of labor turnover.
The higher percentage of labor turnover, the higher will be the cost of recruitment and training of new workers. A higher rate of labor turnover also reduces the efficiency since good deal of work would be done by new inexperienced workers. The objective of management therefore should be to keep the percentage of labor turnover at minimal. However, in any organisation a minimum rate of labor turnover will always occur particularly due to retirement, marriages, death and personal betterment.

Causes of Labor Turnover

Labor turnover arises because of various factors including dissatisfaction with job, low rate of wages, unsatisfactory working conditions and non-availability of adequate basic amenities.
The causes of labor turnover may be sub-divided as:

(1) Avoidable causes, and
(2) Unavoidable causes.

(1) Avoidable Causes:

a) These include low wages rate in the present organisation and the worker may look for higher wages elsewhere,
b) Dissatisfaction with job,
c) Bad working conditions,
d) Long and odd working hours,
e) Unsatisfactory relationship with the supervisors,
f) Bad relationship with the fellow workers,
g) Lack of adequate recreational facilities,
h) Inadequate housing, medical facilities,
i) Unfair methods of promotion and lack of promotions avenues,
j) Lack of planning and foresight on the part of management, seasonal nature of industry, non-availability of raw materials, power, etc.

(2) Unavoidable Causes include:—

a) Personal betterment of worker,
b) Retirement and death leading to labor turnover,
c) Domestic responsibilities—to look after old parents,
d) Accident or illness rendering workers permanently incapable to work,
e) Dismissal or discharge due to insubordination, negligence, inefficiency, etc.,
f) Marriages, specially in case of women workers,

Effect of Labor Turnover

The higher rate of labor turnover results in increased cost of production. This is due to—

(i) Increased cost of new recruitment, training,
(ii) Interruption of production,
(iii) Decrease in production due to inefficiency and inexperience of newly recruited workers,
(iv) The new workers are more accident prone and are liable to cause more damage to machinery, tools than old employees,
(v) Losses due to wastage, spoilage and defectives,
(vi) Increased number of accidents causing loss of output and increase in medical expenses and cost of repairs,
(vii) Lack of cooperation and coordination between old and new employees resulting fall in output and increased cost of production,

LABOR EFFICIENCY AND UTILISATION

Labor is a significant cost in many organisations and it is important to continually measure the efficiency of labor against pre-set targets.

Measuring labor efficiency

To measure labor efficiency: Compare actual efficiency with predetermined targets (or budgets) using 'standard hours'.

A standard hour is the number of production units which should be achieved by an experienced worker within a period of one hour.

We can assume that all organisations will benefit from efficient labor, thus it is important to measure how efficient workers are and identify opportunities for improvement.

The following practice question shows the calculation of the efficiency ratio.

PRACTICE QUESTION

Standard time allowed per unit	30 minutes
Actual output in period	840 units
Actual hours worked	410
Budget hours worked	400

The efficiency ratio is calculated by the following formula:

$$\frac{\text{Actual output measured in standard hours}}{\text{Actual hours}} \quad \frac{\text{Actual hours}}{}$$

840 x ½ hours (30 minutes) = 420 hours

$$\frac{420}{410} \times 100 = 102.44\%$$

Problem Question

Calculate the efficiency ratio from the following data.

Standard time allowed per unit	15 minutes
Actual production	900 units
Actual hours	250
Budget hours	200

FACTORY OVERHEAD COST (FOH)

Factory overhead costs are those costs incurred which cannot be identified directly to cost unit. These are incurred in many different parts of organisation.

These include:

1. Indirect materials
2. Indirect labor and
3. Indirect costs attributable to production and the service activities associated with manufacturing.

Marketing, general administration, research and development costs that are not associated with manufacturing are not usually treated as overheads for this purpose.

Factory overhead costs are incurred in three main centers:

- ***Production centers*** costs arising in production departments such as the costs of fuel, protective clothing, depreciation and supervision.
- ***Service centers*** the cost of operating support departments or sections within the factory, for example, the costs of materials handling, production control, and canteen.
- ***General costs centers***general production overhead such as factory rent/taxes, heating and lighting and production management salaries.

The purpose of cost accounting is to provide information to the management. Management need to know cost per unit as a basis for valuing inventory and for decision making.

FOH Cost Allocation & Apportionment

The total cost of factory overhead needs to be distributed among specific cost centers. Some items

can be allocated immediately, e.g. the salary of a cost centre supervisor or indirect materials issued to a cost centre. Other items need to be apportioned between a number of centers, e.g. factory rent and taxes or the factory manager's salary.

Cost Allocation

It refers to the costs that can be identified with specific cost centers.

Apportionment

It refers to the costs that cannot be identified with specific cost centre but must be divided among the concerned department/cost centers.

Steps of Allocation & Apportionment

1. Item wise collection of FOH cost.
2. Identifying cost centre (Production & Services).
3. Allocating and apportioning general F.O.H cost to the cost centers.
4. Apportioning FOH cost of service cost centers to the production cost centers.
5. Calculation of total FOH cost for each production cost centers.
6. Determining FOH rate for each production cost center.

FOH Absorption Rate

Finally FOH absorption rate is calculated at which the cost is absorbed in the cost unit. This is also known as overhead absorption rate (OAR) this can be calculated as under:

$$OAR = \frac{\text{Estimated F.O.H cost}}{\text{Base}}$$

Bases for FOH Absorption Rate

Following can be used as base to calculate overhead absorption rate:

1. Direct Labor hours
2. Machine hours
3. No. of unit produced
4. Direct labor cost
5. Prime cost

Problem Question

Apportion each of the cost given in four cost centers A, B, C, and D

Supervision	Rs. 7,525
Indirect workers	6,000
Holiday pay & national Insurance	6,200
Tolling cost	9,400
Machine Maintenance labor cost	4,500
Powers	1,944
Small tools & Supplies	1,171
Insurance of machinery	185
Insurance of building	150
Rent & rates	2,500
Depreciation of machinery	9,250

Basis of apportionment of different costs:

	A	B	C	D	Total
1. Floor Space	1,800	1,500	800	900	5,000
2. Kilowatt hours	270,000	66,000	85,000	65,000	486,000
3. Cost of machine	30,000	20,000	8,000	16,000	74,000
4. Indirect workers	3	3	1	1	8
5. Total workers	19	24	12	7	62
6. Machine maintenance hrs	3,000	2,000	3,000	1,000	9,000
7. Supervision cost	2,050	2,200	1,775	1,500	7,525
8. Tooling cost	3,500	4,300	1,000	600	9,400
9. Small tools & supplies	491	441	66	173	1,171
10. Machine running hours	30,000	36,000	19,000	8,000	93,000

LESSON # 15

ALLOCATION AND APPORTIONMENT OF FOH COST

Bases for apportioning costs

In selecting a basis for apportioning an overhead item, the cost of obtaining a high degree of accuracy must be considered. For example, the charge for heat and light could be shared on the basis of a complex formula incorporating power points, light bulbs and wattage but you should be aware that the end result will still be open to question. When answering examination questions, you may have to use your own judgment in relation to the information given as it is impracticable to provide a comprehensive list of bases to cover every situation.

Practice Question

Plastic Pots & Furniture
Basis of Apportionment

	Production Department			Service Department	
	Molding	**Machining**	**Finishing**	**Canteen**	**Maintenance**
Materials (Rs.)	300,000	130,000	45,000	40,000	75,000
Wages (Rs.)	400,000	750,000	755,000	95,000	100,000
Cost of Assets (Rs.)	125,000	250,000	130,000	70,000	75,000
Horse Power Hour	700	1,400	600	88	200
Area in Sq. Yard	180	180	240	60	60
Metered Units	6,000	6,000	7,000	2,000	3,000
No. of Employees	240	300	380	30	80

Plastic Pots & Furniture
Work Sheet
Apportionment of Factory Overhead Product Department

Cost Heads	**Production Department**			**Service Department**		**Total**
	Molding	**Machining**	**Finishing**	**Canteen**	**Machine Maintenance**	
Allocated Cost (Identified)						
Materials				**40,000**	**75,000**	**115,000**
Labor Wages				**95,000**	**100,000**	**195,000**
				135,000	**175,000**	**310,000**
Electricity	**13,500**	**13,500**	**15,750**	**4,500**	**6,750**	**54,000**
Bonus Pay	**4,000**	**7,500**	**7,550**	**950**	**1,000**	**21,000**

Factory Rent	**60,000**	**60,000**	**80,000**	**20,000**	**20,000**	**240,000**
Power	**175,000**	**350,000**	**150,000**	**22,000**	**50,000**	**747,000**
Depreciation	**37,500**	**75,000**	**39,000**	**21,000**	**22,500**	**195,000**
c/f				**203,450**	**275,250**	**156,700**

Apportionment Electricity

Basis: Metered units

Canteen	Machine Maintenance	Molding	Machining	Finishing	Total
2,000	3,000	6,000	6,000	7,000	24,000
2	3	6	6	7	24
2/24	3/24	6/24	6/24	7/24	

Molding	54,000x 6/24	13,500
Machining	54,000x 6/24	13,500
Finishing	54,000x 7/24	15,750
Canteen	54,000x 2/24	4,500
Machine maintenance	54,000x 3/24	6,750

Apportionment Bonus Pay

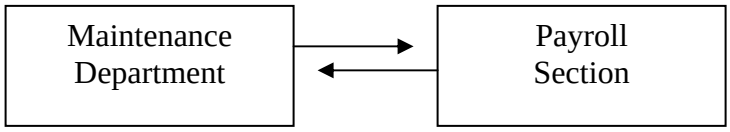
Basis: Labor wages

Molding	Machining	Finishing	Canteen	Machine Maintenance	Total
400,000	750,000	755,000	95,000	100,000	2,100,000
400	750	755	95	100	2100
400/2100	750/2100	755/2100	95/2100	100/2100	

Molding	21,000/2100*400	4,000
Machining	21,000/2100*750	7,500
Finishing	21,000/2100*755	7,550
Canteen	21,000/2100*95	950
Machine maintenance	21,000/2100*100	1,000

Reciprocal costs between service centers

A particular problem arises when service centers provide reciprocal services to each



In this situation, a secondary allocation of costs arises. There are a number of methods of dealing with this, of which the simplest, the repeated distribution method, is shown below.

Repeated distribution method

This method takes each service department in turn and re-allocates its costs to all departments which benefit. The re-allocation continues until the numbers being dealt with become very small.

Problem Question

	Production			Serv*ice*	
Department	***A***	***B***	***C***	***P***	***Q***
Costs Proportion	Rs.3,000	Rs.4,000	Rs. 2,000	Rs.2,500	Rs.2,700
P Proportion	20	30	25	-	25
Q	25	25	30	20	-

Apportion the cost of Service department to the Production departments. To calculate the cost of a cost unit we must include a fair share of all costs incurred in its production. If more than one product is made. This will include allocation and apportionment.

Blanket v departmental absorption rates

Blanket rates

A blanket absorption rate is a single rate of absorption used throughout an organization's production facility and based upon its total production costs and activity.

The use of a single blanket rate makes the apportionment of overhead costs unnecessary since the total production costs are to be used. How ever this is not recommended for the following reasons:

- It relies on a single activity measure being appropriate for the entire production function.
- It does not distinguish between the miming costs of particular activities or departments when absorbing costs into cost units.

Departmental rates

A departmental absorption rate is a rate of absorption based upon the particular department's overhead cost and activity level

This method allows the activity of each department to be measured using a basis which is appropriate. It also ensures that the cost attributed to the cost unit reflects the cost of the departmental resources used in its cost units.

LESSON # 16

FACTORY OVERHEAD COST
(Apportionment & Variance Analysis)

Reciprocal Apportionment

This method recognizes the fact that if a service department receives from other service e department, the department receiving services should be charged. Thus the costs of interdepartmental services are taken into account on reciprocal basis.

There are two main methods which may be used for reciprocal distribution:

1. Repeated distribution method
2. Algebraic method

Repeated distribution method

Under this method, the total of overhead costs of the service departments are distributed to other service and product ion department according to the given percentage till the expense of all service departments are exhausted or remains insignificant.

PRACTICE QUESTION

Following is the cost of summary of allocated indirect cost of an organization

Machining	Finishing	Maintenance	Air-conditioning	Allocated indirect cost
100,000	70,000	40,000	30,000	240,000

The above costs of service departments are apportioned among the departments in the following ratios.

	Machining	Finishing	Air-conditioning
Maintenance Appropriation	60%	15%	25%
Air Conditioning	70%	25%	5%

			Production		Service	
	Allocate Indirect cost		Machining	Finishing	Maintenance	Air-conditioning
	Rs. 240,000		100,000	70,000	40,000	30,000
	Maintenance		24,000	6,000	(40,000)	10,000
	Air-conditioning		28,000	10,000	2,000	(40,000)
	Maintenance		1200	300	(2,000)	500
	Air-conditioning		350	125	25	(500)
	Maintenance		15	3.50	(25)	6.50
	Air-conditioning		5	1.50	0.50	(6.50)
			153,570	86,430		

Solution (Algebraic method)

Maintenance Dept = X = (40,000)+5% of Air condition
Air conditioning Cost = Y = (30,000)+25% of maintenance
X =40,000+5% of y
X = 30,000 + 25% of x
X =40,000+0.05(30,000+0.25x)
X =40,000+1500+0.0125x
X =0.0125x = 41,500
0.9875x = 41,500
X = 41,500
0.9875

Cost of Maintenance Dept
X = 42,025
Y = 30,000 + 25% of x
Y = 30,000 + 0.25 (42,025)
Y = 30,000 +10,506 = 40,506
Y = 40,506

Apportionment

Machinery	Finishing	Maintenance	Air-condition
1,00,000	70,000	40,000 (42,025)	30,000
25,215	6,304	2,025	10,506 (40,506)
28,354	10,127	2,025	40,506
1,53,569	86,431	0	0

Over/under-absorption of overhead

In the previous LESSON s reference was made to an accounting problem associated with the use of predetermined absorption rates.
Where the amount of overhead absorbed exceeds the actual overhead cost incurred, the excess is known as over-absorption; if the amount absorbed is less than the cost incurred then the difference is know as under-absorption.

Accounting *for* over/under absorptions

The extent of any over/under-absorption is a balancing figure in the production overhead account. This is normally transferred to the costing profit and loss account each month. Though it may be carried forward in the production overhead account until the end of the year when any net over/under-absorption for the year is transferred to profit and loss account. This treatment, it is argued, is reasonable because the predetermined absorption rate is based on annual costs and activity levels.

PRACTICE QUESTION

Q. 1

From the following data calculate the over/under absorption and show how the transactions would be recorded in the production overhead account.

Absorption rate = Rs.5.00 per direct labor hour
Number of direct labor hours = 1,400
Production overhead incurred = Rs. 6,900

Solution	**Rs.**
Production overhead absorbed = Rs.5.00 x 1,400	7,000
Production overhead incurred	6,900
Over-absorption	**100**

Production overhead account

	Rs.		Rs.
Creditors	6,900	Work-in-progress	7,000
Balance (over-absorption)	100		
	7,000		7,000

Q. 2

From the following data relating to four departments of a factory you are required to:

(a) Journalize departmental overheads incurred
(b) Journalize departmental overheads recovered
(c) Give the journal entry recording under or over-absorbed overhead expenditure.

	Actual expenses Rs.	*Absorption rates (based on pre-determined annual estimates}*
Department A	1,000	Rs.0.10 per machine hour
Department B	4,000	Rs.0.75 per direct labor hour
Department C	7,000	100% on direct wages
Department D	3,500	Rs.0.25 per unit

	Machine hours worked	*Direct labor hours worked*	*Direct wages*	*Units produced*
			Rs.	
Department A	10,000	11,000	6,000	100,000
Department B	3,000	5,300	6,000	48,900
Department C	6,000	18,000	6,800	52,000
Department D	14,000	30,000	10,000	13,800

Solution

(a) Departmental overheads incurred.

	Dr -	*Cr*
	Rs.	*Rs.*
Department A overhead account	1,000	
Department B overhead account	4,000	
Department C overhead account	7,000	
Department D overhead account	3,500	
Factory overhead control account		15,500
Transfer of actual departmental expenses for period	15,500	15,500

(b) Departmental overheads recovered

	Dr	*Cr*
	Rs.	*Rs.*
Work in progress account	15,225	
Department A overhead account		1,000
Department B overhead account		3,975
Department C overhead account		6,800
Department D overhead account		3,450
Transfer of absorbed departmental expenses for period	**15,225**	**15,225**

(c) Under- or over-absorbed overhead expenditure

	Dr ***Rs.***	***Cr*** ***Rs.***
Profit and loss account	275	
Department B overhead account		25
Department C overhead account		200
Department D overhead account		50
	275	
		275

Transfer of under-absorbed departmental expenses for period

(c) Under or over-absorbed overhead expenditure

Department A	10.000 machine hours x Rs.0.10	1,000
Department B	5.300 labor hours x Rs.0.75	3,975
Department C	100% of Rs.6.800	6,800
Department D	13,800 units x Rs.0.25	3,450

If predetermined absorption rates are used. It is likely that there will be under or over-absorption of overheads. This is the balance on the production overhead account and will be debited or credited in the costing profit and loss account.

Absorption of non-production costs

Non-production costs are costs incurred for non-manufacturing reasons such as administration or selling and marketing cost.
The cost of administration, marketing, research and development etc. has a great impact on the fortunes of a business, and thus must be allowed for in cost-per-unit. Calculations which provide information for cost control and disclose the effect of management decisions on other function costs, and *vice versa.*

Marketing

Marketing comprises the activities of selling, publicity and distribution.
The cost accounting system should show:

- Suitable cost centre analysis to identify costs with responsibility
- Analysis between fixed and variable, especially for distribution costs, e.g. packaging and delivery
- Statistical bases to measure and compare costs**,** e.g. salesmen's calls, number of orders

General administration

General administration represents the costs of general management, secretarial accounting and administrative services except for any such costs which can be directly related to production, marketing, research or development.
Once again the cost accounting emphasis will be on analysis by cost centre for control.

Research and development

Research costs are those incurred in seeking new or improved products or methods. Development costs are those incurred by those stages from decision implementation to production.
Cost analysis will usually relate to natural classification, such as materials or laboratory services and will accumulate costs by specific project.

Attributing non-production costs to output

IAS 2 regulates the valuation of stocks and work-in-process for financial accounting purposes and states that only production costs should be included in stock valuations. This defeat the argument for attributing non-production costs to output. However, as has been stated above, such costs are often significant, and their inclusion in internal unit costs may be necessary in order to ensure that they are fully recognized in any pricing policy discussions undertaken by management accountants.

For pricing purposes the most common method of attributing non-production costs to output units is by an absorption rate calculated as a percentage of production cost. The alternative to this is to treat non-production overheads as period costs and write them off in full as an expense of the period in which they are incurred, with no absorption into units produced in the period.

Multiple Choice Questions

1 The following statements relate to the effects or advantages of using a predetermined overhead absorption rate, rather than calculating overhead costs on the basis of actual costs and actual activity levels.

(a) IAS 2 requires the absorption of production overhead to be based on normal levels of activity rather than actual levels of activity.
(b) Using a pre-determined absorption rate avoids fluctuations in unit costs caused by abnormally high or low overhead expenditure or activity levels.
(c) The net profit each year, allowing for the under- or over-absorbed overhead adjustment to profit, will be the same with pre-determined overhead rates as with actual rates.
(d) Using a pre-determined absorption rate offers the administrative convenience of being able to record full production costs sooner.

All of these statements are correct except:

A. Statement (a)
B. Statement (b)
C. Statement (c)
D. Statement (d)

2 What is cost apportionment?

A. The charging of discrete identifiable items of cost to cost centers or cost units
B. The collection of costs attributable to cost centers and cost units using the costing methods, principles and techniques prescribed for a particular business entity
C. The process of establishing the costs of cost centers or cost units
D. The division of costs amongst two or more cost centers in proportion to the estimated benefit received, using a proxy, e.g. square feet

3 Grumpy & Dopey Ltd estimated that during the year 75,000 machine hours would be used and it has been using an overhead absorption rate of Rs.6.40 per machine hour in its machining department. During the year the overhead expenditure amounted to Rs.472,560 and 72,600 machine hours were used.

Which one of the following statements is correct?

A. Overhead was under-absorbed by Rs.7,440
B. Overhead was under-absorbed by Rs.7,920
C. Overhead was over-absorbed by Rs.7,440
D. Overhead was over-absorbed by Rs.7,920

PROBLEM QUESTION

You are the cost accountant of an industrial concern and have been given the following budgeted information regarding the four cost centers within your organisation.

You also ascertain the following points:

(i) The canteen staff is outside contractors.
(ii) Departments 1 and 2 are production cost centers and the Maintenance department and Canteen are service cost centers.
(iii) The Maintenance department provides 4,000 service hours to Department 1 and 3,000 service hours to Department 2
(iv) Department 1 is machine-intensive and Department 2 is labor-intensive.
(v) 6,320 machine hours and 7,850 labor hours are budgeted for Departments 1 and 2 respectively for 2006.

Required

Prepare an overhead cost statement showing the allocation and apportionment of overhead to the four cost centers for the year 2006, clearly showing the basis of apportionment. Consider the following given information:

	Dept 1	Dept 2	Maint-enance	Canteen	Total
	Rs.	*Rs.*	*Rs.*	*Rs.*	*Rs.*
Indirect labor	60,000	70,000	25,000	15,000	170,000
Consumables	12,000	16,000	3,000	10,000	41,000
Heating and lighting					12,000
Rent and rates					18,000
Depreciation					30,000
Supervision					24,000
Power					20,000
					315,000

You are also given the following information:

	Dept 1	*Dept 2*	*Mainte dept*	*Canteen*	*Total*
Floor space in square meters	10,000	12,000	5,000	3,000	30,000
Book value of machinery in Rs	150,000	120,000	20,000	10,000	300,000
Number of employees	40	30	10		80
Kilowatt hours	4,500	4,000	1,000	500	10,000

LESSON# 17

FACTORY OVERHEAD COST (Contd.)

Overhead Absorption Rate

After preparing estimates of factory overhead for production departments, the next step is to select a factory overhead absorption base for each production department. The base to be selected for this purpose should be the principal cost deriver of factory overhead of the department.
Cost Driver is defined as a measure of activity the magnitude of which influences if magnitude of cost of relevant cost objectives. In other words Factory overhead application base should be a measure of activity which has causal relation with incurrence of factory overhead.
The most simple and direct measure of activity of a manufacturing concern is number of units produced. It can be safely regarded as the best cost driver for the purpose of factory overhead absorption in such situations where there is a mass production of homogeneous units (i.e. process costing industries) or where a few products are produced in batches (i.e. batch costing industries). In process costing industries like sugar, cement etc. Kg. or a bag may be regarded as unit of output; a bottler may use a bottle or a liter as a unit of output. In bate costing industries the activity is measured "in equivalent number of units produced.
For example, a chip-board factory produces three grades of chip board say A, B, and C and a square foot is used as the unit to measure out put. Technical estimates reveal that factory overhead cost of one square foot of grade B and grade C is respectively one-half and one-fourth of grade A. In other words proportion of factory overhead cost of one square foot of chip board among the three grades is 4:2:1. Consequently, for the purpose of factory overhead absorption one square foot of grade A, B, and C shall be regarded as equivalent to 4 Sq, Ft. 2 Sq, Ft. and 1 Sq. Ft. respectively.
On the other hand in job costing industries each unit of output is quite different from the other. For example, a furniture manufacturer produces chairs (study chairs, office chairs, easy chairs, dining chairs), tables. (study tables. office tables, dining tables, dressing tables), beds (doubly beds. single beds) and many other items, each according to specifications of customers. In such a situation because of the dissimilarities, a unit of output can neither be used to measure the activity nor as base for factory overhead absorption. Therefore, some other common denominator should be adopted to measure the activity and as base for applying factory overhead to the products. Basis generally selected for this purpose are listed below in descending order of frequency of use:

1. Direct labor cost;
2. Direct labor hours;
3. Machine hours;
4. Direct materials cost;
5. Prime cost.

No hard and fast rule regarding selection of the absorption base can be prescribed. However, two guiding principles in this respect are: (i) the selected base should give accurate results, and (ii) cost of operating the base should not be greater than the benefit derived from accuracy.
Many times we find that factory overhead cost fluctuates with time spent on the products or Jobs, therefore, direct labor hours and machine hours are more suitable cost derivers. But use of direct labor hours or machine hours as factory overhead absorption base requires additional cost and clerical efforts to collect data of time spent on each job, Consequently, for the sake of convenience, management may decide to adopt direct labor cost as base for applying factory overhead, provided that it also gives approximately correct results. Use of direct materials cost as factory overhead absorption base is rarely recommended because prices of materials are subject to violent fluctuation as well as direct materials cost seldom represents a cost driver of factory overhead. Same is the case with prime cost as a base for factory overhead absorption.

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PRACTICE QUESTION

Units of output as the Absorption Base.
Babul Bottlers produces "Bubble Drink" which is filled in bottles of three sizes i.e. 25 ml. 1 liter and 5 liters. The firm assigns factory overhead cost to its products by using a predetermined factory overhead absorption rate calculated on the basis of units of output. Technical studies reveal that proportion of factory overhead incurred on one bottle of each size mentioned above is 1:2:4 respectively. Estimated production during the coming year is as follow:

Bottle Size	Production
250 ml.	80,000 bottles
1 liter	70,000 bottles
5 liter	20,000 bottles

Estimated factory overhead cost for the coming year is Rs 360.000
Required: Calculate predetermined factory overhead rate for each size of bottle.

Solution:

Bottle Size	Estimated output Bottles	Points Assigned	Estimated Total Points	Estimated FOH Per Point	Estimated FOH for Each Size	Predetermine FOH rate per Bottle
				Rs.	Rs	Rs.
250 ml.	80,000	1	80,000	1.20	96,000	1.20
1 liter	70,000	2	140,000	1.20	168,000	2.40
5 liter	20,000	4	80,000	1.20	96,000	4.80
			300,000		360,000	

Notes:
Estimated FOH per point= Total FOH/Total point = Rs. 360.000/300.000 point
Estimated FOH for each size Predetermined FOH rate per bottle=Rs. 1.20 = Estimated FOH per point or Estimated points of each size = Estimated FOH for each size/Estimated output of each size

Q. 2
Following figures are presented to you by Alfa Manufacturing Company.

Items	Budgeted Figures for operations During 2006		Actual Figures for operations during January 2006	
	Dept A	Dept B	Dept A	Dept B
Direct materials (Rs) Direct	6,000,000	2,400,000	50,000	250,000
labor (Rs.)	1,500,000	1,200,000	145,000	105,000
Factory overhead (Rs.)	1,200,000	1,800,000	14,000	9,500
Direct labor hours	150,000	100,000	26,000	28,000
Machine hours	300,000	360,000		

(i) Calculate predetermined factory overhead absorption rates for the departments using five different bases. (Present your answer by enlisting the rates in descending order of approximate frequency of their use).

(ii) Calculate total product cost of output during January 2006 under all of the three bases,

Solution:

(i) Predetermined Factory Overhead Absorption Rates:

FOH Absorption Bases	Predetermined FOH Absorption Rates	
	Department	Department B
(1) Direct labor cost base	80%	150%
(2) Direct labor hours base	Rs.8	Rs 18
(3) Machine hours base	Rs.4	Rs. 5
(4) Direct materials cost base	20%	75%
(5) Prime cost base	16%	50%

NOTE:

FOH absorption rate = Estimated FOH for the year x 100 (if base is in Rs)
Estimated base for the year

Total Product Cost for January 2006

Particulars	(1) Direct Labor Cost Base	(2) Direct Labor Hours Base	(3) Machine Hours Base
Department A Direct materials	Rs. 450,000	Rs. 450,000	Rs. 450,000
Direct labor	145,000	145,000	145,000
Factory overhead applied	116,000	112,000	104,000
Total Department B: Direct materials	711,000	707,000	699,000
	250,000	250,000	250,000
Direct Labor	105,000	105,000	105,000
Factory overhead applied	157,500	171,000	140,000
Total	512,500	526,000	495,000
Total product cost	1,223,500	1,233,000	

NOTES:

Factory Overhead Applied:

Department A:

(1) Rs 145,000 x 80% = Rs. 116,000

(2) 14,000 hours x Rs 8 = Rs. 112,000

(3) 26,000 hours x Rs. 4 = Rs, 104,000

Department B:

(1) Rs, 105.000 x 150%= Rs, 157,500

(2) 9.500 hours x Rs. 18 = Rs. 171,000

(3) 28,000 hours x Rs. 5 = Rs. 140,000

Selection of Capacity Level

Capacity Level means ability to produce. The term is synonymous as Activity Level or Volume. Industries producing homogeneous units may express their capacity level in terms of units of output, whereas, Job costing industries may measure it in terms of direct labor cost, direct labor hours, machine hours etc.

For the purpose of calculating predetermined factor overhead absorption rate it is necessary to select an appropriate capacity level at which the cost and the cost driver should be estimated.

In cost accounting literature we find reference to following types of capacity levels.

Theoretical Capacity It is the maximum capacity level that could be achieved if there were 100% utilization of time. This capacity level can never be achieved because of unavoidable interruptions e.g. Fridays, holidays, repair and maintenance, machine breakdown, electricity breakdown, shortage of materials, lack of demand etc. Theoretical capacity is the starting point for measurement of practical capacity.

Practical Capacity It is the maximum capacity level that can he attained under efficient working conditions. When loss of time due to unavoidable interruptions as mentioned above, is deducted from theoretical capacity the remainder is practical capacity.

Expected/Normal Capacity It is the capacity level expected to be attained during the accounting, year. Expected/normal capacity is dependent of market demand for the products. It may be equal to or less than the practical capacity.

Most of the experts make a slight difference between expected and normal capacity. They are of the opinion that normal capacity is the average of expected capacity over a number of years. This average is used to smooth the seasonal, cyclical and trend variations over the years.

Selection of an appropriate capacity level is necessary because:

(1) Fixed factory overhead absorption rate is inversely related with capacity level i.e. the fixed rate is higher at a lower capacity level and it is lower at a higher capacity level,

(2) Amount of unabsorbed fixed factory overhead at the end of an accounting period is used to denote cost of failing to achieve the target production i.e. cost of unutilized capacity (the idle capacity variance to be discussed later).

Practical capacity is seldom selected for the purpose of budgeting. It is the expected/normal capacity that is used to budget or estimate the costs. Long term planning prospective advocates selection of normal capacity level. However, on account of difficulties in estimating with reasonable accuracy beyond one year. expected actual capacity is most commonly adopted.

Following practice question shows affects of capacity level on factory overhead, application rate and on the amount of unabsorbed fixed factory overhead.

PRACTICE QUESTION

At beginning of the year 2006 Shahbaz & Co. estimated its fixed factory overhead at Rs. 350,000 and variable factory overhead at Rs. 500,000 for a normal volume of 125,000 units. Practical volume was estimated at 140,000 units per year. During 2006 the company could produce only 100,000 units.

Required: Compute each of the following on the bases of (i) Expected volume and (ii) Practical volume:

(a) Predetermined factory overhead application rate:
(b) Amount of factory overhead applied during 2006 and

Solution:

(a) Predetermined Factory Overhead Application Rate ;

Estimated Factory Overhead
Estimated Capacity Level

(i) At normal capacity

(Rs. 350,000 Fixed + Rs 500,000 Variable) = Rs 6.80 per unit
125,000 units

(ii) At practical capacity level

(Rs. 350,000 Fixed + Rs. 500,000 Variable) = Rs 6.07 per unit
140,000 units

(b) Factory Overhead Applied During 2006:

Capacity attained x Factory overhead application rate at normal capacity

(i) Using the rate at expected capacity

100.000 units x Rs 6.80 = Rs. 680,000

Blanket Rate

A blanket absorption rate is a single rate of absorption used throughout an organization's production facility and based upon its total production costs and activity.

The use of a single blanket rate makes the apportionment of overhead costs unnecessary since the total production costs are to be used. How ever this is not recommended for the following reasons:

- It relies on a single activity measure being appropriate for the entire production function.
- It does not distinguish between the miming costs of particular activities or departments when absorbing costs into cost units.

Accounting for Factory Overhead Cost

Factory overhead cost includes indirect materials cost, indirect labor cost and other indirect manufacturing costs.

Most of the factory overhead cost items are recorded (identified) straight away as factory overhead cost; these include some sort of indirect material items, indirect labor, electricity, insurance, rent, repair etc. etc. Accounting entry for these costs is:

Factory overhead control a/c	xxx	
Bank/cash/accounts payable a/c		xxx

Some of the factory overhead cost items are allocation or transfer of cost from another accounting head. Accounting entry for these costs is:

Factory overhead control a/c	xxx	
Depreciation a/c		xxx
Prepaid rent a/c		xxx
Etc. .		xxx

Applied factory overhead is entered in the work in process account. In order to journalize total

Work in process control a/c xxx
Factory overhead applied a/c xxx

The amounts are then posted to relevant ledger accounts.

Actual factory overhead continues to accumulate on debit side of factory overhead control account throughout the year and applied factory overhead cost on credit side of factory overhead applied account. At the end of year factory overhead applied account is closed to factory overhead control account by passing following accounting entry:

Factory overhead applied a/c xxx
Factory overhead control a/c xxx

Actual and applied overhead are never equal. They could be equal only when estimates of factory overhead cost and the capacity level prepared for calculating the absorption rate are 100% correct. In practice it is impractical to achieve this much accuracy. As a result, after the close of applied account, factory overhead control account shows either a debit balance representing under applied factory overhead or a credit balance representing over applied factory overhead.

Under applied factory overhead means that factory overhead cost charged to production is less than the actual factory overhead and the cost of production is understated.

On the other hand over applied factory overhead means that factory overhead charged to production is more than the actual factory overhead and the cost of production is overstated.

This under or over applied balance is disposed off by adopting anyone of the following four methods.

1. Adjusting Cost of Entire Production of the Period.

This is the most accurate method and gives correct figures for income determination and for balance sheet. At the end of a year total production of the year stands divided into

a) cost of goods sold,
b) finished good inventory' and
c) work in process inventory.

An under or over absorbed factory overhead means respectively under or overstated cost of goods sold, finished goods inventory and work in. process inventory. Therefore mathematically correct method is to adjust all of these three accounts by distributing under or over applied overhead to these accounts in the proportion of their respective balances.

Assume that at the end of year factory overhead control account shows an over applied balance of Rs. 100,000. Balances of cost of goods sold, finished goods and work in process control accounts are Rs. 1,600,000 .Rs. 300,000 and Rs. 100,000 respectively. The over applied factory overhead shall be disposed off by passing following entry in general journal.

Factory overhead over-applied a/c	100,000	
Cost of goods sold a/c		80,000
Finished goods a/c		15,000
Work in process a/c		5,000

The above entry closes factory overhead control account and reduces the balance of cost of goods sold, finished goods, and work in process control accounts by the accounts by which these are overstated. Had the factory overhead cost under absorbed, the above entry would have been reversed.

1. **Closing the Variance to Cost of Goods Sold.**

Posting of under or over applied factory overhead to the subsidiary ledgers of finished goods and work in process control accounts is a tedious .job requiring much clerical efforts especially in job-order and batch costing industries, Therefore, when the amount of under or over absorbed factory' overhead is insignificant. The cost accountants prefer to close it only to cost

of goods sold. In this case the entry to be passed in general journal to dispose off an over applied balance is as follow:

Factory over head over-applied a/c		xxx
	Cost of goods sold a/c	xxx

Obviously the entry to dispose of an under applied balance shall be opposite to the above entry. This method though theoretically not very sound, is justified on the ground of convenience.

2. **Closing the Variance to Income Statement.**

Where factory overhead variance is on account of some abnormal factors e.g. idle capacity caused by strikes or lockouts, unlawful spending, poor utilization of production facilities, mismanagement in production etc. the amount of variance is closed to Income Summary/Profit and Loss Account. The above noted factors result in under absorption of factory overhead. The general journal entry to dispose off such under applied factory overhead is as follow:

Income summary/Profit & loss a/c		xxx
	Factory overhead under-applied a/c	xxx

In this case, cost of goods sold at normal is deducted from the net sales. The resulting gross profit is termed as gross profit at normal. Then from the gross profit at normal amount of under absorbed factory overhead is deducted and the remainder is called gross profit at actual. Alternatively this amount of under absorbed factory overhead may also be deducted from the net profit/income.

PRACTICE QUESTION

City Links Limited applies factory overhead @ 60% of direct labor cost. During the year just completed following actual costs were recorded:

Direct labor cost	Rs. 580,000
Factory overhead cost	Rs. 428,000

At the end of the year following balances appear in some of the control accounts:

Cost of goods sold	Rs. 1,750,000	
Finished goods	Rs.	500,000
Work in process	Rs.	250,000

Required:

a) Determine under or over applied factory overhead.
b) Pass accounting entry to close factory overhead applied account at the end of year.
c) Pass accounting entries to dispose off under or over applied factory overhead in following cases:

i) The variance is regarded as a significant amount.
ii) The variance is regarded as an insignificant amount.
iii) The variance is regarded as cause by poor scheduling of production and excessive spending.

Solution:

(a) Under or Over applied Factory Overhead:

Actual factory overhead	Rs. 428,000	
Capacity attained x application rate		
Rs. 580,000 x 60%		348,000
Under applied		80,000

(b) Entry to Close Factory Overhead Applied a/c:

	Factory overhead control a/c		348,000
	Under applied Factory overhead a/c	80,000	
	Factory overhead control a/c		80,000

(c) Entries to dispose off under or over applied Factory Overhead:

(i)	Cost of goods sold a/c	56,000	
	Finished goods a/c	16,000	
	Work in process a/c	8,000	
	Factory overhead under applied a/c		80,000

Rs. 80,000 x 1,750 =Rs. 56,000
2,500 x 500 =Rs. 16,000
x 250 =Rs. 8,000

(ii)	Cost of goods sold a/c	80,000	
	Factory overhead under applied a/c		80,000
(iii)	Income summary a/c	80,000	
	Factory overhead under applied a/c		80,000

Factory overhead variance means the difference between actual factory overhead incurred and factory overhead applied during the year. Under applied factory overhead is regarded as an unfavorable sign because actual factory overhead cost is greater than the factory overhead absorbed by the production, On the other hand. Over applied factory overhead is considered as favorable sign because actual factory overhead is less than the factory overhead absorbed. This total variance is analyzed to determine the causes. The causes of variance lie in the following two factors:

a) The variance may be due to the difference between capacity level budgeted for calculating predetermined factory overhead absorption rate and the capacity level actually attained till the end of year: and
b) The variance may be due to the difference between factory overhead budgeted for capacity attained and the factory overhead cost actually incurred

If the variance is caused by difference in capacity i.e. the first factor mentioned above, it is called Capacity Variance or Volume Variance.
On the other hand, if the variance is caused by difference in budgeted and actual costs. i.e. the second factor mentioned above, it is called Budget Variance or

Spending Variance
In practice the total variance is composed of both of these two factors. The total variance is decomposed into capacity variance and budget variance in order to determine the magnitude of variance caused by each of the two factors listed above.

Capacity/Volume Variance
Capacity variance is on account of presence of fixed factory overhead. Predetermined factory overhead absorption rate is the sum of fixed rate and variable rate. We know that total fixed

changes inversely with changes in activity level Assume that for an estimated activity level of 50,000 machine hours budgeted factory overhead is Rs. 150,000 which includes Rs 100.000 of fixed cost. The absorption rate and its composition in this case is as follow:

FOH absorption rate:

Rs, 150,000/ 50.000 machine hrs = Rs. 3 per machine hr.

The fixed rate:

Rs. 100,000/50.000 machine hrs = Rs. 2 per machine hr.

The variable rate:

Rs 3 per machine hr less Rs. 2 per machine hr = Rs. 1 per machine hr.

It is very easily understood that Rs, 100.000 of fixed factory overhead can be absorbed only when capacity attained till the end of year is 50,000 machine hours If capacity attained is less than the budgeted capacity it means an unfavorable capacity variance, which will be signified by unabsorbed fixed factory overhead. Assume that the capacity attained is 48,000 machine hours. At this capacity level only Rs 96,000 of fixed factory overhead is absorbed (i.e. 48,000 hrs x Rs. 2) and the under absorbed fixed cost of Rs 4,000(i.e. Rs. 100,000 less Rs. 96,000) represents the portion of factory overhead variance cause by unfavorable capacity variance. Similarly, where capacity attained is more than the budgeted capacity it is a favorable capacity variance which will be signified by over absorbed fixed factory overhead. In other words capacity variance can be computed by multiplying the difference in capacity (budgeted and attained) by the fixed rate. The same result is obtained by taking. the difference between absorbed factory overhead and budgeted factor* overhead for capacity attained.

Budget/Spending Variance

Budget variance is the difference between budgeted factory overhead for capacity attained and actual factory overhead incurred. It represents either over-spending or under-spending.

If actual factory overhead is more than the budgeted, it is unfavorable budget variance. On the other hand if actual factory overhead is less than the budgeted it is favorable budget variance.

In order to determine exact causes of budget variance, the difference between actual and budgeted figures of each item of factory overhead is computed and communicated to the responsible person for the purpose of control. The budget variance may be due to fixed factory overhead items or it may be due to the variable items or the both.

Following practice question explains the computation and presentation of the variance and its analysis.

PRACTICE QUESTION

Shahzewaz Associates prepared following estimates for the year 2006.

Fixed factory overhead
Variable factory overhead

Direct labor hours Actual results for the year 19xx were as follow:

Fixed factory overhead	Rs. 450,000
Variable factory overhead	Rs. 600,000
Direct labor hours	200,000

Required: Calculate

(i) Total factory overhead variance.
(ii) Capacity variance.
(iii) Budget variance.

Solution:

(i) Total Factory Overhead Variance

Actual factory overhead

Fixed FOH + Variable FOH

Rs. 450.000 + Rs. 680,000	Rs. 1,130,000
Absorbed factory overhead	
Capacity attained x Absorption rate	
220,000 hours x Rs. 5.25	1,155,000
Over applied	25,000

(ii) Capacity Variance

Absorbed factory overhead (220,000 x 5.25)	Rs. 1.155.000
Budgeted factory overhead for capacity attained	
Fixed factory overhead + (Capacity attained x Variable rate)	
(Rs. 450,000 + 220,000 hours x Rs. 3)	1,110,000
Favorable	45,000

(iii) Budget Variance

Budgeted factory overhead for capacity attained	Rs. 1,110,000
Actual factory overhead	1,130,000
Unfavorable	20,000

Supporting Calculations

Absorption rate = (Rs 450.000 + Rs. 600,000)
200.000 direct labor hours
= Rs. 5.25 per direct labor hour

Variable rate = Rs. 600.000
2,00,0000 direct labor hours
= Rs. 3 per direct labor hour

It should be remembered here that no definite conclusions can be drawn only on the basis of factory overhead variance analysis, as presented above Analysis of factory overhead variance is a part of whole process of variance analysis whereby direct materials variance and direct labor variance are also computed and analysed. Complete study of variance analysis is a part of advanced courses of cost accounting.

In the above practice question capacity attained in terms of direct labor hours is greater than the budgeted capacity. This seemingly favorable capacity variance may, in fact, be due to unfavorable factors. For example, direct labor may be less efficient and as a result same quantity of output is

produced by working greater number of hours, or it may be due to defective materials which require more conversion time and as such the hours worked over and above the budgeted capacity have not resulted in extra output Similarly an unfavorable budget variance may be on account of higher spending on preventive repairs and maintenance or higher spending on training of workers, which is in effect beneficial for the organisation.

Here a practice question is discussed to explain High and Low Point Method. This method is a technique to segregate fixed and variable portions of a total/semi-variable cost.

Practice Question

Predetermined factory overhead absorption rate computed by AI-Nasr Associates Rs. 6 per machine hour. Budgeted factory overhead for activity level of 150.000 machine hours is Rs. 800,000 and for activity level of 100,000 machine hours it is Rs. 700,000. Actual factory overhead incurred during the year is Rs. 710,000 at an actual volume of 120,000 machine hours.

Required:

(i) Variable factory overhead absorption rate.
(ii) Budgeted fixed factory overhead,
(iii) Budgeted activity level on which the absorption rate is based
(iv) Over or under absorbed factory overhead.
(v) Volume variance
(vi) Spending variance

Solution:

(i) Variable Factory Overhead Absorption Rate:

	Activity Level (Machine Hours)	**Budgeted FOH (Rs.)**
High	**150,000**	**800,000**
Low	**100,000**	**700.000**
	50,000	**100,000**

For a change of 50,000 machine hour's m activity level there is a change of Rs, 100,000 in budgeted factory overhead. This change in budgeted factory overhead is due to variable factory overhead. Therefore,

$$\text{Variable rate} = \frac{\text{Change in budgeted FOH}}{\text{Change in activity level}}$$

Rs 100,000/50,000 machine hours

Rs. 2 per machine hour

(ii) Budgeted Fixed Factory Overhead:

Total FOH for 150,000 machine hours	= Rs. 800.000
Budgeted variable FOH = 150,000 hrs Rs 2	= Rs. 300,000
Budgeted fixed FOH = Rs 800.000 less Rs. 300,000	= Rs. 500.000
OR	
Total FOH for 100.000 machine hours	= Rs 700.000
Budgeted variable FOH =100.000 hrs x Rs. 2	= Rs 200.000
Budgeted fixed FOH = Rs, 700.000 less Rs. 200,000	=Rs. 500.000

(iii)Budgeted Activity Level

$$\text{Budgeted activity level} = \frac{\text{Fixed FOH}}{\text{Fixed rate}}$$

= Rs. 500.000/ (Rs. 6 less Rs. 2)
=125,000 machine hours

(iv) Over or under absorbed Factory Overhead:

Actual factory overhead	**Rs. 710.000**
Absorbed factory overhead	
Actual volume x FOH absorption rate	
120,000 hrs x Rs. 6	720.000
Over absorbed	10,000

(v) **Volume Variance:**

Absorbed factory overhead	Rs. 720,000
Budgeted FOH for actual volume	
Fixed FOH + (Actual volume x Variable rate)	
Rs, 500.000 + (120.000 hrs, x Rs. 2)	740,000
Unfavorable	20,000

(vi) **Spending Variance:**

Budgeted FOH for actual volume	Rs. 740,000
Actual factory overhead	710,000
Favorable	30,000

LESSON# 18

JOB ORDER COSTING SYSTEM

It has been explained that a cost accounting system is composed of two sub-systems:

(i) A system of recording and summarizing costs and

(ii) A costing system.

Costing system means *"the ascertainment of costs* ", It includes determination of total cost as well as unit cost. A costing system determines and reports to management total and unit cost of product or project of service with details of cost components

Costing is compulsory for satisfying at least three important needs of management.

I. Unit cost must be known to assist the management in making price decisions.
II. Ascertainment of cost at every stage of production is important for exercising control over costs.
III. In order to operate a system of accounting for costs, management needs to know cost of materials, labor and overhead to be charged to work in process, cost of work completed and transferred to finished goods and the cost of goods sold so that necessary debit and credit entries can be passed.

Choice of a Costing System

Job Order Costing or Process Costing?

What type of costing system an accounting entity should adopt? It depends upon:

(1) Nature of operations and

(2) Information needs of management.

Take the example of a construction company that produces houses in response to customers' orders and according to their specifications. All the times, the company remains engaged in the construction of many houses at different sites for different customers. Such a company definitely wants to know the cost incurred on each house separately so that customers' can be billed properly and profit (or loss) on each contract may be ascertained. Here the nature of operations is such that each house is clearly distinguishable from the other and separate calculation of cost for each house is desirable and practically possible. This company will employ job costing system.

On the other hand take the example of a company producing cement. All of the bags of cement produced are quite similar. Here separate calculation of cost of cement supplied to each customer is neither desirable nor feasible. The company can calculate cost per bag of cement produced by dividing total cost incurred during the accounting period by total number of bags produced during the period.

Accordingly, the company can fix the price per bag and bill each customer according to the number of bags supplied to him. This company will use process costing system.

Job costing and process costing are two basic types of costing systems and can be viewed as two ends of a spectrum or range. In practice we find companies employing either one of these two or some combination of features of the two both of these at the same time. For example, a ready made garments manufacturer employs process costing to accumulate and determine the cost of free size shirts produced by him in large quantity. At the same time he uses job costing to accumulate the cost of waiters' uniforms supplied to a hotel under a contract.

Job costing may be defined:

The costing system that separately accumulates costs incurred to produce each job in a situation where each job is distinguishable from the other throughout the production process.

The job may be a single unit or a multi unit batch, a contract or a project, program or a service. Job costing is employed by organisations possessing following characteristics:

1. Production is generally in response of customers' orders.

2. Every order has its own manufacturing specifications. Therefore, every job is different from the other and requires different amounts materials, labor and overhead.
3. Each job is clearly distinguishable from the other at all stages production process which makes job-wise accumulation of possible.
4. Job-wise accumulation of cost is desirable and/or necessary for and profit determination and
5. Each job is generally of high value.

Following are the examples of organisations employing job costing include:

a) Accounting firms
b) Civil engineering
c) Furniture manufacturing
d) Medical care
e) Printing press
f) Ship-building
g) Advertising agencies
h) Computer programming
i) Jewellery manufacturing
j) Movie studios
k) Repair shops

As the costs are accumulated separately for each job, therefore, job costing requires considerable amount of clerical work. Where production is carried in different departments of a factory, department wise cost accumulation is also necessary for performance evaluation of departmental management. In this way clerical work is further increased. Consequently, job costing is *more expensive* as compared with process costing. Job costing is also called specific order costing or production order costing.

Job order costing procedures

Most of the times, organisations employing job order costing are required to submit quotation before finalization of customer's order. Therefore, naturally, the first step in job order costing is to prepare an estimate of cost likely to be incurred to produce the job. The estimation is done by coordination of sales, designing and production departments. On the basis of estimated cost price is quoted. When customer's order has been initialized production planning and control department takes the first step towards execution of the order.

On receipt of production order, cost accounting department prepares a job cost sheet for each job. Job cost sheet may be defined as *a document used for accumulating costs incurred to produce a job.*

Design and contents of job cost sheet vary widely depending on customs of manufacturing operations and information needs of management.

However, generally, a job cost sheet is designed to show the following information:

1. Job number
2. Name of the customer
3. Description and specifications of the job
4. Date of commencement of production
5. Date of completion of job.
6. Direct materials cost incurred on the job
7. Direct labor cost incurred on the job
8. Factory overhead applied to the job
9. Total cost of the job
10. Selling and administration expenses chargeable to the job
11. Sales price of the job
12. Profit (or loss) on the job

14. Where cost estimates are prepared before production, estimated cost should also be shown for comparison and efficiency evaluation.

Job cost sheet is one of the *basic documents* used in job order costing. Upto the time the job is *incomplete;* job cost sheet serves as a *subsidiary record .for work in process control account* and is placed in work in process subsidiary ledger. On *completion* of job, the relevant job cost sheet is removed from work in process subsidiary ledger.

Now it reveals the cost of completed job and serves as *source document* for debiting finished goods account (or completed jobs control account) and for crediting work in process account.

Then it is placed in finished goods subsidiary ledger and serves as *subsidiary record .for finished goods account.* When completed job is shipped to the customer, relevant job cost sheet serves as *source document* for debiting cost of goods sold account and for crediting finished goods account. Then it is placed in cost of goods sold subsidiary ledger where the same job cost sheet serves as *subsidiary record for cost of goods sold account.*

Manufacturing process is, most of the times, divided into departments. This departmentalization is the logical result of different types of operations performed to produce a product. For example, furniture manufacturing is divided into cutting, assembling and finishing and polishing departments; readymade garments manufacturing is divided into cutting, stitching finishing and packing departments.

These departments are regarded as cost centers. **Cost Centre** means *a division or segment for which a separate individual is made responsible .for incurrence of cost.* Accumulation of cost for each department is necessary to achieve better control over cost. In job order costing it is necessary to identify cost not only with the department but also with the relevant job.

Direct materials, direct labor and factory overhead to be charged to each job and to each department are recorded in the following manners:

Direct Materials: Every materials requisition issued to secure direct materials bears the name of department and job number for which materials are required. Periodically (weekly or fortnightly etc) a summary of materials requisitions is prepared. Materials requisition summary analyses cost of materials issued and ascertains cost of materials chargeable to each department and to each job. Indirect materials issued cannot be associated with particular jobs, therefore, these are summarised only by department. Instead of posting each individual materials issue to job cost sheets, the periodic totals are recorded on relevant job cost sheets.

The *periodic grand total* are debited to work in process and factory overhead -control accounts and credited to materials control account.

Direct Labor: Primary labor cost data are accumulated on Job Time Tickets. Job time tickets contain names of departments and job numbers for which labor time is used. A labor cost analysis sheet is prepared periodically that analyses the direct labor cost by departments and by jobs. As indirect labor cost cannot be identified with particular jobs, therefore, labor cost analysis sheet analyses it only by departments. The *periodic totals* are posted to job cost sheets and debited to work in process and factory overhead control accounts.

Factory Overhead: Factory overhead is applied to jobs on the basis of predetermined departmental factory overhead applied rates. Factory overhead is also *periodically* applied to the jobs and entered in job cost sheets. Total applied factory overhead is debited to work in process control account and credited to factory overhead applied account.

Practice Question

Job Order Costing. Shah Taj Engineering Works on April 5, 2006 started production of 100 lawn mower of model EG- 72 ordered by Capital Development Authority. Islamabad, vide Order No. 2119-M dated April 1, 2006 at a price of Rs. 3,600 per lawn mower.

Production Planning Department allotted Job No. J-832-LM and instructed the factory to complete production by April 20, 2006. However, the factory completed production on April 18, 2006.

On April 11, weekly Materials Requisitions Summary. No. MRS-16 and weekly Labor Cost Analysis Sheet No.LAS-16 showed following charges to Job No. J-832-LM.

.	**Department 101**	**Department 102**
Direct materials	Rs. 58,500	11,700
Direct labor	Rs. 13,500	15,750
		(900 hours)

Materials Requisitions Summary No. MRS-17 and Labor Cost Analysis Sheet No. LAS-17 prepared on April 18 revealed following direct costs for the job.

	Department 101	Department 102
Direct materials	Rs.71,500	Rs. 14,300
Direct labor	Rs. 16,500	Rs. 19,250
		(1100 hours)

In department 101 factory overhead is applied @ 50% of direct labor cost and in department 102 @ Rs. 12 per direct labor hour. Marketing and administration expenses chargeable to the job were respectively 7.5 % and 5% of the sale price. The lawn mowers were delivered to customer on April 22, 2006

Required:

(i) Prepare a Job Cost Sheet for Job No. J-832-LM.

(ii) Assuming that J-832-LM was the only job worked on during the two weeks period, pass account entries in General Journal form to record:

(a) Cost incurred on the job:

(b) Completion of the job; and

(c) Sale of the job.

Solution

SHAH TAJ ENGINEERING WORKS LIMITED
JOB COST SHEET FOR JOB NO. J-832-LM

Customer's Name: Capital Development Authority. Islamabad.
Order No. 2119-M Dated 02-04-2006 Description Lawn Mowers Model EG- 72
Total Cost Rs. 260.000 No. of units. 100Date Started 05-04-2006
Date wanted 20-04-2006 Date Completed 18-04-2006 Unit Sales Price Rs. 3,600 Unit Cost Rs. 2,600

DIRECT MATERIALS

Date	Mat. Req. Sum. No	Department 101	Department 102	Total
11-04-2006 18-04-2006	MRS-16 MRS-17	Rs. 58,500 71,500	11,700 14,300	70,200 85,800
Total		130,000	26,000	156,000

DIRECT LABOR

Date	Lab Analysis Sheet No.	Department 101	Department 102	Total

11-04-2006	LAS-16	Rs. 13,500	15,750	29,250
18-04-2006	LAS-17	16,500	19,250	35,750
Total		30,000	35,000	65,000

FACTORY OVERHEAD APPLIED

Date	Department 101			Department 102			Total
	D.L Cost	Rate	Amount	D.L Hours	Rate	Amount	
11-04-2006	13,500	50%	6,750	900	12	10,800	17,750
18-04-2006	16,500	50%	8,250	1,100	12	13,200	21,450
Total			15,000			24,000	39,000

Total Production Cost

Direct material cost	156,000
Direct labor cost	65,000
Factory overhead cost	39,000
	260,000

Income Statement

Sales price 100 units @ Rs. 3,600		360,000
Cost of production		260,000
Gross profit		100,000
Operating expenses		
Marketing Expenses (Rs. 360,000 x 7.5%)	27,000	
Administration Expenses (Rs. 360,000 x 5%)	18,000	45,000
Net Income/profit		**55,000**

Problem Questions

Q. 1

Arman Advertisers on November 15, 2006 received an order from Pheasent Cosmetics Limited for manufacturing and installation of a huge neon sign for a contract price of Rs. 180,000. Job No. 676-PN was allotted and manufacturing was begun on November 21, 2006 .The costs are charged to the jobs periodically by means of weekly summaries.

Following costs were related to Job No. 676-PN

WEEK ENDED

	Nov. 23	Nov. 30	Dec.7	Dec. 14
	Rs.	Rs.	Rs.	Rs.
Direct materials	13,300	24,800	16,400	12,600
Direct labor	1,800	12,400	20,100	14,200

Factory overhead is applied @ 25% of prime cost. The Job was completed on December 14, 2006 Selling expenses are applied to the job @ 3 % of contract price and administration expenses @ 2% of contract price.

Required: Prepare a job cost sheet containing above information

Q. 2

In order to submit quotation for air conditioning of Hina Shopping Centre, management of Indus Electrical Industries made following estimates:
Direct materials Rs. 280,000;
Direct labor Rs. 120,000;
Predetermined overhead applied rate is 50% of direct labor cost;
Predetermined rates for charging marketing and administration expenses are respectively 3% and 2% of the contract price.
On the basis of above estimates contract price was quoted as Rs. 575,000
The quotation was accepted by the owners of Hina Shopping Centre and the order was finalized on October 6, 2006.

Job No. 1617 was assigned to the order and the work was started on October 12, 2006. Weekly materials requisition summaries and labor cost analysis sheets showed following charges to Job No. 1617.

Date	Direct Material	Direct labor
October 17	Rs. 120,000	Rs. 46,000
October 24	Rs. 96,000	Rs. 44,000
October 31	Rs. 60,000	Rs. 48,000

The job was completed on October 31. However, the time allowed for completion of job was upto November 4.

Required

(i) Prepare job cost sheet for Job No. 1617.

(ii) Assuming that Job No. 1617 was the only job worked on during the above period, pass entries in general journal form to record production and sale of the job. Job was accepted by the customer on November 4 and cash received for the contract price.

Q. 3

Hussain Engineering Co. Ltd. produces machines as per customer's specifications. The following data pertains to Job Order No. K 101:
Customer: Azam Banking Co.
Date Started: 06-08-2006.
Customer Order No. C 467.
Date Finished: 20-08-2006.
Dated: 31-07-2006. Total Cost of manufacture?
Sales Price?
Description: 6 Banking Machines.

	Week End 13/08	**Week End 20/08**
Materials used. Dept. A.	Rs. 4,800	Rs. 2,600
Direct labor rate. Dept. A.	Rs 40 per hour	Rs. 40 per hour
Labor hours used, Dept. A.	1,200	800
Direct labor rate, Dept. B.	Rs 42 per hour	Rs. 42 per hour
Labor hour uses, Dept. B.	600	280
Machine hours. Dept. B.	400	240
Applied factory overhead Dept. A. Rs. 20/labor hr.		Rs. 20/labor hr.
Applied factory overhead Dept. B Rs. 18/machine hr		Rs.18/machine hr

Required: a) Prepare a job order cost sheet
b) Calculate sales price of the job, assuming that it has been contracted with a markup of 40%

LESSON# 19

PROCESS COSTING SYSTEM

(An introduction)

Definition

Process costing system applies when standardised goods are produced tom a series of inter-connected operations.

In some industries, the output produced emerges from a continuous process. An example might be an oil refinery; Oil in a raw state is input and subjected to a process of purification. Refined oil emerges at the end of the process.

Problems that arise in such situations include the attribution of materials costs and conversion costs to units of finished output and the occurrence of losses during the process (spoilt or lost production).

The characteristics and application of process costing

Continuous production

In the job order costing, costs were directly allocated to a particular job. When standardised goods or services result from a sequence of repetitive and continuous operations, it is useful to work out the cost of each operation. Then because every unit produced may be assumed to have involved the same amount of work, costs for a period are charged to processes or operations, and unit costs are ascertained by dividing process costs by the quantity of output units produced This is know n as process costing.

Series of interconnected operations

Process costing applies when standardised goods are produced from a series of interconnected operations. Process costing system is employed by industries possessing following characteristics:

1. There is mass production of a single product or two or more products in successive runs of scheduled duration e.g., vegetable canning or fruit juice bottling.
2. All units of output are exactly similar and are produced by the same manufacturing process.
3. Entire manufacturing process is divided into departments or processes, each performing a specific set of operations.
4. Completed output of each department, except the last one, is the raw materials for the next department.
5. Manufacturing operations may result in production of joint products or by products.
6. Production is not in response to customers' orders but in anticipation of demand.

Examples of industries using Process Costing include:

Bottling, Pharmaceuticals, Cement, Paint, Coal, Distilleries Electricity, Ice, Soap, Sugar, Canning, Chemicals, Cooking oil, Electric appliances, Flour, Natural gas, Petroleum Products, Rubber, Steel, Textile. Under process costing, for the purpose of cost control, each department involved in manufacturing process is regarded as a cost centre and product costs are accumulated separately for each department. **Cost Centre** *means a division or segment for which an individual is made responsible .for the incurrence of cost*

Departmental costs are passed through department work in process accounts and not through a single work in process control account as in job costing. As all units are produced from the same raw materials and by same manufacturing operations, therefore, it is assumed that same cost is chargeable to each unit. Instead of accumulating cost of individual units, an average unit cost is computed by dividing total cost by total output of the period. Cost is associated only with departments and not with jobs. It reduces clerical efforts for accumulation and analysis of cost. In this way process costing is *less expensive,* as compared with job costing.

The Process Cost Sheet also called ***Cost of Production Report*** is the basic document in process costing. This document is prepared for each department and shows the quantities processed, total and unit cost, and cost of work transferred out, and still in process. .
Following table is meant to make the difference between the two costing systems more clear.

	Job order costing system	Process costing system
Application	Where different products having peculiar specifications are produced against customers' orders	Where single standard product is produced or two or more standard products are produced in successive runs. Production is for stock and in anticipation of demand.
Accumulation of Cost	In order to determine cost of each job, costs are compiled job wise. At the same time, to evaluate efficiency of departmental management cost are also compiled department wise	Costs are associated only with departments
Cost per unit	Unit cost is computed on completion of job. The job may itself be a single cost unit e.g. a machine or it may be a multi unit	An average unit cost is computed at the end of costing period by dividing total cost by units of output of the period
Work in process a/c	Only one work in process control account is maintained	A separate work in process control account is maintained for each producing department
Cost of operating the system	More clerical efforts are needed to accumulate costs by jobs and by departments,- therefore, the system is more expensive	Cost accumulation is simple as costs are accumulated only by departments; therefore, the system is comparatively less expensive.

Process costing procedures
In process costing industries standard products are produced in accordance with production budget. Therefore, it becomes unnecessary to issue a production order. Production Planning and Control Department communicates production targets to departmental heads by means of written letters. Data of quantities produced by each department are collected and compared with budgeted quantities for control purposes. This information is collected by departmental supervisors or

quality inspectors may recording these data. Each producing department is a cost centre because for the purpose of cost control management is interested in ascertaining departmental costs.
In process costing, generally, a separate work in process account is maintained for each producing department.

Data Collection
Collection of departmental cost figures of direct materials, direct labor and factory overhead is based on similar procedure as for, job order costing. However, the source documents used for the data collection are comparatively simple. These documents identify costs only with departments and not with jobs as well.
Direct Materials:
Production people secure materials by issuing properly authorised Materials Requisitions. At the end of each month, these requisitions are sorted and a Materials Requisition Summary indicating cost of direct and indirect materials issued to each department is prepared. Monthly totals of direct and indirect materials issued are debited to departmental work in process control accounts and factory overhead control account respectively and credited to materials control account.

Direct Labor:
Instead of using Job Time Tickets, labor cost data are accumulated on Clock Cards and Daily Time Sheets. These documents show labor time utilized by each department and classification of labor cost as direct and indirect. At the end of each month, labor cost data accumulated on these source documents are summarised in Labor Cost Analysis Sheet indicating direct and indirect labor cost for each department. Monthly totals of direct labor are debited to departmental work in process accounts and indirect labor is debited to factory overhead control account.

Factory Overhead:
Factory overhead costs, other than indirect materials and indirect labor discussed earlier, are accumulated in Voucher Register and in General Journal by means of adjusting entries for depreciation, expired insurance etc, Monthly total, are debited to factory overhead control account.
Factory overhead is charged to production through predetermined departmental factory overhead applied rates. Some industries using process costing charge actual factory overhead to departments. This method gives satisfactory results if production is stable from month to month, But if there are fluctuations in production volume, charge of actual factory overhead is unsatisfactory especially when considerable portion of factory overhead is a fixed cost,

Cost of Completed Output:

Cost of completed output of each production department is calculated in Cost of Production Report. Cost of units completed and transferred out is credited to work in process control account of the respective department and debited to work in process control account of the department receiving the units. Cost transferred out by the last department is, however, debited to finished goods control account

Cost of Production Report

In process costing Cost of Production Report also called Process Cost Sheet is the key document. At the end of costing period, generally a month, a Cost of Production Report is prepared. It summarizes the data of quantity produced and cost incurred by each producing department. It also serves as a source document for passing accounting entries at the end of costing period.
Cost of production report is divided into **five** sections. Each section is meant to provide specific

1. **Quantity schedule.**
2. **Cost accumulated in the department/process.**
3. **Calculation of equivalent units produced.**
4. **Calculation of cost per unit.**
5. **Accounting treatment / apportionment of the accumulated cost**

Quantity Schedule:

The first section Quantity Schedule contains input and output data in terms of quantities. The information is presented in the following order.

(i) Units in process at the beginning of costing period.
(ii) Units started in process or received from preceding department during the period. (Total of (i) and (ii) constitutes total units to be accounted for)
(iii) Units completed and transferred to next department or to finished goods.
(iv) Units completed but still in the department.
(v) Units in process at the end of the period and their degree of completion.
(vi) Units lost in process during the period indicating whether normal loss or abnormal loss. The stage of completion at which the loss occurs is also specified.

(Total of (iii) , (iv) , (v) and (vi) is again the total units to be accounted for)

The quantity schedule assists management to look at a glance production performance of departments as well as it provides necessary data for preparing remaining sections of the report.

Cost accumulated in the department/process.

The second section Cost Accumulated to Departments shows total cost for which the departments are accountable. Total costs include cost of beginning work in process inventory, cost transferred in from the preceding department and cost of direct materials, direct labor and factory overhead added by the department. If there is normal loss of units, unit cost received from preceding department requires adjustment. This adjustment for lost units is also shown in this section. This section provides data for debiting work in process control accounts of the departments.

Calculation of equivalent units produced.

In order to arrive at cost per unit of output, total of each cost element is divided by the number of units produced, For this purpose, where at the end of costing period, there are some partially completed units in process, these units must be stated in terms of equivalent completed units, For example, if 4,000 units. are in process at the end of month estimated as 50% complete, these will be equivalent to 2,000 completed units. These equivalent units are added to units completed by the department to arrive at equivalent production. Then total cost is divided by this equivalent production figure to calculate unit cost.

Calculation of cost per unit

In process costing, costs are averaged over the units produced. The costs accumulated to a process for a period are collected and divided by the number of units equally produced during the period.
Accounting treatment / apportionment of the accumulated cost

The last section presents a summary to the explaining the accounting treatments of the costs incurred in the department. This includes

(i) Adjustment for lost units for normal loss, if any.
(ii) Cost transferred out.
(iii) Cost of abnormal loss, if any.
(iv) Cost of work in process ending inventory and

Cost of production report is generally presented to management with supplementary reports of usage of materials, labor and factory overhead.

Standard format of a simple
Cost of Production Report

I- Quantity Schedule:

Units put into the process		***
Units completed in this process & transferred to next department.		***
Units not yet completed at the end of the Period.	***	
		****

II- Cost Accumulated In The Department / Process:

Direct Material Cost		***
Direct Labor		***
Factory Overhead (Applied)	***	
		****

III- Calculation of Equivalent Units Produced

100% of completed units + % completed of the in process units

IV- Calculation Of Per Unit Cost

$$= \frac{\text{Total Cost}}{\text{Equivalent Units Produced}} .$$

V- Accounting Treatment

1- Finished goods

2- Closing Work in process

Problem Questions

Q. 1

Heera Manufacturing Company manufactures a product. Production made and manufacturing costs incurred in the first department during the month of October .are given below:
10,000 units were started in process out of which 9,400 units were transferred to next department and remaining 600 units were 1/2 complete as to materials, labor and overhead. Direct materials Rs. 19,400, direct labor Rs. 24,250 and factory overhead Rs. 14,550 was charged to production.
Required: Cost of production report for the month.

Q. 2

Production and cost data of first production department of Excellent Manufacturing Company for the month of March 2006 are as follow:

Units started in process were 5,000. Units completed and transferred to second department were 4,500. Remaining units were in process estimated to be 50%, 40%, 60% completed as to materials, labor and factory overhead respectively. Costs of materials, labor and overhead were Rs. 50,000, Rs. 60,000 and Rs. 40,000 respectively.
Required: Cost of production report.

LESSON# 20

PROCESS COSTING SYSTEM

Practice Question

Q. 1

Mini Soap Manufacturing unit completed and transferred out 600 soaps to department-11 at the end of the week. In department-11 500 soaps completed and transferred out. Units which were still in process 100 (100% material, Conversion cost 60%).

	Rs.	
Cost received from preceding department		540
Following costs were incurred by department-11:		
Direct Material	150	
Direct Labor	112	
Factory overhead	168	430
		970

Required: Prepare cost of production report

Cost of Production Report
Department-II

I-Quantity Schedule:			
Units received previous department		600	
Unites completed and transfer to next department		500	
Units still in process		100	600
II-Cost Accumulated in the Department / Process:			
Cost received from preceding department		Rs.	540
Cost added by department-11:			
Direct Material	150		
Direct Labor	112		
Factory overhead	168		430
			970

III-Calculation of Equivalent Units Produced:
(100% of completed units + % of units in process)

Units completed in department-I = 500 + 100 = 600

Direct Material:	500+(100x100%)	= 600
Direct Labor :	500+(100x60%)	= 560
F.O.H :	500+(100x60%)	= 560

IV- Unit Cost:

As to Previous department:

Total cost / Number of Equivalent units produced = 540 / 600 = 0.90

As to Direct Material:	150 / 600 = 0.25
As to Direct Labor:	112 / 560 = 0.20
As to F.O.H:	135 / 900 = 0.15
	1.65

V- Apportionment of the Accumulated Cost:

Cost of units transferred to the next department

No of completed units x Total cost per unit:

500	x	1.65	=	825

Units in process:

Cost of preceding department 100 x 0.9 = 90

Direct Labor	60 x 0.20	=	12
F.O.H	60 x 0.30	=	18
			145
			970

Q. 2

Mini Soap Manufacturing unit started to incurring cost in first department for 1000 soaps. At the end of the week 600 soaps were completed, 300 still in process and 100 units lost. 100% of direct material had been incurred but 75% conversion cost was yet incurred on the incomplete work.

The detail of costs incurred by the department:

	Rs.
Direct material	500
Direct labor	225
Factory overhead	135

Required: Prepare cost of production report

Cost Of Production Report
Department-I

I-Quantity Schedule:

Units started in process		1000
Units completed in the department	600	
Units still in process	300	
Units Lost (Normal)	100	
		1,000

II-Cost Accumulated in the Department / Process:

	Total Rs
Direct Material	500
Direct Labor	225
F.O.H	135
	860

III-Calculation of Equivalent Units Produced:

Direct material	600+ (300x100%)	= 900
Direct labor	600+ (300x75%)	= 825
F.O.H	600+ (300x75%)	= 825

IV- Unit Cost:

Direct material	500/900	= 0 .555
Direct labor	225/825	= 0.27272
F.O.H	135/825	= 0.163636
		0.992

V- Apportionment of the Accumulated Cost:

Cost of units transferred to the next department

600	x	0.992	595

Work in process:

Direct Material	300 x 0.5555 = 167	
Direct Labor	300 x 0.2727 = 61	
F.O.H	300 x 0.16363 = 37	265
		860

LESSON# 21

PROCESS COSTING SYSTEM (Contd.)

Normal Loss in First Department.

Loss of units during manufacturing process is, in many industries, a normal condition. This loss may be due to unavoidable spoiled work or wastage, evaporation or shrinkage etc. In other words, normal loss represents *the lost units expected to arise even under efficient operating conditions.*

Such a loss is inherent in manufacturing operations and cannot be avoided, for this reason; cost of normal loss is absorbed by the good units produced. It has the affect of increasing unit cost of good output. Total cost of the department is not divided by all units processed, instead. It is divided only by the good units produced.

Practice Question

During the month of January 2006 direct materials worth Rs. 300,000 were issued to produce 26,000 units of finished product. Direct labor to process these materials totaled Rs. 110,000 and factory overhead Rs. 55,000. During the month processing of 20,000 units were completed and these units were transferred to next department, whereas, 1,000 units were lost during processing (the loss is regarded as normal). All of the direct materials had been issued for the units in process at the end of month, but these units were only 40% converted. Cost of Production Report for the month 'based on above inforn1ation is given below:

Ginza Beauty products
Department I
Cost of Production Report
For the Month of January, 2006.

Quantity Schedule

Units started in process		26,000
Units transferred to next department	20,000	
Units still in process	5,000	
(100% materials, 40% labor & FOH)		
Units lost in process		
Normal loss	1,000	
	26,000	

Cost accumulated to Department

	Total Rs.	**Units** Rs.
Cost added by the department:		
Direct materials	300,000	12
Direct labor	110,000	5
Factory overhead	55,000	2.50
Total cost to be accounted for	465,000	19.50

Cost Apportioned

Transferred to next department
(20,000 units x Rs. 19.50) Rs. 390,000

Work in process ending inventory:			
Direct materials (5000 units x Rs. 12.00)	60,000		
Direct labor (5000 units x 40% x Rs. 5.00)	10,000		
FOH (5000 units x 40% x Rs. 2.50)		5,000	75,000
			465,000

Whenever, normal loss occurs in the first department, it requires no separate calculation. Number of units so lost is ignored while computing equivalent production. The result is a decrease in equivalent production quantity (the denominator) and an increase in unit cost.
In the above cost of production report, equivalent production of department I include 20,000 completed units plus 5,000 units in work in process ending inventory adjusted for their stage of completion.

Normal Loss in Departments Subsequent to the First.
It is stated earlier that cost of normal loss is absorbed by the good units produced and this is done by omitting lost units from equivalent production quantity. Same procedure applies when units are lost during processing in a department subsequent to the first.
However, here an *adjustment in unit cost from preceding department* is also necessary. In the above report total cost of Rs. 390,000 received from department I was for 20,000 units. Out of these 20,000 units, 500 units were lost. Now total cost of Rs. 390,000 applies only to 19,500 remaining good units. This *decrease* in number of units will cause an *increase* in unit cost from preceding department. In department 2, after the lost units have been taken into account, unit cost from department I come to Rs. 20.00 (i.e. Rs. 390,000 + 19,500 units). This increase of Rs. 0.50 (i.e. Rs. 20.00 *less* Rs. 19.50) is called adjustment for lost units.
The adjustment for lost units can be computed by anyone of the following two methods. For the purpose of explanation assume the following:
Assembling department received from cutting department 32,000 units at a total cost of Rs.120,000 resulting in a unit cost of Rs. 3.75. During processing in assembling department 2,000 units were lost. The lost units are considered as normal.
First Method: Firstly find unit cost received from preceding department after adjustment for lost units and then deduct it from the unit cost before adjustment; the difference is adjustment per unit. Unit cost after adjustment is calculated by dividing total cost from preceding department by good units left after the loss.
Computations are illustrated as follow:

	Rs
Unit cost after adjustment	
Rs. 120,000/30,000 units	4.00
Unit cost before adjustment	3.75
Adjustment per unit	**0.25**

Second Method: Find total cost of lost units at which they are received by the department. This total cost is now to be absorbed by the remaining good units. How much cost is to be absorbed by each good unit is computed by dividing remaining good units into total cost of lost units. The resulting figure is adjustment per good unit.
These computations are explained as follows:

Cost of lost units accumulated upto preceding department	
2,000 units x Rs. 3.75	Rs. 7,500
Adjustment per unit Rs. 7.500/30,000 units	Rs. 0.25

LESSON# 22

PROCESS COSTING SYSTEM (Contd.)

Normal Loss at the End of Process:

Preceding discussion of normal loss is for a situation where units are lost at the beginning or during manufacturing process in the department. In many industries, lost units are identified by quality inspectors at the end of manufacturing process when all production costs have been incurred by the department. In such cases cost of units lost is charged to completed units only and no portion of loss is absorbed by Units in work in process ending inventory

For this purpose lost units are included in equivalent production and the adjustment for lost units is not required, cost of lost units is included in cost of units completed and transferred out or still in the department. This treatment increases unit cost of completed units only.

Assuming that in department 2 lost units are discovered in final inspection at the end of process, cost of production report of the department will be as follow:

Ginza Beauty products
Department 2
Cost of Production Report
For the Month of January 2006

Quantity Schedule.		
Units received from preceding department		20,000
Units transferred to next department	16,000	
Units still in process		
(80% direct labor & factory overhead)	3,500	
Units lost in process		
Normal loss (at the end of process)	500	20,000
	Total	**Unit**
Cost Charged to Department.	**Rupees**	**Rupees**
Cost from preceding department	390,000	19.50
Cost added by department:		
Direct labor	36,284	1.88
Factory overhead	72,568	3.76
Total cost added by department	108,852	5.64
Total cost to be accounted for	498,852	25.14
Cost Accounted for as Follow	**Rupees**	**Rupees**
Transferred to next department		
(16,000 units x Rs. 25.93)		414,810
Work in process ending inventory		
Cost from preceding department		
(3,500 units x Rs. 19.50)	68,250	
Direct labor (3,500 units x 80% x Rs 1.88)	5,264	
FOH (3.500 units x 80% x Rs. 3.76)	10,528	84,042
Total cost accounted for		**498,852**

Equivalent units produced

16,000 + (3,500 x 80%) + 500 = 19,300 units

Cost per unit

Direct labors	36,284/19,300 units	1.88
Factory overhead	72,568/19,300 units	3.76

Cost transferred to next department

16000 units x Rs. 25.14	402,240
Add cost of lost units	
500 units x Rs. 25.14	12,570
Total cost	414,840

Unit Cost of Units Transferred out:

Rs. 414,840 = 25.9256
16,000 units

The logic of charging cost of normal loss at the end of process only to completed units is that these units have goon through quality inspection, whereas, units still in process are yet to pass the inspection, of-course, units till in process include spoiled units as well. Therefore, units in work in process ending inventory shall be charged with the cost of spoiled units, .1cluded therein, only after these units will have goon through quality inspection. In many industries units being processed in a department are checked at a definite stage before the end of process, say at 75% or 90% stage of completion. In this case cost of normal loss is charged only to those nits which have passed through the stage at which quality check is made. These units may be still in process or may have been completed and transferred out.

Abnormal Loss

Abnormal loss is the loss of units not expected to arise under efficient operating conditions. It is not inherent in the manufacturing process; instead, it is on account of some accident or carelessness. The reasons of abnormal loss include defective materials or poor workmanship, machine breakdown or some other contingency. Abnormal loss represents inefficiencies in the manufacturing process; therefore, it is improper to treat it as a part of product cost of good units. Cost of abnormal loss is treated as *separate unfavorable item* and is shown as such in cost of production report. It is debited to factory overhead control account or to a separate expense account to be charged directly against revenues of the period and is credited to the departmental work in process control account. Being an indicator to inefficiency, abnormal loss requires immediate attention of management.

For the purpose of computing unit cost, units of abnormal loss are, included in equivalent production after adjustment for degree of completion. Consequently unit cost represents, cost per unit as if there were no loss.

PRACTICE QUESTION

Q. 3

Mini Soap Manufacturing unit completed and transferred out 600 soaps to department-11 at the end of the week. In department-11 450 soaps completed and transferred to finished goods. Units which were still in process 100 and 50 units lost (Normal). Units in process 100% with the reference of material and 60% with conversion cost.

		Rs.
Cost received from preceding department		540
Following costs were incurred by department-II:		
Direct Material	150	
Direct Labor	112	
Factory overhead	168	430
		970

Required: Prepare cost of production report

Solution:

Cost of Production Report
Department-II

I-Quantity Schedule:

Units received previous department		600
Units completed and transfer to		
Finished goods	450	
Units still in process	100	
Units lost (Normal)	50	
		600

II-Cost Accumulated in the Department / Process:

		Rs.
Cost received from preceding department		540
Cost added by department-11:		
Direct Material	150	
Direct Labor	112	
Factory overhead	168	430
		970

III-Calculation of Equivalent Units Produced:
(100% of completed units + % of units in process)

Units completed in department-I = 450 + 100 = 550

Direct Material:	450+(100x100%)	= 550
Direct Labor :	450+(100x60%)	= 510
F.O.H :	450+(100x60%)	= 510

IV- Unit Cost:
Previous department = 540 / 550 = 0.98182

Direct Material	150 / 550 = 0.272727
Direct Labor	112 / 510 = 0.21961
F.O.H	135 / 510 = 0.32941
	1.80357

V- Apportionment of the Accumulated Cost :
Transferred to finished goods

450	x	1.80357	812

Work in process:

Cost of preceding department			
(100 x 0.98182)		98	
Direct Material	(100 x0.272727)	27	
Direct Labor	(60 x 0.21961)	13	
F.O.H	(60 x 0.32941)	20	
			158
			970

Transfer to Finished Goods

Cost of preceding department (450 x 0.98182)	442

Direct Material	(450 x0.272727)	123	
Direct Labor	(450 x 0.21961)	99	
F.O.H	(450 x 0.32941)		148
			812

Q. 4

Mini Soap Manufactures Co. started to incurring cost in first department for 1000 soaps. At the end of the week 600 soaps were completed and 300 still in process . 100% of direct material had been incurred. But 75% conversion cost was yet incurred on the incomplete work. Remaining 100 units were abnormally lost (completed 100% material, 50% conversion cost)

Following in the detail of cost incurred:

Direct material Rs.	500
Direct labor	225
Factory Overhead	135
	860

Required: Prepare cost of production report

Cost Of Production Report
Department-I

III-Calculation of Equivalent Units Produced:

Direct material: 600+(400x100%)+(100x100%) = 1000
Direct labor :600+(300x75%)+(100x50%) = 875
F.O.H : 600+(300x75%)+(100x50%) = 875

IV- Unit Cost:

Direct material:	500/1,000	= 0 .50	
Direct labor :	225/875	= 0.25714	
F.O.H :	135/875	= 0.15428	
		0.91142	

V- Apportionment Of the Accumulated Cost to Finished Goods:

Cost of units transferred to the next department

600 x 0.91142 = 547

Closing W.I.P Inventory:

Direct Material	300 x 0.50	= 150	
Direct Labor	300 x 75% x 0.25714	= 58	
F.O.H	300 x 75% x 0.15428	= 34	
			242

Abnormal Loss

Direct Material = 100 x 0.5	= 50	
Direct Labor = 50 x 0.25714	= 13	
FOH = 50 x 0.15428	= 8	
		71
		860

Problem Question

Q. 1

Orient Industries. Limited produces a product that passes through two departments. Production data for the first month of its operations are as follow:

	Department A	Department B
Production Costs:	Rupees	Rupees
Direct materials	140,000	28,000
Conversion costs	200,000	70,000

Production units:	***Units***	***Units***
Started / received in process	23,000	13,000
Transferred out	18,000	13,000
Still in process		
2/3 complete	3,000	
1/5 complete		2,500

In department B there is an abnormal loss of 1,500 units when 1/3 complete.
Required: Prepare cost of production report for the month

Q. 2
Delight Food Products produces 'Squash Cubes" by continuous processing. During February 19 -' producing department ***XYZ*** received 8,000 cubes from the preceding department aI1d after processing, transferred 5,500 cubes to next department. During the month there was normal loss of 400 cubes at the end of process. 600 cubes, 75% converted, were lost due to negligence of a worker. There was no work in process beginning inventory, the ending inventory was estimated as 60% converted. Following product costs were charged to the department during February:

	Rs.	
Cost from preceding department	16,400	
Direct materials	2,000	
Direct labor	3,625	
Factory overhead	5,075	**Rs. 27,000**

In department ***XYZ*** all materials are added at the start of process.
Required: Cost of production report for February 2006

Q. 3
Quantity schedule of Mirza and Company shows that 12,000 units were started in process during the month of June. 7,000 units were completed and transferred to next department. 4,000 units, 25 % complete as to materials and 50% complete as to labor and factory overhead, were in process at the end of June. The remaining units were lost during processing. Costs incurred by the department were materials Rs. 90,000 labor Rs. 70,000 and factory overhead Rs. 50,000. .

Required: Cost of production report for the month.

Q. 4
Tahir Manufacturing Company uses process costing. Costs of direct materials, direct labor and factory overhead incurred by department A during April 2000, were Rs. 25,000, Rs. 30,000 and Rs. 20,000 respectively. The quantity schedule shows that 8,000 units were started in process. 5,000 units were transferred to next department. 2,000 units were still in process (all materials, 50% labor and 25 % factory overhead). The remaining units were lost, in process.
Required: Cost of production report for April, 2000.

Q. 5
During April, 20,000 units were transferred in from Department A at a cost of Rs. 39,500. Materials cost of Rs. 6,500 and conversion cost of Rs. 9,000 were added in Department B. On April 30, Department B had 5,000 units of work in process 60% complete as to conversion costs. Materials are added in the beginning of the process in Department B.

Required: Cost of production report.

LESSON# 23

PROCESS COSTING SYSTEM

(Opening balance of work in process)

Work-in-process and equivalent units

Partially-processed units

At the end of a period there may be some units which have been started but have not been completed. These are **closing work-in-process units.**

At this stage we assume for simplicity that there is no opening work-in-process. In that case the output for a period will consist of two classes of finished units of production:

• Those that have been started and fully processed within the period

• Those that have been started during the period, but not finished by the end of the period. This closing work-in-process will be completed during the following period;

Further costs will be incurred in order to achieve this.

Equivalent units

Once processing has started on a unit; of output, to the extent that it remains in an uncompleted state it can be expressed as a proportion of a completed unit. For example, if 100 units are exactly half-way through the production process in terms of the amount of cost they have absorbed, they are effectively equal to 50 complete units. Therefore, 100 units which are half-complete can be regarded as 50 equivalent units that are complete.

Practice Question

A manufacturer starts processing on 1 March. In the month of March he starts work on 20,000 units of production. At the end of March there are 1,500 units still in process and it is estimated that each is two thirds complete. Costs for the-period total Rs19,500.

Calculate the value of the completed units and the work-in-process at 31 March.

In practice it is unlikely that all inputs to production will take place at the same time, as was suggested in the example above. For instance, materials are frequently added at the beginning of a process, whereas labor may be applied throughout the process. Thus, work-in-process may be more complete as regards one input or cost element than as regards another. Equivalent units must thus be calculated for each input and costs applied on that basis,

Practice Question

In this activity, use the same data as in Activity 1 except that:

- all materials have been input to the process
- work-in-process is only one-third complete as regards labor

Costs for the period are as follows:

Materials	10,000
Labor	9,500
Total	19,500

Costs for a process are allocated to equivalent units to calculate valuations for finished goods and work-in-process.

The FIFO and weighted average methods of cost allocation

In the previous examples it was assumed that there was no opening stock of work-in-process. In reality, of course, this is unlikely to be the case, and changes in levels of work-in-process during me period can give rise to problems. There are basically two methods of accounting for such changes.

• The weighted average (or averaging) method

• The FIFO method.

Weighted average method

In the weighted average method opening stock values are added to current costs to provide an overall average cost per equivalent unit. No distinction is therefore made between units in process at the start of the period and those added during it and the costs associated with them

Problem Question

FL Manufacturing Co Ltd
Process information for month ended 31 December
Work-in-process 1 December (15,000 units, two-fifths complete)
Rs. 10,250 (work-in-process value made up of: materials Rs 9,000
Plus conversion costs Rs1,250).

Units started during December	30,000
Units completed during December	40,000
Work-in-process 31 December (half completed)	5,000
Material cost added in month	24,750
Conversion cost added in month	20,000

Materials are wholly added at the start of the process.
Conversion takes place evenly throughout the process.

Calculate the values of finished production for December and work-in-process at 31 December, using the weighted average method.

Choosing the valuation method in practice

In practice the FIFO method is little used, for two main reasons:

- It is more complicated to operate
- In process costing, it seems unrealistic to relate costs for the previous period to the current period of activities.

Choosing the valuation method in examinations

In order to use the weighted average or FIFO methods to account for opening work-in-process different information is needed, as follows:

Method	Information needed
For weighted average.	An analysis of the opening work-in-process value into cost elements (i.e. materials, labor)
For FIFO	The degree of completion of the opening work in process for each cost element.

If all of the information is available so that either method may be used, the question will specify the required method.

Where there is opening work-in-process, two methods of cost allocation can be used which make different assumptions and produce different stock valuations. They are FIFO and weighted average.

LESSON# 24

PROCESS COSTING SYSTEM (Contd.)

PRACTICE QUESTION

Q. 1

Mini Soap Manufacturing unit providing following information

Units of opening work in process	200 units
Units put into the process	800 units
Units completed and transfer out	1000 units

Units of opening work in process 100% completed as per direct material and 75% completed with direct labor and factory overhead cost.

Cost incurred on opening work in process:

Direct Material	Rs. 6,000
Direct Labor	2,000
Factory overhead	1,000
	9,000

Cost incurred during the accounting period on units put in the process:

Direct Material	Rs. 20,000
Direct Labor	10,000
Factory overhead	8,000
	38,000

Required: Prepare cost of production report of process-1 (using FIFO and Weighted Average method of inventory costing)

Cost of Production Report
Department-1

I-Quantity Schedule:

Units of opening work in process	200
Units put in the process	800
	1,000
Units completed and transfer out	**1,000**

II-Cost Accumulated in the Process:

Direct Material (6,000 + 20,000)	26,000
Direct Labor (2,000 + 10,000)	12,000
F.O.H (1,000 + 8,000)	9,000
	47,000

III-Calculation of Equivalent Units Produced (FIFO)

As to Direct Material	200 x 0% +	800	800
As to Conversion cost	200 x 25% +	800	850

IV- Unit Cost (FIFO) :

Direct Material	20,000 / 800	= 25
Direct Labor	10,000 / 850	= 11.7647
F.O.H	8,000 /850	= 9.4118
		= 46.1765

V- Cost Apportionment/Accounting Treatment (FIFO) :

Cost of opening work in process

Cost already incurred on opening WIP	Rs. 9000	
Material	100% complete 0	
Labor	200 x 25 % = 50 x 11.7647 = 588	
FOH	200 x 25 % = 50 x 9.4118 = 471	10,059
Cost of units put into the process during the period		
800 x 46.1765		36,947
		47,000

III-Calculation of Equivalent Units Produced (W. Avg method)

Material and Conversion cost = 1000 units

IV- Unit Cost (W. Avg) :

Direct Material	26,000 / 1,000	= 26
Direct Labor	12,000 / 1,000	= 12
F.O.H	9,000 / 1,000	= 9
		47

V- Cost Apportionment

Cost of units transferred to the next department:

1000 x 47 = 47,000

Q. 2

Mini Soap Manufacturing unit providing following information:

Units of opening work in process	200
Units put into the process	800
	1000
Units of closing work in process	300
Units completed and transfer out	700

Cost incurred on opening work in process:

Direct Material	Rs. 6,000
Direct Labor	2,000
Factory overhead	1,000
	9,000

Cost incurred on units put in the process:

Direct Material	Rs. 20,000
Direct Labor	10,000
Factory overhead	8,000
	38,000
	47,000

Units of opening work in process 100% completed as per direct material and 75% completed with direct labor but the units of closing work in process 100% completed as per material and 50% direct labor.

Required: Prepare cost of production report of process-1

Cost of Production Report

Calculation of Equivalent Units Produced (Weighted Average Method)

	Material	Labor	FOH
Completed units	700	700	700
Opening WIP	300	(300 x50%) 150	(300 x50%) 150
Total	1000	850	850

	Per unit cost (W.Avg)
Material	26,000 / 1000 = 26
Labor	12,000 / 850= 14.1176
FOH	9,000 / 850 = 10.5882
Total	**50.7058**

Cost Apportionment

Cost of units transferred to the next department:

700 x 50.7058 = 35,494

Work in process

Material	300 x 26 =	7,800
Labor	150 x 14.1176 =	2,118
FOH	150 x 10.5882 =	1,588
		11,506
		47,000

Equivalent production (FIFO)

	Opening WIP	**Completed # of units (Current period)**	**Closing work in process (% of completion)**	**Total**

Material	0	500	300	800
Labor	(200 x 25%) 25	500	(300 x 50%) 150	700
FOH	(200 x 25%) 25	500	(300 x 50%) 150	700

Cost Per Unit (FIFO)

Direct Material: 20,000 / 800 = 25
Direct Labor: 10,000 / 700 = 14.2857
F.O.H : 8,000 / 700 = 11.4286

1- Cost of units transferred to next department

a- Opening work in process

Cost already incurred		9,000
Direct Labor	200 x 25% = 50 x 14.2857 =	714
FOH	200 x 25% = 50 x 11.4286 =	571
		10,285

b- Cost of completed units

500 x 50.7143 25,358

Cost transferred to next department 35,643

2- Closing work in process

Material 300 x 25 = 7500
Labor 150 x 14.2857 = 2142
FOH 150 x 11.4286 = 1715

11,357
47,000

Q. 3

Units of opening work in process	2,000
Units produced during the period	16,000
	18,000
Units completed and transfer out	14,800
Work in progress at the end	3,200

Stage of completion	Material	Labor & Overhead
Opening WIP	100%	50%
Closing WIP	100%	25%

Cost incurred on opening work in process:

Direct Material	Rs. 24,000	
Direct Labor		3,200
Factory overhead		3,200
		30,400

Cost incurred during the current period :

Direct Material	Rs. 20,000	
Direct Labor		63,680
Factory overhead		63,680
		319,360
		349,750

Required: Prepare cost of production report of process-1

Cost of Production Report

Calculation of Equivalent Units Produced (Weighted Average Method)

	Material	**Labor & FOH**
Completed units	14,800	14,800
Opening WIP	3,200	(3,200 x50%) 800
Total	18,000	15,600

Equivalent production (FIFO)

	Opening WIP	Completed # of units (Current period)	Closing work in process (% of completion)	Total
Material	0	12,800	3,200	16,000
Labor & FOH	(2000 x 50%) 1000	12,800	(300 x 25%) 800	14,600

	Per unit cost (W.Avg)	Per unit cost (FIFO)

Material	2,16,000 / 18,000 = 12	19,200 / 16,000 = 12
Labor	66,880 / 15,600 = 4.2872	63,680 / 14,600 = 4.3616
FOH	66,880 / 15,600 = 4.2872	63,680 / 14,600 = 4.3616
Total	**20.5744**	**20.7232**

Cost Apportionment (Weighed Average Method)

Transfer to next department
14,800 X 20.5744 = 304,500
Work in process
Material 3200 x 12 = 38,400
Labor 800 x 4.2872 = 3430
FOH 800 x 4.2872 = 3430
45,260
349,760

Cost Apportionment (Weighed Average Method)
1- Cost of units transferred to next department
a- Opening work in process
Cost already incurred 30,400
Direct Labor 1000 x 4.3616 = 4316
FOH 1000 x 4.3616 = 4316

39,122

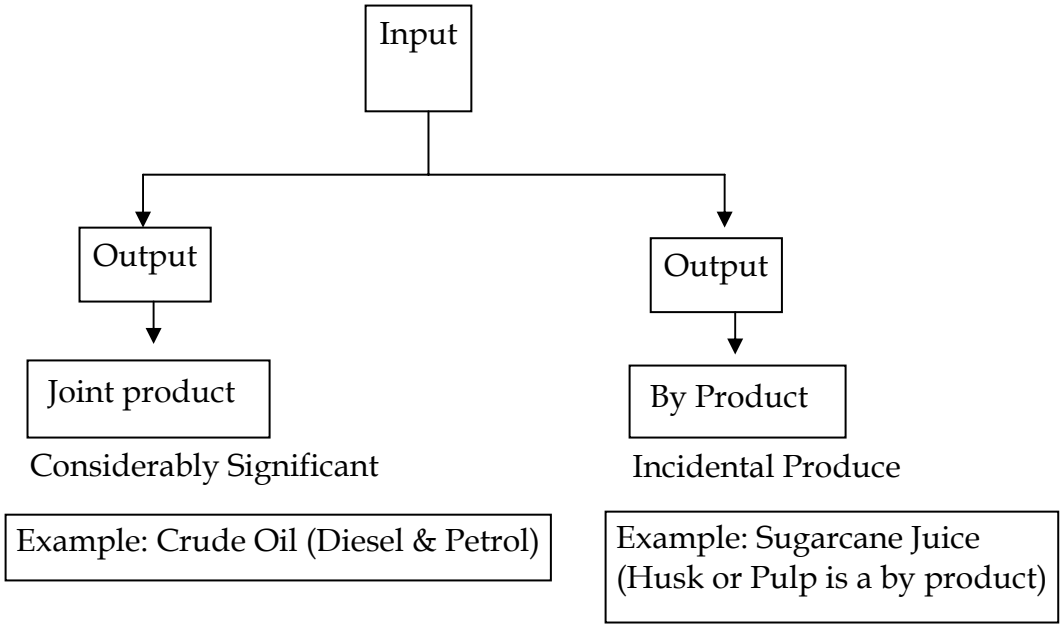
b- Cost of completed units
12,800 x 20.7232 265,258
Cost transferred to next department **304,380**

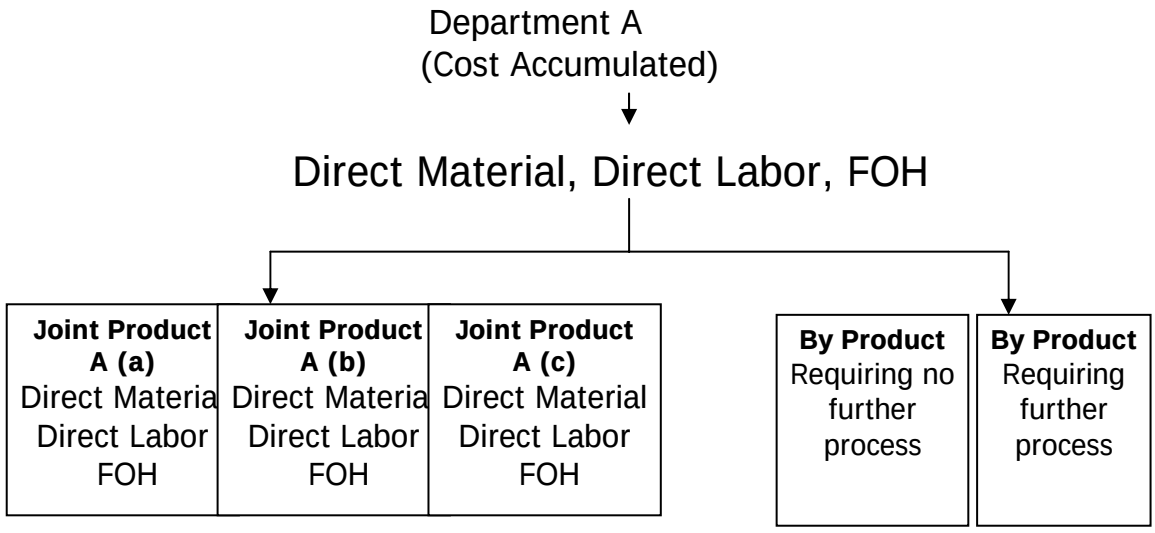
2- Closing work in process
Material 3,200 x 12 = 38,400
Labor 800 x 4.3616 = 3,490
FOH 800 x 4.3616 = 3,490
45,380
349,760

LESSON# 25

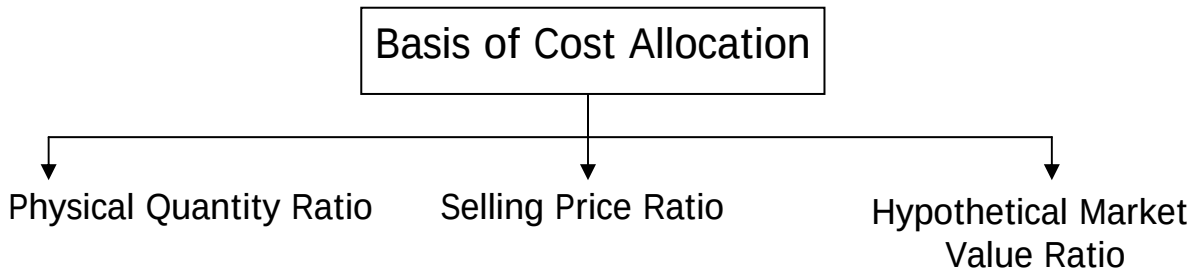
COSTING/VALUATION OF JOINT AND BY PRODUCTS

Following are self explanatory diagrams which help in understanding the concept of joint product and by products.





For by products:



Valuing by-products and joint products

By-products

Either of the following methods may be adopted when valuing by-products:
(a) The proceeds from the sale of the by-product may be treated as pure profit
(b) The proceeds from the sale, less any handling and selling expenses, may be applied in reducing the cost of the main products.

If a by-product needs further processing to improve its marketability, such cost will be deducted in arriving at net revenue, treated as in (a) or (b) above.
Recorded profits will be affected by the method adopted if stocks of the main product are maintained.

Accounting for joint products

Joint products are by definition, subject to individual accounting procedures. Joint costs may require apportionment between products if only for joint valuation purposes.
The main bases for apportionment are as follows:

Physical measurement of joint products

When the unit of measurement is different, e.g. liters and kilos, some method should be found of expressing them in a common unit. Some joint costs are not incurred strictly equally for all Joint products: such costs can be separated and apportioned by introducing weighting factors.

Market value

The effect is to make each product appear to be equally profitable. Where certain products are processed after the point of separation, further processing costs must be deducted from the market values before joint costs are apportioned.

Technical estimates of relative use of common resources

Apportionment is, of necessity, an arbitrary calculation and product costs which include such an apportionment can be misleading if used as a basis for decision-making.

Problems of common costs

Even if careful technical estimates are made of relative benefits, common costs apportionment will inevitably be an arbitrary calculation. When providing information to assist decision-making, therefore, the cost accountant will emphasize cost revenue differences arising from the decision.
Here are some examples of decisions involving joint products:

- withdrawing, or adding, a product
- Special pricing
- Economics of further processing.

Apportioned common costs are not relevant to any of the above decisions although a change in marketing strategy may affect total joint costs, e.g. withdrawing a product may allow capacity of the joint process to be reduced.
In the short or medium term, it is probably impractical and/or uneconomic to alter the processing structure. The relative benefit derived by joint products is, therefore, irrelevant when considering profitability or marketing opportunities.

LESSON# 26

COSTING/VALUATION OF JOINT AND BY PRODUCTS (Contd)

PRACTICE QUESTION

Q. 1

Physical quantity method

Cost Allocation at Split off Point

1960 liter fresh milk put in the process

Skim Milk	1,000 Liter
Cream	500 Liter
Butter	200 Liter
Ghee	100 Liter
Yogurt	60 Liter
Miscellaneous	100 Liter

Cost incurred for 1,960 liters of milk is Rs. 15,680

Solution

Skim Milk	= 15,680 / 1960 x 1000 = 8,000
Cream	= 15,680 / 1960 x 500 = 4,000
Butter	= 15,680 / 1960 x 200 = 1,600
Ghee	= 15,680 / 1960 x 100 = 800
Yogurt	= 15,680 / 1960 x 60 = 480
Miscellaneous	= 15,680 / 1960 x 100 = 800

Q. 2

Cost incurred in the department Rs 70,000

Drum sticks	Rs. 4 per gram
Breast pieces	Rs. 6 per gram
Wings	Rs. 3 per gram
Miscellaneous	Rs. 2 per gram

Drum stick	20,000 X 4	= 80,000
Breast pieces	10,000 X 6	= 60,000
Wings	6,000 X 3	= 18,000
Miscellaneous	4,000 X 2	= 8,000
		1,66,000

Solution

Drum stick	= 70,000 / 1,66,000 x 80,000 = 33,735
Breast pieces	= 70,000 / 1,66,000 x 60,000 = 25,300
Wings	= 70,000 / 1,66,000 x 18,000 = 7,590
Miscellaneous	= 70,000 / 1,66,000 x 8,000 = 3,375
	70,000

Physical Quantity Ratio

Total quantity produced 40,000 grams

Drum stick	20,000
Breast pieces	10,000

Miscellaneous	4,000
	40,000

Drum stick	= 70,000 / 40,000 x 20,000	= 35,000
Breast pieces	= 70,000 / 40,000 x 10,000	= 17,500
Wings	= 70,000 / 40,000 x 6000	= 10,500
Miscellaneous	= 70,000 / 40,000 x 4000	= 7,000
		70,000

Q. 3. ABC limited produces three products O, P and Q by the operation. Cost accumulated during the operation.

Direct Material 1000 kg @ Rs 2 =	Rs.	2,000
Direct Labor		5,000
FOH		8,000
		15,000

Output

O	500 Kg	Sold at split off point for Rs 20 / kg
P	300 kg	Enters into a second process
Q	200 kg	Enters into a second process

Second process for product P

Cost incurred: Total		Per Unit
Direct Labor cost	Rs. 6,000	Rs. 20
FOH	Rs. 3,000	Rs. 10

Product P is 100% complete & sold for Rs 70 / kg

Second process for product Q

Cost incurred: Total		Per Unit
Direct Labor cost	Rs. 1,400	Rs. 7
FOH	Rs. 600	Rs. 3

Product Q is 100% complete & sold for Rs 30 / kg

Solution

Method # 1 Physical Quantity Ratio

Process-1

Quantity Schedule

Units put in the process 1,000 kg	
Completed units of product "O"	500 kg
Transfer to further process	
Product "P"	300
Product "Q"	200
	1000

Cost Accumulated as follow:

Direct Material	2,000
Direct Labor	5,000
FOH	8,000
	15,000

Cost Allocation / Accounting Treatment

Product O = 15,000 x500 / 1000 = 7,500
Product P = 15,000 x 300 / 1000 = 4,500
Product Q = 15,000 x 200 / 1000 = 7,500

Product O

No further process is required
Completed & Sold

Sold 500 x 20 = 10,000
Cost 500 x 15 = 7,500
Gross Profit **2,500**

Product P

Cost Accumulated	
Cost received from Process 1	Rs. 4,500
Direct Labor	6,000
FOH	3,000
	13,500

Unit Cost = 13,500 / 300 = 45 / Kg
Transfer to finished goods = 300 x 45 = 13,500

Sales 300 x 70	= 21,000
Less Cost 300 x 45	= 13,500
	7,500

Product Q

Cost Accumulated		
Cost received from Process 1	Rs. 3,000	
Direct Labor		1,400
FOH		600
		5,000

Unit Cost 5,000 / 200 = 25 / Kg
Transfer to finished goods = 200 x 25 = 5,000

Sales 200 x 30	= 6,000
Less Cost 200 x 25	= 5,000
	1,000

Method # 2 Hypothetical market Value Basis

	O Rs	P Rs	Q Rs
Final Price	20	70	30
Additional Cost per kg In further processing			
Direct Labor	-	20	7
Factory Overhead	-	10	3
Hypothetical Market Value At split off point	**20**	**40**	**20**

Cost Allocation in the Process-1

Product O (Finished)	15,000 / 80 x 20	= 3,750
Product P Transferred to process II	15,000 / 80 x 40	= 7,500
Product Q Transferred to process II	15,000 / 80 x 20	= 3,750
		15,000

Product P

Process -II

Quantity Schedule

Received From process-I	300
Completed and transfer out	300

Cost Accumulated

Cost received from process-1		7,500
Cost added		
Direct Labor	6,000	
FOH	3,000	
		9,000
		16,500

Cost Apportionment / Accounting Treatment

Cost transfer to finished good Rs 16,500

16,500 / 300 = 55 per kg

300 x 55 = 16500

Sales	300 x 70	= 21,000
Less Cost	300 x 55	= 16,500
Gross Profit		**4,500**

Product Q

Process -II

Quantity Schedule

Received From process-I	200
Completed and transferred out	200

Cost Accumulated

Cost received from process-1	3,750
Cost added	
Direct Labor	1,400
FOH	600
	5,750

Cost Apportionment / Accounting Treatment

Cost transfer to finished good Rs 5,750

5750 / 200 = 28.75 per kg

200 x 28.75 = 5,750

Sales 200 x 30	= 6,000
Less Cost 300 x 55	= 5,750
	250

By Products

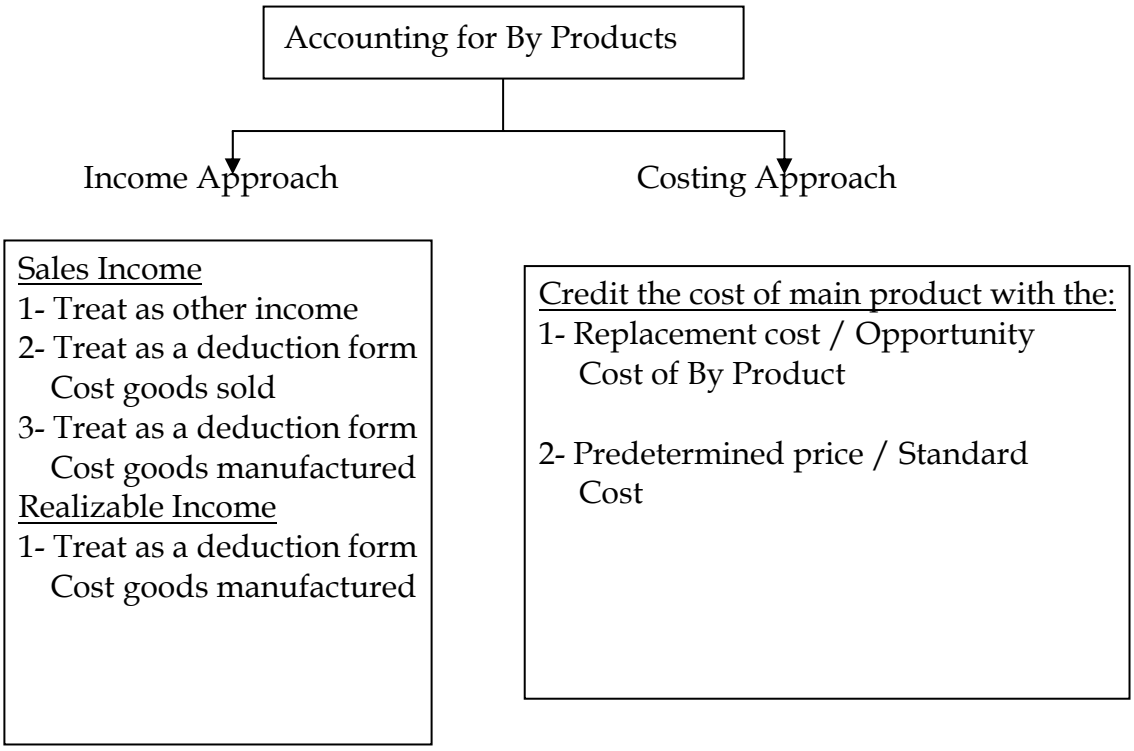
Some examples of by products are given below:

Main Product	By Product
Soap	Glycerin
Meat	Hides & Fats
Flour	Bran

Classification of by product

By product can be classified into two categories:

1. Requiting no further process, for example Bran
2. Requiting further processing, for example Hides



PRACTICE QUESTION

Following is a question on by product:

	Main product	By product
Opening stock	-----	-----
Production during the year	4,000	800
Closing stock	400	100
Cost incurred	64,000	-----
Cost of 3600 units (64,000/4000x3600)	57,600	-----
Sales price (Per unit)	30	2.50
Further processing cost		0.50

Solution

Method # 1			***Rupees***
Treat as an other income			
Sales (3600 x 30)			108,000
Less Cost of goods sold			
Opening stock	----		
Production cost	64,000		
Less Closing stock (16 x 400)	(6,400)		
			57,600
Gross Profit			50,400
Add other income			1,400
			51,800
Sales of By Product	(700 x 2.5)	1,750	
Less Further Processing cost	(700 x 0.5)	350	
		1,400	

Method # 2		***Rupees***
Treat as a deduction from cost of goods sold		
Sales (3600 x 30)		108,000
Less Cost of goods sold		
Opening stock	----	
Production cost	64,000	
Less Closing stock (16 x 400)	6,400	
	57,600	
Less Sales value of By Product	(1,400)	
		56,200
Gross Profit		**51,800**

Method # 3		***Rupees***
Treat as a deduction from cost of goods manufactured		
Sales (3600 x 30)		108,000
Less Cost of goods sold		
Opening stock	----	
Production cost (64,000 – 1,400)	62,600	
Less Closing stock (62,600 x 10%)	6,260	
		56,340

Realizable Value Basis

Production cost on By Product	800 x 2.50 =	2,000
Additional cost on By Product	800 x 0.50 =	400
Realizable Value		**1,600**

Treat as a deduction from cost of goods manufactured

Sales (3600 x 30)		108,000
Less Cost of goods sold		
Opening stock	----	
Production cost (64,000 – 1,600)	62,400	
Less Closing stock		
(62,400/4,000=15.6 x 400)	6,240	
		56,160
Gross Profit		**51,840**

Further example of by product

Joint Cost Rs. 206,800

		Further Cost Incurred per pound	Sales Price	Market Value
Grade 1	20,000 lb	1	5	(5-1) = 4 x 20,000 80,000
Grade 2	40,000	0.2	4	(4-0.2) = 3.8 x 40,000 152,000
Grade 3	60,000	0.5	3	(3-0.5) = 2.5 x 60,000 150,000
Grade 4	80,000	0.2	2	(2-0.2) = 1.8 x 80,000 144,000
Grade 5	50,000	0.1	1	(1-0.1) = 0.9 x 50,000 45,000
Total	250,000			

Multiple Choice Questions

A chemical compound is made by raw material being processed through two processes. The output of Process A is passed to Process B where further material is added to the mix. The details of the process costs for the financial period number 10 were as shown below:

Process A

Direct material 2,000 kilograms at Rs5 per kg
Direct labor Rs 7,200
Process plant time 140 hours at Rs60 per hour

Process B

Direct material 1,400 kilograms at Rs12 per kg
Direct labor Rs 4,200
Process plant time 80 hours at Rs72.50 per hour

process on direct labor cost.

	Process A	*Process B*
Expected output was	80% of input	90% of input
Actual output was	1,400 kgs	2,620 kgs

Assume no finished stock at the beginning of the period and no work-in-progress at either the beginning or the end of the period.

Normal loss is contaminated material which is sold as scrap for Rs0.50 per kg from Process A and Rs1.825 per kg from Process B, for both of which immediate payment is received.

Q. 1

For process A what is the scrap value of the normal loss?

A Rs 200
B Rs 2,000
C Rs 1,000
D Rs 0

Q. 2

What is the abnormal loss for process A in units?

A 100
B 200
C 300
D 400

Q. 3

What is the cost per kg for process A?

A Rs 18,575
B Rs 13,454
C Rs 14.575
D Rs 16,575

Problem Question

Q. 1

Kong CO. manufactures two products, one in process A, the other in process B. The following information applies to the processes for Period.

All materials are input at the start of each process, conversion costs (labor and overhead) are incurred evenly throughout the process, and losses are identified at the end of process A and can be sold for 10p per liter. The dosing work-in-progress is % of the way through the process.

Write up the accounts for process A and for process B

	Process A	**Process B**
Material input-1	4.000 liters costing Rs 3,000	200 kg costing Rs 2,000
Labor and overhead	Rs 3,440	Rs 3,900
Transfers to finished goods	13,000 liters	180 kg
Opening work-in-progress	Nil	Nil
Closing work-in-progress	Nil	20 kg
Normal loss as % of input	10%	Nil

Q. 2

Mineral Separators Ltd operates a process which produces four unrefined minerals known as W, X. Y and Z. The joint costs for operating the process for Period V were as below.

shown below.

There were no stocks of unrefined materials at the beginning of Period V, and no work-in-progress, but the stocks shown below were on hand at the end of the period, although there was no work-in-progress at that date.

The price received per ton of unrefined mineral sold is shown below and it is confidently expected that these prices will be maintained.

You are required:

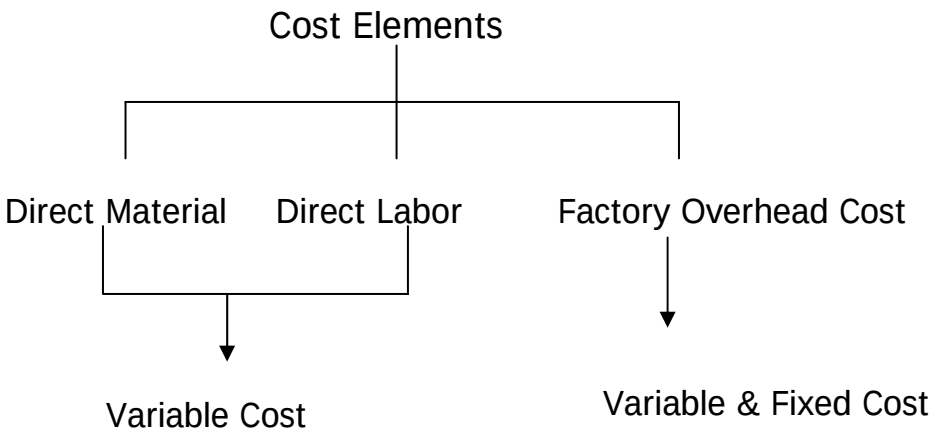
(a) To calculate the cost value of the closing stock, using sales value as the basis of your calculation.

(b) To calculate the cost value of dosing stock, using weight of output as the basis of your calculation.

LESSON# 27

MARGINAL AND ABSORPTION COSTING
(Product costing systems)

Following diagram helps to recall the behavior of different cost elements.



Marginal cost is the cost the variable cost that changes with the production of each next unit.

Marginal and Absorption Costing

So far *we* have been looking at the various different types of cost and have gradually built up the total cost of a cost unit by aggregating the cost of direct materials, direct labor, direct expenses, variable overheads and fixed overheads (absorbed into cost units). We can display this total cost as part of a profit and loss account (namely cost of sales). In doing so we must remember to adjust the profit and loss account for any overhead under- or over-absorbed.
This adjustment is only necessary because we are including fixed overheads in the cost of the cost unit. In other words, we are presenting cost information according to absorption costing principles. However, there is another method of presenting cost information, i.e. marginal costing.

Marginal Costing

Under this system, we do not attempt to absorb fixed overheads into cost units, and so we avoid the difficulties of setting absorption rate, adjusting for under or over-absorbed overhead, etc.
Cost units are valued at their marginal cost only (not their fully absorbed cost). In other words the cost of a cost unit is presented as the total of direct materials, direct labor, direct expenses and variable overheads (but not fixed overheads).
Of course, this does not mean that we can simply ignore fixed overheads It is simply that we choose to treat all fixed overheads as period costs, rather than trying to attribute them to individual cost units You will find that this presentation of cost information has distinct advantages over-absorption costing when it comes to decision making.
A key concept in marginal costing is that of contribution margin.

Contribution Margin is defined as the sales value of a cost unit minus its variable cost.

In **absorption costing,** fixed manufacturing overheads are absorbed into cost units. Thus stock is valued at absorption cost and fixed manufacturing overheads are charged in the profit and loss account of the period in which the units are sold.

In **marginal costing**, fixed manufacturing overheads are not absorbed into cost units, Stock is valued at marginal (or variable) cost and fixed manufacturing overheads are treated as period costs and are charged in the profit and loss account of the period in which the overheads are incurred.

Practice Question
A Company produces a single product and has the following budget:

Company Budget Cost Per Unit	**Rs.**
Selling price	10
Direct materials	3
Direct wages	2
Variable overhead	1

Fixed production overhead is Rs. 10,000 per month; production volume is 5,000 units per month.

Calculate the cost per unit to be used for stock valuation under:
(a) Absorption costing
(b) Marginal costing.

Solution

(a) Absorption cost per unit

		Rs
Direct materials		3
Direct wages		2
Variable overhead		1
Absorbed fixed overhead	Rs 10,000 / 5000 units	2
Cost per Unit		**8**

(b) **Marginal cost per unit**

Direct materials	3
Direct wages	2
Variable overhead	1
Cost per Unit	**6**

The stock valuation will be different for marginal and absorption costing. Under absorption costing stock will include variable and fixed overheads whereas under marginal costing stock will only include variable overheads.

Further practice question explaining the concept of product cost, period cost and cost per unit under two product costing systems:

	Absorption Costing 100 units	Marginal Costing 100 units
Direct Material Rs. 80 per unit	8,000	8,000
Direct Labor Rs. 50 per unit	5,000	5,000
Factory Overhead		
Variable FOH	3,000	
Fixed FOH	2,000	3,000
Product Cost		
Fixed Cost	**18,000**	**16,000**
(Period Expenses)		2,000

Cost per Unit

Under Absorption costing $\frac{18,000}{100}$ Rs. 180 per unit

Under Marginal costing $\frac{16,000}{100}$ Rs. 160 per unit

Contribution Margin

Contribution margin is the difference between sales and the variable cost of sales.
This can be written as:

Contribution margin = Sales *less* variable costs of sales

Contribution margin is short for "contribution to fixed costs and profits".

The idea is that after deducting the variable costs from sales, the figure remaining is the amount that contributes to fixed costs, and once fixed costs are covered the remaining amount is that of profits.

Contribution and profit

Marginal costing values goods at variable cost of production (or marginal cost) and contribution can be shown as follows;

Marginal costing: Profit calculation

	Rs
Sales	**X**
Less: variable costs	**(X)**
Contribution margin	**X**
Less: fixed costs	(X)
Profit	**X**

Profit is contribution **less** fixed costs. In absorption costing this is effectively calculated in one stage as the cost of sales already includes fixed costs

Absorption costing: profit calculation

	Rs
Sales	**X**
Less: absorption cost	(X)
Profit	X

Profit statements under absorption and marginal costing

To produce financial statements in accordance with IFRS 2, absorption costing must be used, but either marginal or absorption costing can be useful for internal management reporting the choice made will affect:

• The *way* in which profit information is presented

• The level of reported profit if sales do not exactly equal production (i.e. stock is increasing or decreasing).

LESSON# 28

MARGINAL AND ABSORPTION COSTING (Contd.)

PRACTICE QUESTION

This example continues with the Company from the above practice question.
Show profit statements for the month if sales are 4,800 units and production is 5,000 units under
(a) Total absorption costing
(b) Marginal costing.

Solution

(a) Profit statement under absorption casting

		Rs.	***Rs***
Sales (4,800 @ Rs10)			48,000
Less:			
Cost of sates			
Opening stock			
Production	(5,000 @ Rs. 8)	40,000	
Less: Closing stock (200 @ Rs. 8)		(1,600)	(38.400)
Operating profit			**9,600**

(b) Profit statement under marginal costing

Sales (4.800 @ Rs10)		48,000
Less:		
Cost of sates		
Opening stock		
Production (5,000 @ Rs6)	30,000	
Less: Closing stock (200 @ Rs6)	(1,200)	
		(28,800)
Contribution		19,200
Less: Fixed overheads		10,000
Operating profit		**9,200**

PRACTICE QUESTION

	Absorption Costing 100 units	Marginal Costing 100 units
Direct Material Rs. 80 per unit	8,000	8,000
Direct Labor Rs. 50 per unit	5,000	5,000
Factory Overhead		
Variable FOH	3,000	3,000
Fixed FOH	2,000	
Product Cost	**18,000**	**16,000**
Fixed Cost (Period Expenses)		2,000

Cost per Unit

Under Absorption costing	18,000 / 100	Rs. 180 per unit
Under Marginal costing	16,000 / 100	Rs. 160 per unit

Prepare income statements under absorption and marginal costing systems assuming the following facts:

a) All produced units Sold

b)

No. of units sold	80
No. of units in closing stock	20
No. of units produced	**100**

c)

No. of units sold	110
No. of units in opening stock	10
No. of units produced	**100**

Selling price Rs. 240 per unit

Solution

a) All Units Sold

	Absorption costing	*Marginal costing*
Sales (110 x 240)	24,000	24,000
Less Product cost		
100 x 180	**18,000**	
100 x 160		*16,000*
Gross profit	**6,000**	
Contribution margin		**8,000**
Less Fixed cost	0	(2000)
Profit	**6,000**	**6,000**

b) 80 units sold & 20 units in closing stock

	Absorption costing		*Marginal costing*	
Sales 80 x 240		19,200		19,200
Production cost				
100 x 180 =	18,000			
100 x 160 =			16,000	
Less closing stock				
20 x 180 =	(3600)			
20 x 160 =			(3,200)	
		14,600		12,800
Less Fixed cost				2,000
Contribution Margin	4,600			
Profit		**4,600**		**4,400**

c) 110 units sold

	Absorption costing		*Marginal costing*	
Sales 110 x 240		26,400		26,400
Opening stock				
10 x 180 =	1,800			
10 x 160 =			1,600	
Production cost				
100 x 180 =	18,000			
100 x 160 =			16,000	
		19,800		17,600
Less Fixed cost				2,000
Contribution Margin		6,600		
Profit		**6,600**		**6,800**

Reconciliation of the difference in profit

The difference in profit is due to there being a movement in stock levels - an increase from 0 to 200 units over the month.

Under absorption costing closing stock has been valued at Rs 1,600 (i.e. Rs 8 per unit which includes Rs 2 of absorbed fixed overheads). Under marginal costing the increase in stock is valued at Rs 1,200 (i.e. at Rs 6 per unit) and all fixed overheads are charged to the profit and loss account. Only if stock is rising or falling will absorption costing give a different profit figure from marginal costing. If sales equal production, the fixed overheads absorbed into cost of sales under absorption costing will be the same as the period costs charged under marginal costing and thus the profit figure will be the same.

The two profit figures can therefore be reconciled as follows:

	Rs
Absorption costing profit	9,600
Less: fixed costs included in the increase in stock (200 x Rs2)	(400)
Marginal costing profit	**9,200**

If stock levels are rising from opening to closing balance

Absorption Costing profit > Margin Costing profit

If stock levels are falling from opening to closing balance

Absorption Costing profit < Margin Costing profit

(Fixed costs carried forward are charged in this period, under absorption costing)

If stock levels are the same

Absorption Costing profit = Margin Costing profit

	Absorption Costing	**Marginal Costing**
Produced units = Units sold	Same Profit	Same Profit
Produced units > Units sold	More Profit	Less Profit
Produced units < Units sold	Less Profit	More Profit

Reconciliation of the above practice question

b) 80 units sold & 20 units in closing stock

	Rs
Absorption Profit	4,800
Less Closing Stock @ Fixed FOH Rate 20 x 20	(400)
Marginal Costing Profit	4,400

c) 110 units sold with an opening stock of 10 units

Absorption Profit	6,600
Add Opening Stock @ Fixed FOH Rate 10 x 20	200
Marginal Costing Profit	**6,800**

Reconciliation formula to learn

	Rs
Profit as per absorption costing system	xxx
Add Opening stock @ fixed FOH rate at opening date	xxx
Less Closing stock @ fixed FOH rate at closing date	xxx
Profit as per marginal costing system	**xxx**

Advantages of marginal costing

(Relative to the absorption costing)

Preparation of routine operating statements using absorption costing is considered less informative for the following reasons:

1. Profit per unit is a misleading figure: in the example above the operating margin of Rs2 per unit arises because fixed overhead per unit is based on output of 5,000 units. If another basis were used margin per unit would differ even though fixed overhead was the same amount in total
2. Build-up or run-down of stocks of finished goods can distort comparison of period operating statements and obscure the effect of increasing or decreasing sales.
3. Comparison between products can be misleading because of the effect of arbitrary apportionment of fixed costs. Where two or more products are manufactured in a factory and share all production facilities, the fixed overhead can only be apportioned on an arbitrary basis.
4. Marginal costing emphasizes variable costs per unit and fixed costs in total whereas absorption costing accounts for all production costs to calculate unit cost. Marginal costing therefore reflects the behavior of costs in relation to activity. Since most decision-making problems involve changes to activity, marginal costing is more appropriate for short-run decision-making than absorption costing.

PRACTICE QUESTION

This practice question illustrates the misleading effect on profit which absorption costing can have. A company sells a product for Rs10. and incurs Rs4 of variable costs in its manufacture. The fixed costs are Rs900 per year and are absorbed on the basis of the normal production volume of 250 units per year. The results for the last four years, when no expenditure variances arose- were as follows:

Item	*1st year*	*2nd year*	*3rd year*	*4th year*	*Total*
	units	*units*	*units*	*units*	
Opening stock		200	300	300	
Production	300	250	200	200	950
	300	450	500	500	950
Closing stock	200	300	300	200	200
Sales	100	150	200	300	750
	Rs	*Rs*	*Rs*	*Rs*	*Rs*
Sales value	**1,000**	**1,500**	**2,000**	**3,000**	**7,500**

Prepare a profit statement under absorption and marginal costing.

Solution

The profit statement under absorption costing would be as follows:

Items	1st year Rs.	2nd year Rs.	3rd year Rs.	4th year Rs.	Total Rs.
Opening stock @ Rs7.60		1,520	2,280	2,280	
Variable costs of production @ Rs4	1,200	1,000	800	800	3,800
Fixed costs ® 900/250 =Rs3.60	1,080	900	720	720	3,420
	2,280	3,420	3,800	3,800	7,220
Closing stock @Rs7.60	1,520	2,280	2,280	1,520	1,520
Cost of sales	(760)	(1,140)	(1,520)	(2,280)	(5,700)
(Under)/over absorption (w)	180	Nil	(180)	(180)	(180)
Net Profit	**420**	**360**	**300**	**540**	**1,620**

Working: Calculation of over / under absorption

Fixed cost control account

Incurred Year 1	900	Absorbed 300 x Rs. 3.60	1,080
Over absorption	180		
	1,080		1,080
Year 2	900	250 x Rs. 3.60	
Year 3	900	200 x Rs. 3.60	720
		Under absorption	180
	900		900
Year 4	900		
		200 x 3.60	720
		Under absorption	180
	900		900

If marginal costing had been used instead of absorption, the results would have been shown as follows:

Item	*1st year*	*2nd year*	*3rd year*	*4th year*	*Total*
	Rs	*Rs*	*Rs*	*Rs*	*Rs*
Sales	1,000	1,500	2,000	3,000	7,500
Variable cost of sales (@ Rs4)	400	600	800	1,200	3,000
Contribution margin	600	900	1,200	1,800	4,500
Fixed costs	900	900	900	900	3,600
Net profit/ (loss)	(300)	-	300	900	900

The marginal presentation indicates clearly that the business must sell at least 150 units per year to break even, i.e. Rs900 + (10 - 4), whereas it appeared, using absorption costing, that even at 100 units it was making a healthy profit.

The total profit for the four years is less under the marginal principle because the closing stocks at the end of the fourth year are valued at Rs800 (Rs4 x 200) instead of Rs 1,520, i.e. Rs720 of the fixed costs are being carried forward under the absorption principle.

The profit figures shown may be reconciled as follows:

	Year 1	*Year 2*	*Yea 3*	*Yea r4*	*Total*
	Rs	*Rs*	*Rs*	*Rs*	*Rs*
Profit / (loss) Under marginal costing	(300)	Nil	300	900	900
Add: Fixed overheads Absorbed in stock increase					
200 x Rs3.60 =	720				
100 x Rs3.60=		360			
200 x Rs3.60=					720
Less: Fixed overheads Absorbed in stock decrease					
100 x 3.60=				(360)	
Profit per absorption	420	360	300	540	1,620

Problem Questions

Q.1. A factory manufactures three components X, Y and Z and the budgeted production for the year is 1,000 units1,500 units and 2,000 units respectively. Fixed overhead amounts to Rs6.750 and has been apportioned on the basis of budgeted units: Rs 1,500 to X, Rs 2,250 to Y and Rs 3,000 to Z. Sales and variable costs are as follows:

		X	**Y**	**Z**
Selling price	Rs.	4	6	5
Variable cost	Rs.	1	4	4

Q. 2. A company that manufactures one product has calculated its cost on a quarterly production budget of 10.000 units. The selling price was Rs 5 per unit. Sales in the four successive quarters of the last year were as follows:

Quarter 1 10,000 units

Quarter 2 9,000 units

Quarter 3 7,000 units

The level of stock at the beginning of the year was 1,000 units and the company maintained its stock of finished products at the same level at the end of each of the four quarters.
Based on its quarterly production budget, the cost per unit was as follows:

Cost per unit		**Rs.**
Prime cost		3.50
Production overhead	0.75	
Selling and administration overhead	0.30	
Total		**4.55**

Fixed production overhead, which has been taken into account in calculating the above figures, was Rs 5,000 per quarter. Selling and administration overhead was treated as fixed, and was charged against sales in the period in which it was incurred.
You are required to present a tabular statement to bring out the effect on net profit of the declining volume of sales over the four quarters given, assuming in respect of fixed production overhead that the company:
(a) Absorbs it at the budgeted rate per unit
(b) Does not absorb it into the product cost, but charges it against sales in each quarter (i.e. the company uses marginal costing).

Advantages of Absorption Costing

(Relative to marginal costing)
Absorption costing is widely used and you must understand both principles.
The only difference between using absorption costing and marginal costing as the basis of stock valuation is the treatment of fixed production costs.
The arguments used in favor of absorption costing are as follows:

1. Fixed costs are incurred within the production function, and without those facilities production would not be possible. Consequently such costs can be related to production and should be included in stock valuation.
2. Absorption costing follows the matching concept by carrying forward a proportion of the production cost in the stock valuation to be matched against the sales value
3. When the items are sold.
4. It is necessary to include fixed overhead in stock values for financial statements routine cost accounting using absorption costing produces stock values which include a share of fixed overhead.
5. Overhead allotment is the only practicable way of obtaining job costs for estimating prices and profit analysis.
6. Analysis of under-/over-absorbed overhead is useful to identify inefficient utilization of production resources.

Arguments against absorption costing
The fixed costs do not change as a result of a change in the level of activity. Therefore such costs cannot be related to production and should not be included in the stock valuation.
The inclusion of fixed costs in the stock valuation conflicts with the prudence concept, therefore the fixed costs should be written off in the period in which they are incurred.

PRACTICE QUESTION

Following information relates to a manufacturing company

Selling price	Rs. 20 per unit
Units produced	30,000
Units sold	20,000
Variable cost	
Direct material	Rs. 5 per unit
Direct labor	Rs. 3 per unit
F.O.H	Rs. 1 per unit
Selling & administrative expenses	Rs. 2 per unit
Fixed cost	
F.O.H	Rs 120,000
Selling & administrative expenses	Rs. 15,000

Solution

Working for cost per unit under

Absorption Costing	
Fixed FOH Rate	
120,000/30,000 =	4
Variable FOH Rate	
Direct Material	5
Direct Labor	3
FOH	1
	9
	13

Marginal Costing	
Variable FOH Rate	
Direct Material	5
Direct Labor	3
FOH	1
	9

Income Statement under Absorption Costing System

			Rupees
Sales (20,000 x 20)			400,000
Less Cost of goods sold			
Opening stock	0		
Add Production cost			
(13 x 30,000)	390,000		
Less Closing stock			
(13 x 10,000)	130,000		
			260,000
Gross Profit			**140,000**
Less Operating expenses			
Selling & Administrative expenses			
Variable expenses			
(20,000 x 2) =		40,000	
Fixed expenses		15,000	55,000
Net profit			**85,000**

Income Statement under Marginal Costing System

		Rupees
Sales		400,000
Less Variable cost of goods sold		
Opening stock	0	
Add Variable production cost (9 x 30,000)	270,000	
Less Closing stock (9 x 10,000)	90,000	
		180,000
Gross contribution margin		220,000
Less Variable Selling & Admin Expenses (2 x 20,000)		40,000
Contribution margin		180,000
Less Fixed expenses		
Production	120,000	
Selling & Admin Expenses	15,000	135,000
Net Profit		**45,000**

Reconciliation

Profit as absorption costing	85,000
Less Closing stock (10,000 x 4)	40,000
Profit as per Marginal costing	45,000

Multiple Choice Questions

Q.1. When comparing the profits reported using marginal costing with those reported using absorption costing in a period when closing stock was 1,400 units, opening stock was 2,000 units, and the actual production was 11,200 units at a total cost of Rs 4.50 per unit compared to a target cost of Rs 5.00 per unit, which of the following statements is correct?

A Absorption costing reports profits Rs 2,700 higher
B Absorption costing reports profits Rs 2,700 lower
C Absorption costing reports profits Rs 3,000 higher
D There is insufficient data to calculate the difference between the reported profits

Q. 2. When comparing the profits reported under marginal and absorption costing during a period when the level of stocks increased:

A. An absorption costing profits will be higher and closing stock valuations lower than those under marginal costing
B. An absorption costing profits will be higher and closing stock valuations higher than those under marginal costing
C. The marginal costing profits will be higher and closing stock valuations lower than those under absorption costing
D. The marginal costing profits will be lower and closing stock valuations higher than those under absorption costing

Q. 3. Contribution margin is:

A. Sales less total costs
B. Sales less variable costs
C. Variable costs of production less labor costs

Problem Question

Rays Company manufactures and sells electric blankets.
The selling price is Rs 12.
Each blanket has the unit cost set out below.
Administration costs are incurred at the rate of Rs20 per annum.
The company achieved the production and sales of blankets set out below.
The following information is also relevant:

1. The overhead costs of Rs2 and Rs3 per unit have been calculated on the basis of a budgeted production volume of 90 units.
2. There was no inflation.
3. There, was no opening stock.

Unit cost	**Rs.**
Direct material	2
Direct labor	1
Variable production overhead	2
Fixed production overhead	3
	8

Year	**1**	**2**	**3**
Production	100	110	90
Sales	90	110	95

You are required:

(a) To prepare an operating statement for each year using
(i) Marginal costing and (ii) absorption costing
(b) To explain why the profit figures reported under the two techniques disagree.

LESSON# 29

COST – VOLUME – PROFIT ANALYSIS
(Contribution Margin Approach)

This topic is based on your knowledge of cost behavior and shows how this is applied in a decision-making situation. Cost-volume-profit (CVP) analysis is a technique which uses cost behavior theory to analyze the activity level as to the contribution margin and fixed cost relationship and the level at which there is neither a profit nor a loss (the break-even activity level).
This is important management information because managers need to know the minimum activity level that must be achieved in order that the business does not incur losses.
CVP analysis may also be used to predict profit levels at different volumes of activity based upon the assumption that costs and revenues exhibit a linear relationship with the level of activity.

Cost-volume-profit analysis determines how costs and profit react to a change in the volume or level of activity, so that management can decide the 'best' activity level.

Following are the assumptions which are used in CVP analysis.

1. Variable costs and selling price (and hence contribution) per unit are assumed to be unaffected by a change in activity level.
2. Fixed costs, whilst not affected in total by a change in the activity level, will change per unit as the activity level changes and there are more (or less) units over which to "share out" the fixed costs If fixed costs per unit change with the activity level, then profit per unit must also change.

Thus, cost-volume-profit analysis is always based on contribution per unit (assumed to be constant unless a question clearly says otherwise) and never on profit per unit because profit per unit changes every time a few more or less units are made.

CVP is a relationship of four variables

Sales	⟶	Volume
Variable cost	⟶	Cost
Fixed cost	⟶	Cost
Net income	⟶	Profit

This may be understood through the following equation

Volume @ sales price	=	Revenue
Cost matching with the sales	=	**(Cost)**
Result	=	**Profit**

CVP analysis is a tool for decision making. There are two approaches of CVP analysis:

1. Contribution margin approach
2. Break even analysis approach

Contribution Margin Approach & CVP Analysis

Contribution margin contributes to meet the fixed cost. Once the fixed cost has been met the incremental contribution margin is the profit.
Income Statement as per the marginal costing system is used as a Standard format of Income Statement to analyze the Cost-Volume-Profit relationship.

	Rs.
Sales	xxx
Variable Cost	xxx
Contribution Margin	xxx
Fixed Cost	xxx
Profit	xxx

PRACTICE QUESTION

Basic question

90 units of product "PR" is sold for Rs. 100 per unit. Variable cost relating to production and selling is Rs. 75 per unit and fixed cost is Rs. 2,250.

Q. 1. Management decides to increase its sales by 10 units.
Required: Prepare income statement and analyze.

Solution

	Rs.	**Rs.**	**Rs.**
Sales (90 x 100)	9,000 (10 x 100)	1,000	10,000
Variable cost (90 x 75)	(6,750) (10 x 75)	(750)	(7,500)
Contribution margin	2,250	250	2,500
Fixed cost	(2,250)	0	2,250
Profit / Loss	0	250	250

Analysis
This shows physical increase in volume causes an increase in contribution margin and if there is not increase in the fixed cost because of such change, the incremental contribution margin is added in the final profits.

Q. 2. Management decides to increase its sales price by 10%. Continue with the Q. 1.
Required: Prepare income statement and analyze.

Solution

Sales	100 x Rs 110	11,000
Variable cost	100 x Rs. 75	(7,500)
Contribution margin		3,500
Fixed cost		(2,250)
Profit		**1,250**

Analysis
This shows increase in sales price per unit causes an increase in the contribution margin, as there is not change in the volume the fixed will remain unchanged. So the incremental change is contribution margin is included into the profit.

Q. 3. Management decides to decrease its sales price by 10%. Continue with the Q. 1.
Required: Prepare income statement and analyze.

Sales	100 x Rs 90	9,000
Variable cost	100 x Rs 75	(7,500)
Contribution margin		1,500
Fixed cost		(2,250)
Loss		(750)

Analysis

This shows decrease in sales price per unit causes a decrease in the contribution margin, as there is not change in the volume the fixed will remain unchanged. So the change in contribution margin is subtracted from the profits, which result into a loss of Rs. 750 in this case.
Normally a decrease in sales price should case an increase in the sales volume.

Q.4. Management decides to decrease its sales price by 10% and expects an increase in sales volume by 50%. Continue with the Q. 1.
Required: Prepare income statement and analyse.

Solution

Sales	150 x Rs 90	13,500
Variable cost	150 x Rs 75	(11,250)
Contribution margin		2,250
Fixed cost		(2,250)
Loss		0

Analysis

This shows decrease in sales price per unit causes a decrease of Rs. 1,000 in the contribution margin, as well as an increase in volume is causing an increase in the profit, this results in an increase in profit.
Here in this scenario the increase in the volume must be more than 50% to earn profits.

Q.5. Management decides to decrease its sales price by 10% and expects an increase in sales volume by 200%. Continue with the Q. 1.
Required: Prepare income statement and analyse.

Solution

Sales	200 x Rs 90	18,000
Variable cost	200 x Rs 75	(15,000)
Contribution margin		3,000
Fixed cost		(2,250)
Profit		**750**

Analysis

This shows decrease in sales price per unit causes a decrease of Rs. 1,000 in the contribution margin, as well as an increase in volume is causing an increase in the profit, this results in an increase in profit.
Here in this scenario the increase in the volume must be more than 50% to earn profits.

Q.6. Management decides to increase its sales volume by 100% and it is also assumed that the fixed cost also increase upto Rs. 2,500. Continue with the Q. 5.
Required: Prepare income statement and analyse.

Solution

Sales	200 x Rs 90	18,000
Variable cost	200 x Rs 75	(15,000)
Contribution margin		3,000
Fixed cost		(2,500)
Profit		**500**

Analysis

This shows a decrease in fixed cost causes a decrease in the profits.

Q.7. Management decides to increase its sales volume by 100% and it is also assumed that the fixed cost also increase upto Rs. 2,500, and also there is an increase of 20% in the variable cost. Continue with the Q. 6.

Required: Prepare income statement and analyse.

Solution

Sales	200 x Rs 90	18,000
Variable cost	200 x Rs 90	(18,000)
Contribution margin		0
Fixed cost		(2,500)
Loss		**(2,500)**

Sales	***
Variable cost	(***)
Contribution margin	***
Fixed cost	(***)
Profit / Loss	***

This lesson ends up at following lessons:

1. At zero contribution margin the loss will be equal to the fixed cost
2. Increase in variable cost reduces the contribution margin
3. Sales – Variable cost = Contribution margin
4. Contribution margin + Variable cost = Sales
5. Contribution margin – Fixed cost = Profit
6. Profit + Fixed cost = Contribution margin
7. Sales - Variable cost = Fixed cost + Profit

LESSON# 30

COST – VOLUME – PROFIT ANALYSIS
(Break-even Approach)

Break-even

Cost-volume-profit analysis can be used to calculate break-even.
Break-even is the point where sales revenue equals total cost, i.e. (here is neither a profit nor a loss.
Profit (or loss) is the difference between contribution margin and fixed costs.
Thus the break-even point occurs where contribution margin equals fixed costs

Target Contribution Margin

Target contribution margin is the amount which if equal to fixed cost will give nil net profit, whereas, if we need to earn a target profit, such profit will be added up into the fixed cost to have target contribution margin.
Contribution margin per unit can be assumed to be constant for all levels of output in the relevant range. Similarly, fixed costs can be assumed to be a constant amount in total.
The relationships may be depicted thus:

Contribution Margin per unit

Selling price per unit ***less*** variable costs per unit

Total contribution

Volume x (Selling price per unit ***less*** variable costs per unit)

Target Contribution Margin

Fixed costs + Profit target

Target Sales in number of units

$$\frac{\text{Target Contribution Margin}}{\text{Unit contribution}}$$

Contribution may be calculated in total, or on a per-unit basis using selling prices and variable costs per unit.
The difference between contribution and fixed costs is profit (or loss); thus when contribution equals fixed costs, break-even occurs. In this way a target profit may be converted into a target contribution margin which may be used to calculate the number of units required to achieve the desired target profit.

Contribution margin to sales ratio

Contribution to sales ratio (C/S ratio) =

$$\frac{\text{Contribution Margin in Rs}}{\text{Sales in Rs}}$$

Note: you may encounter the term profit to volume (or P/V) ratio, which is synonymous with the contribution to sales ratio. Profit to volume is an inaccurate description, however, and should not be used. The C/S ratio is conveniently written as a percentage.

Break even point refers to the volume (sales) at which the entity earns no profit and suffers no loss.

It is the point where	Contribution margin = Fixed cost
And	Target profit = 0

Contribution margin – Fixed cost = 0 Profit
Contribution margin = Fixed cost + 0 Profit

At break even point the target contribution is equal to the fixed cost

Contribution Margin – Fixed cost = Profit

Contribution margin = Fixed cost + Profit

Practice Question
Q. 1

Income Statement

		Rs.
Sales	700 units x Rs 8	5,600
Variable cost	700 units x Rs 6	4,200
Contribution margin		1,400
Fixed cost		1,000
Profit		400

Variable cost over sales

4,200 / 5,600 x 100 = 75%

Contribution margin over sales

1,400 / 5,600 x 100 = 25%

Per Unit Calculation

Sales price	Rs 8
Less Variable cost	(6)
Contribution Margin	2

6 / 8 x 100 = 75%
2 / 8 x 100 = 25%

		Total	*per unit*	*%*
Sales	700 units x Rs 8	5,600	8	100%
Variable cost	700 units x Rs 6	4,200	6	75%
Contribution margin		1,400	2	25%
Fixed cost		1,000		
Profit		400		

Break even sales in Rupees

Remember the formula to calculate required amount in absence of certain information:

Given Amount x (% of required amount / % of given amount) = Required Amount

Here, to calculate break even sale, we need contribution margin to be equal to the fixed cost so that the profit is zero.

Now if the target contribution margin is equal to Rs. 1,000 then what would be the sales at this point?

Now the above formula will be applied to calculate breakeven sales:

Target CM is the given amount and its % is 25, so the sale which is 100% will be:

Rs 1,000 x 100 / 25 = Rs 4,000

OR

Rs 1,000 x 1/25 = Rs. 4,000

OR

Rs 1,000 / 25 = Rs. 4,000

So,

Break even Sales in Rs. = Fixed cost / C/S ratio

Check

Income Statement

		Rs.
Sales	500 units x Rs 8	4,000
Variable cost	500 units x Rs 6	3,000
Contribution margin		1,000
Fixed cost		1,000
Profit		**0**

Break even sales in units

Simple formula:

Break even sales in Rupees / Sales price per unit = number of units

4,000 / 8 = 500 units

Direct formula

Target CM / CM per unit

Here the target contribution margin is equal to the fixed

Fixed Cost / CM per unit

Rs. 1,000 / 2 = 500 units

Break even sales in Rupees = Target CM / Contribution to sales ratio

Break even sales in units = Target CM / Contribution margin per unit

Q. 2

Calculate Sales to target profit of Rs. 500, using the information given in practice question no. 1.

Sales	***
Variable cost	(***)
Contribution margin	***
Fixed cost	1,000
Profit	500.

Target contribution margin = Fixed cost + Target profit
= 1,000 + 500
= 1,500
Sales to earn target profit of Rs. 500

= Rs 1,500 x 100 / 25 = Rs. 6,000

= Rs 1,500 / 0.25 = Rs. 6,000

Check

Income Statement

	Rs.
Sales	6,000
Less Variable cost	4,500
Contribution Margin	1,500
Less Fixed cost	1,000
Profit	**500**

Fixed cost + Target profit
Contribution to sales ratio

Problem Question
A company sold fans at Rs 2,000 each. Variable cost Rs. 1,200 each and fixed cost Rs. 610,000.
Calculate:

a. Calculate break even sales in Rupees.
b. Break even sales in units.
c. Sales in units to earn a profit of Rs. 20,000.

Multiple Choice Questions
The following details relate to a shop which currently sells 25,000 pairs of shoes annually.
Selling price per pair of shoes Rs.40
Purchase cost per pair of shoes Rs.25
Total annual fixed costs

	Rs.
Salaries	100,000
Advertising	40,000
Other fixed expenses	100,000

Q. 1
What is the contribution per pair of shoes?
A Rs.15
B Rs.30
C Rs.7.50
D Rs.18

Q. 2
What is the break-even number of pairs of shoes?
A 14,000
B 16,000
C 28,000

LESSON# 31

BREAK EVEN ANALYSIS – MARGIN OF SAFETY

A company sold fans at Rs 2,000 each. Variable cost Rs. 1200 each and fixed cost Rs. 60,000.

Calculate:

a. Calculate break even sales in Rupees.
b. Break even sales in units.
c. Sales in units to earn a profit of Rs. 20,000.

Contribution to sales ratio = Contribution margin / Sales

= 800 / 2,000 = 0.4

a) Break-even sales in Rupees = Fixed cost / C/S Ratio

= 60,000 / 0.4 = Rs. 150,000

b) Break-even sales in units = Fixed cost / Contribution margin per unit

= 60,000 / 800 = 75 units

c) Target profit Rs 20,000

Target contribution = Target profit + Fixed cost

= Target contribution margin / Contribution margin per unit

= 80,000 / 800 = 1,000 units

Check Break even sales

Sales 75 x 2,000	150,000
Less Variable cost (150,000 x 60%)	90,000
Contribution margin	60,000
Less Fixed cost	60,000
Profit	**0**

Check Target Profit

Sales 100 x 2,000	200,000
Less Variable cost (200,000 x 60%)	90,000
Contribution margin	80,000
Less Fixed cost	60,000
Profit	**20,000**

Margin of Safety (MOS)

The margin of safety is the difference between budgeted sales volume and break-even sales volume; it indicates the vulnerability of a business to a fall in demand. It is often expressed as a percentage of budgeted sales

Budgeted sales – Break-even sales = Margin of safety

MOS ratio = MOS / Budgeted Sales x 100 = %

PRACTICE QUESTION

Q. 1

Budgeted Income statement

		Rs.
Budgeted Sales 700 units x Rs 8		5,600
Variable cost 700 units x Rs 8		4,200
Contribution margin	1,400	
Fixed cost		1,000
Profit		400
Break even Sales 500 units x Rs 8		4,000
Variable cost 500 units x Rs 6		3,000
Contribution margin	1,000	
Fixed cost		1,000
Profit		0

Percentage of MOS can be calculated in different ways:

- ***Based on Budgeted sales***

Budgeted sales – Break-even sales
= 5,600 – 4,000 = 1,600

Margin of safety x 100 = %
Budgeted sales

1,600 x 100 = 28.57%
5,600

- ***Using Budget profit***

Budgeted profit x 100 = %
Budgeted contribution margin

400 x 100 = 28.57%
1,400

- ***Using profit and contribution ratio***

Profit to sales ratio x 100 = %
Contribution to sales

Profit to sales ratio = 400 / 5,600 x 100 = 7.14%

Contribution to sales ratio = 1,400 / 5,600 x 100 = 25%

7.14% x 100 = 28.57%
25%

Q. 2

Budgeted Income Statement

	Rs.
Budgeted sales	10,000
Less variable cost	6,000
Contribution margin	4,000
Less Fixed cost	2,500
Profit	1,500

Calculate Margin of safety ratio?

$$\frac{\text{Budgeted profit}}{\text{Budgeted contribution margin}} \times 100 = \%$$

1,500 / 1,000 x 100 = 37.5%

$$\frac{\text{P/S Ratio}}{\text{C/S Ratio}} \times 100 = \%$$

Profit / Sales x 100 = 1,500 / 10,000 x 100 = 15%

Contribution margin / Sales x 100 = 4,000 / 10,000 x 100 = 40%

Margin of safety ratio = $\frac{15\%}{40\%} \times 100 = 37.5\%$

Q. 3

Sales = Rs. 50,000

Margin of safety = 25%

Calculate break even sales?

Step I

Calculate absolute amount of MOS

MOS = 50,000 x 25% = Rs. 12,500

Step II

Calculate: Breakeven sales through the following formula:

MOS = Budgeted sales - Break even sales

Budgeted sales - MOS = Break even sales

50,000 -12,500 = 37,500

Q. 4

Sales = Rs. 50,000

MOS ratio = 25%

Budgeted profit = Rs. 2,500

a). Compute projected profit

b). Prepare Budgeted sales sheet

Budgeted sales	50,000
Less Variable cost	40,000
Contribution margin	10,000

Profit 2,500

MOS ratio = Profit / Contribution margin

= 2500 / Contribution margin

0.25 contribution margin = 2,500
Contribution margin = 2,500 / 0.25
Contribution margin = Rs. 10,000

Break even sales = Fixed cost / C/S ratio

Budgeted sales	37,500
Less variable cost	30,000
Contribution margin	7,500
Less Fixed cost	7,500
Profit	**0**

Q. 4

Combined Break-even sales

	X Rupees	**Y Rupees**	**Z Rupees**
Selling price (P.U)	2.50	4	10
Variable cost (P.U)	(1.50)	(2)	(4)
Contribution margin (P.U)	1	2	6
Sales Volume	80,000	30,000	15,000
Fixed cost Rs. 1,50,000			

Solution

	X Rupees	**Y Rupees**	**Z Rupees**	**Total Rupees**
Contribution margin	(1 x 80,000) =80,000	(2 x 30,000) = 60,000	(6 x 15,000) = 90,000	2,30,000

Sales	(2.5 x 80,000) = 2,00,000	(4 x 30,000) = 1,20,000	(10 x 15,000) = 1,50,000	4,70,000

Product wise contribution to sales ratio

	X	Y	Z
Contribution margin ratio	80,000 / 2,00,000 x 100 = 40%	60,000 / 1,20,000 x 100 = 50%	90,000 / 1,50,000 x 100 = 60%

Combined contribution to sales ratio

$$\frac{230,000}{470,000}$$

= 48.936 or 0.489

Break even sales = $\frac{\text{Target contribution margin}}{\text{C/S ratio}}$

$$= \frac{150,000}{0.48936}$$

= 306,523

PRACTICE QUESTION

Q. 1

Victoria Company produces a single product. Last year's income statement is as follows:

Sales (29,000 units)	Rs. 1,218,000
Less: Variable costs:	812,000
Contribution margin	406,000
Less: Fixed expenses	300,000
Net income	106,000

Required:

1. Compute the break-even point in units and sales Rs.
2. What was the margin of safety for Victoria last year?
3. Suppose that Victoria Company is considering an investment in new technology that will increase fixed costs by Rs. 250,000 per year but will lower variable costs to 45% of sales. Units sold will remain unchanged. Prepare a budgeted income statement assuming that Victoria makes this investment. What is the new break-even point in units and sales Rs, assuming that the investment is made?

Q. 2

Crown Star Products produces two different types of lamps, a floor lamp and a desk lamp. Floor lamps sell for Rs. 30, Desk lamps for Rs. 20, the projected income statement for the coming year follows:

Sales	Rs. 600,000
Less: Variable costs;	400,000

Less: Fixed expenses	150,000
Net income	50,000

The owner of Crown Star estimates that 60% of the sales revenues will be produced by floor lamps with the remaining 40% by desk lamps. Floor lamps are also responsible for 60% of the variable expenses. Of the fixed expenses, one third is common to both products, and one-half are directly to the floor lamp product line.

Required:

1. Compute the sales revenue that must be earned for Crown Star to reach at break even.

Compute the number of floor lamps and desk lamps separately that must be sold for Crown Star to break even.

Question No. 3

Unicorn Enterprises produces two strategy games, Mystical Wars and Magical Dragons. The projected income for the coming year, segmented by product line, follows:

	Wars	Dragons	Total
Sales	Rs. 500,000	Rs. 800,000	Rs. 1,300,000
Less: Variable costs	230,000	460,000	690,000
Contribution margin	270,000	340,000	10,000
Less: Direct fixed expenses	120,000	180,000	300,000
Product margin	150,000	160,000	310,000
Less: Common fixed expenses			210,000
Operating income			100,000

The selling prices are **Rs.** 10 for Mystical Wars and **Rs.** 20 for Magical **Dragons. Required:**

1. Compute the number of games of each kind that must be sold for Unicorn Enterprises to reach its break-even.
2. Compute the revenue that must be earned to produce a net income of 10% of sales revenue.

Question No. 4

Khalid is a salt merchant who supplies salt to general merchants in Lahore city. In the year of 2000 he sold 35,000 bags of salt. One bag consists of 50kg salt. He purchases slat in raw form and then grinds it, fills it in bags and then sold it, Sale price per bag is Rs. 45.

He purchases the raw salt ® Rs. 400 per ton (1 ton consist of 1000 kg). Grinding cost is Rs, 7 per bag, carriage outward cost is Rs. 5 per bag, he also purchases empty bags ® 400 per 100 bags**.** Rent of shop Rs, 1500 per month. Electricity and phone expense is Rs, 16000 per year (assume fixed). Depreciation of plant is Rs. 3,680 per year.

In the year 2001 it is expected that sale price and demand will remain the same but all the variable costs will increased by 15%. All the fixed costs will also increase by 10%.

Required:

1. Break even point in units and Rs. in both years.
2. Income statements of both years.
3. If he wants to earn Rs. 350,000 in the year of 2001 how many bags he has to sell.
4. Assume that demand in 2001 will remain the same he wants to keep same contribution margin ratio as in year 2000 what'-will be the new selling price per bag.

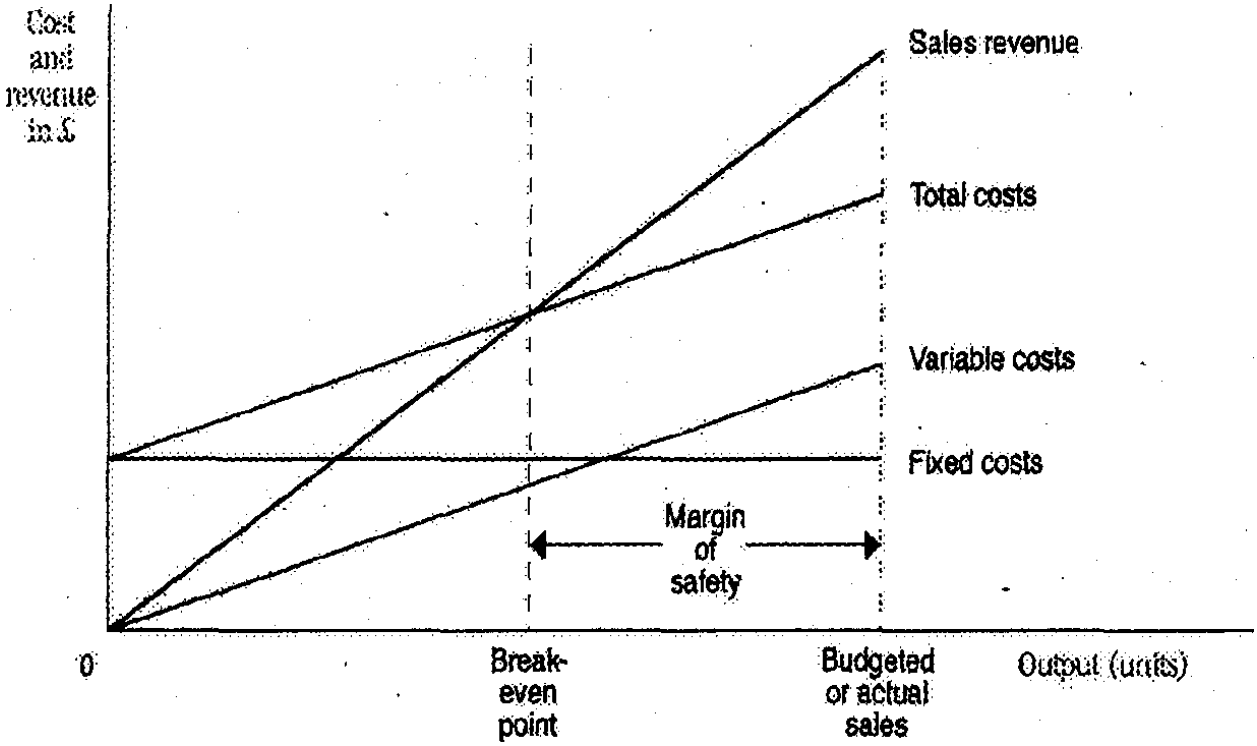
LESSON# 32

BREAKEVEN ANALYSIS – CHARTS AND GRAPHS

The conventional break-even chart

The conventional break-even chart plots total costs and total revenues at different output levels and shows the activity level at which break-even is achieved.

Conventional break-even chart



The chart or graph is constructed as follows:

- Plot fixed costs, as a straight line parallel to the horizontal axis
- Plot sales revenue and variable costs from the origin
- Total costs represent fixed plus variable costs.

The point at which the sales revenue and total cost lines intersect indicates the breakeven level of output. The amount of profit or loss at any given output can be read off the chart.

By multiplying the sales volume by the unit price at the break-even point the level of revenue needed to break even can be determined.

The chart is normally drawn up to the budgeted sales volume.

The difference between the budgeted sales volume and break-even sales volume is referred to as the margin of safety.

Usefulness of charts

The conventional form of break-even charts was described above. Many variations of such charts exist to illustrate the main relationships of costs, volume and profit.

Unclear or complex charts should, however, be avoided, as a chart which is not easily understood defeats its own object.

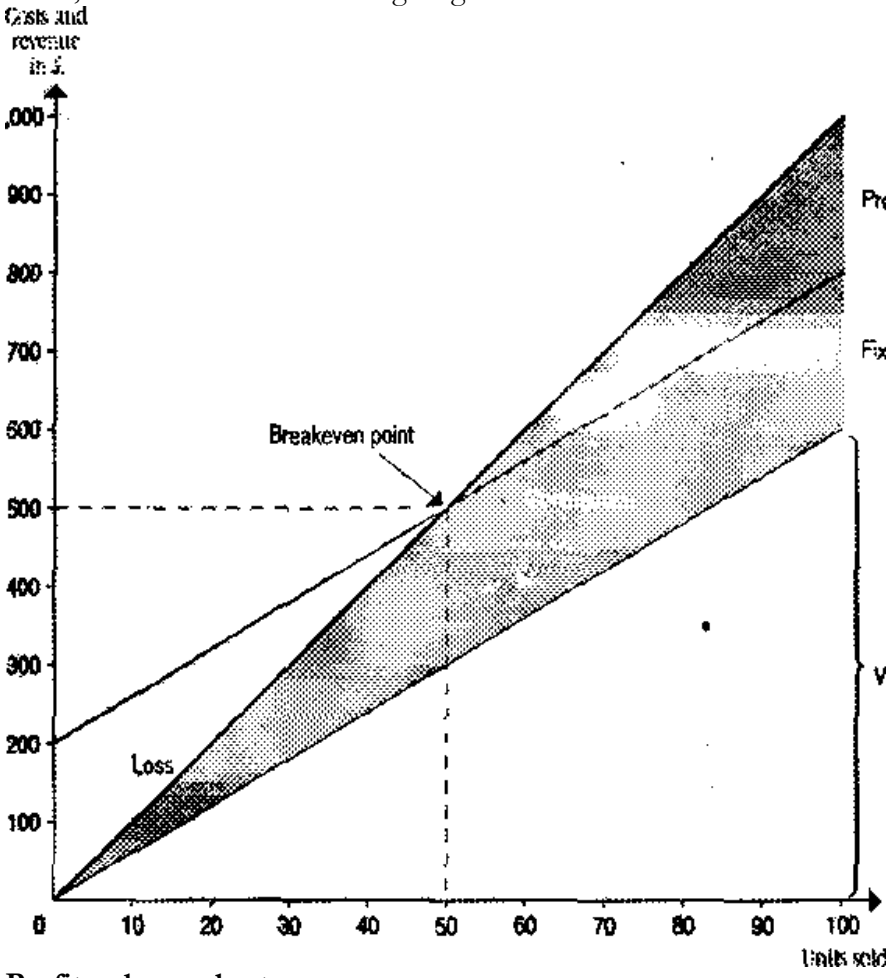
Generally, break-even charts are most useful for the following purposes:

- comparing products, time periods or actual outcomes versus planned outcomes
- showing the effect of changes in circumstances or to plans
- giving a broad picture of events,

Contribution break-even charts

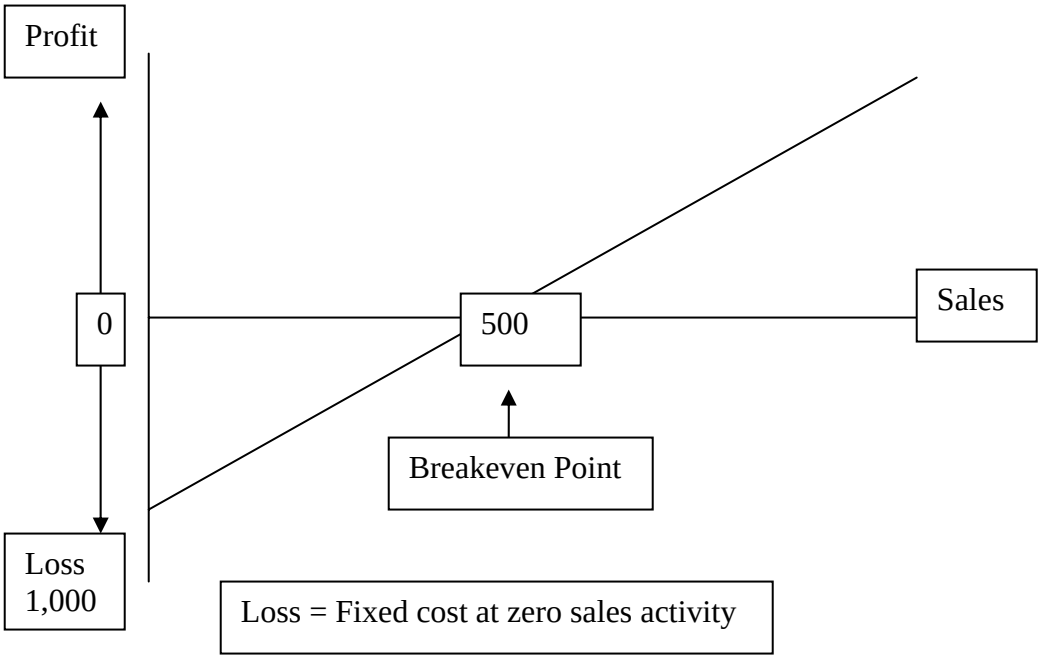
A contribution break-even chart is constructed with the variable costs at the foot of the diagram and the fixed costs shown above the variable cost line.

The total cost line will be in the same position as in the break-even chart illustrated above; but by using the revised layout it is possible to read off the figures of contribution at various volume levels, as shown in the following diagram.



Profit-volume chart

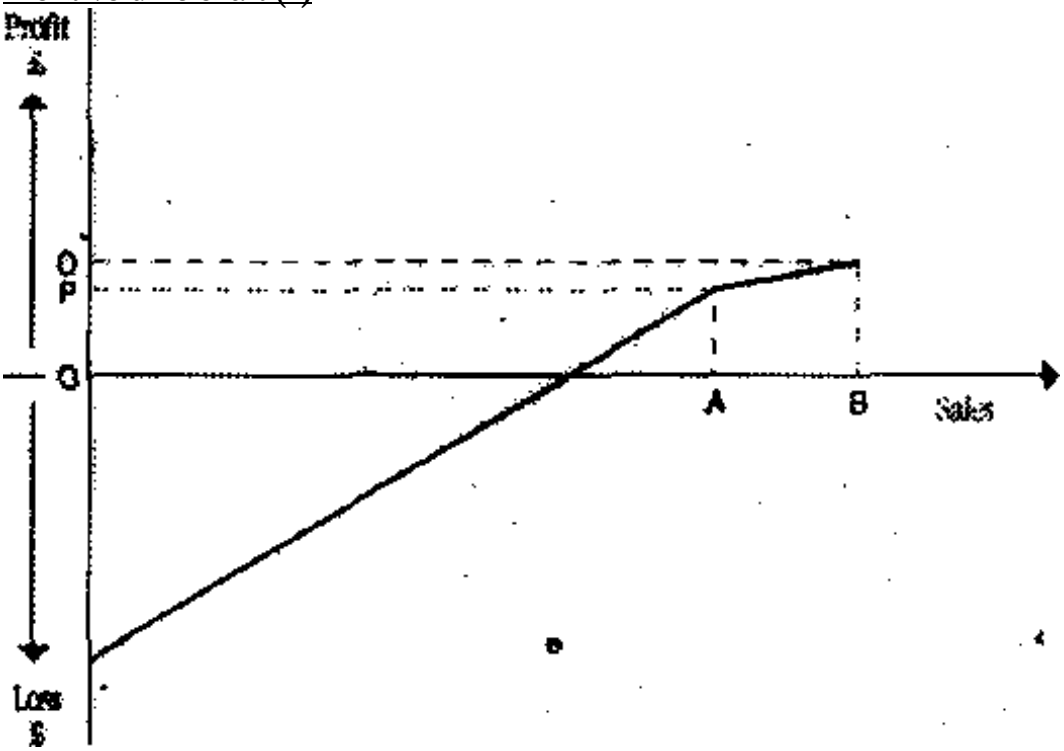
A profit-volume chart is a graph which simply depicts the net profit and loss at any given level of activity.



From the above chart the amount of net profit or loss can be read off for any given level of sales activity, unlike a break-even chart which shows both costs and revenues over a given range of activity but does not highlight directly the amounts of profits or losses at the various levels.

- The points to note in the construction of a profit-volume chart are as follows:
- The horizontal axis represents sales (in units or sales value, as appropriate). This is the same as for a break-even chart.
- The vertical axis shows net profit above the horizontal sales axis and net loss below.
- When sales are zero, the net loss equals the fixed costs and one extreme of the 'profit-volume' line is determined. Therefore this is one-point on the graph or chart.
- If variable cost per unit and fixed costs in total are both constant throughout the relevant range of activity under consideration, the profit-volume chart is, depicted by a straight line (as illustrated above). Therefore, to draw that line it is only necessary to know the profit (or loss) at one level of sales. The 'profit-volume ' line is then drawn between this point and the one for zero sales, extended as necessary.
- If there are changes in the variable cost per unit or total fixed costs at various activities, it would be necessary to calculate the profit (or loss) at each point where the cost structure changes and to plot these on the chart. The 'profit-volume' line will then be a series of straight lines joining these points together, as shown in the simple illustration below.

Profit-volume chart (2)



This illustration depicts the situation where the variable cost per unit increases after a certain level of activity (OA), e.g. because of overtime premiums that are incurred when production (and sales) exceed a particular level.

Points to note:

- The profit (OP) at sales level OA would be determined and plotted.
- Similarly the profit (OQ) at sales level of OB would be determined and plotted.
- The loss at zero sales activity (= fixed costs) can be plotted.
- The "profit-volume' line is then drawn by joining these points, as illustrated.

As long as we make the assumptions that contribution per unit is constant, and fixed costs do not change, we can draw straight-line graphs to show profit or costs and revenues at all possible activity levels.

MULTIPLE CHOICE QUESTIONS

1. If contribution margin is positive?
(a) Profit will occur.
(b) Both a profit and loss are possible.
(c) Profit will occur if the fixed expenses are greater than the contribution margin.
(d) A loss will occur if the contribution margin is greater than fixed expenses.

2. At the breakeven point:
(a) Profit is Rs. 0.
(b) . Fixed Cost + Variable Cost = Safes
(c) Fixed Cost = Contribution Margin
(d) All of the above

3. A completed CVP graph will show that profit or loss at any level of sales is measured by:
(a) A vertical line between the fixed cost line and the x axis.
(b) A horizontal line between the revenue line and the y axis.
(c) A vertical line between the total revenue line and the total expenses line.
(d) A horizontal line between the total revenue line and the total expenses line.

4. Contribution margin ratio is:
(a) Total Contribution Margin / Sales.
(b) Sales / Contribution Margin per unit,
(c) Fixed cost / Contribution margin per unit.
(d) Sales / Variable costs.

5. The impact on net operating income of any given dollar change in total sales can be computed by applying which ratio to the dollar change?
(a) Profit margin.
(b) Variable cost ratio.
(c) Contribution Margin.
(d) Ratio of Variable to Fixed Expenses.

6. The Hino Corporation has a breakeven point when sales are Rs. 160,000 and variable costs at that level of sales are Rs. 100,000. How much would contribution margin increase or decrease, if variable expenses dropped by Rs. 20,000?
(a) 37.5%.
(b) 60%.
(c) 12.5%.
(d) 26%

7. Which of the following represents the CVP equation?
(a) Sales = Contribution margin + Fixed expenses + Profits
(b) Sales = Contribution margin ratio + Fixed expenses + Profits
(c) Sales = Variable expenses + Fixed expenses + Profits
(d) Sales = Variable expenses - Fixed expenses + Profits

8. Margin of Safety is a term best described as the excess of:
(a) Contribution margin over fixed expenses.
(b) Total expenses over the breakeven point.
(c) Sales over the breakeven point.
(d) Sales over total costs.

Point out which of the following statements are TRUE/FALSE

1. Cost-volume-profit (CVP) analysis summarizes the effects of change on an organization's volume of activity on its costs, revenue, and profit.
2. The break-even point is the volume of activity where an organization's revenues and expenses are equal,
3. Total contribution margin can be calculated by subtracting total fixed costs from total revenues.
4. Contribution margin / Sales price per unit = Contribution margin ratio.
5. The sales price of a single unit minus the unit's variable expenses is called the unit contribution margin-

6. The contribution-margin ratio of a firm is determined by dividing the per unit contribution margin by the per unit sales price.

7. The safety margin of an enterprise is the difference between the budgeted sales revenue and the break-even sales revenue-

8. A company's break-even sales revenues are Rs, 400,000, and its contribution margin is 40%. If fixed costs increase by Rs. 24,000, breakeven sales will increase to Rs. 440,000.

9. If the total contribution margin at break-even sales is Rs, 45,000, then the fixed costs must also be Rs. 45,000,

10. If a company sells 50 units of A at Rs. 8 contribution margin and 200 units of B at a Rs. 6 contribution margin, the weighted-average contribution margin is Rs. 7.00.

LESSON# 33

WHAT IS A BUDGET?

A budget is a plan expressed in quantitative, usually monetary terms, covering a specific period of time, usually one year. In other words, a budget is a systematic plan for the utilization of manpower and material resources. In a business organization a budget represents an estimate of future costs and revenues. Budgets may be divided into two basic classes; Capital Budgets and Operating Budgets, Capital budgets are directed towards proposed expenditures for new projects and often require special financing (this topic is discussed in the next Unit). The operating budgets are directed towards achieving short-term operational goals of the organization, for instance, production or profit goals in a business firm. Operating budgets may be sub-divided into various departmental or functional budgets. The main characteristics of a budget are:

It is prepared in advance and is derived from the long, term strategy of the organization.
It relates to future period for which objectives or goals have already been laid down.
It is expressed in quantitative form, physical or monetary units, or both.

Different types of budgets are prepared for different purposes e.g. Sales. Budget, Production Budget. Administrative Expense Budget, Raw material Budget, etc. All these sectional budgets are afterwards integrated into a master budget- which represents an overall plan of the organization. A budget helps us in the following ways:

1. It brings about efficiency and improvement in the working of the organization.
2. It is a way of communicating the plans to various units of the organization. By establishing the divisional, departmental, sectional budgets, exact responsibilities are assigned. It thus minimizes the possibilities of buck-passing if the budget figures are not met.
3. It is a way or motivating managers to achieve the goals set for the units.
4. It serves as a benchmark for controlling on going. Operations.
5. It helps in developing a team spirit where participation in budgeting is encouraged.
6. It helps in reducing wastage's and losses by revealing them in time for corrective action.
7. It serves as a basis for evaluating the performance of managers.
8. It serves as a means of educating the managers.

Budgetary control

No system .of planning can be successful without having an effective and efficient system of control. Budgeting is closely connected with control. The exercise of control in the organization with the help of budgets is known as budgetary control. The process of budgetary control includes (i) preparation of various budgets (ii) continuous comparison of actual performance with budgetary performance and (iii) revision of budgets in the light of changed circumstances.

A system of budgetary control should not become rigid. There should be enough scope for flexibility to provide for individual initiative and drive. Budgetary control is an important device for making the organization more efficient on all fronts. It is an important tool for controlling costs and achieving the overall objectives.

Installing a budgetary control system

Having understood the meaning and significance of budgetary control in an organization, it will be useful for you to know how a budgetary control system can be installed in the organization. This requires, first of all, finding answers to the following questions in the context of an organization:

What is likely to happen?
What can be made to happen?
What are the objectives to be achieved?
What are the constraints and to what extent their effects can be minimized?

Having found answers to the above questions, the following steps may be taken for installing an effective system of budgetary control in an organization.

Organization for budgeting
The setting up of a definite plan of organization is the first step towards installing budgetary control system in an organization. A Budget Manual should, be prepared giving details of the powers, duties, responsibilities and areas of operation of each executive in the organization.

Responsibility for budgeting
The responsibility for preparation and implementation of the budgets may be fixed as under:

Budget controller
Although the Chief Executive is finally responsible for the budget programme, it is better if a large part of the supervisory responsibility is delegated to an official designated as Budget Controller or Budget Director. Such a person should have knowledge of the technical details of the business and should report directly to the President or the Chief Executive of the organization.

Budget committee
The Budget Controller is assisted 'in his work by the Budget Committee. The Committee may consist of Heads of various departments, viz., Production, Sales. Finance Personnel, Purchase, etc. with the Budget Controller as its Chairman. It is generally the responsibility of the. Budget Committee to submit discusses and finally approves the budget figures. Each head of the department should have his own Sub-committee with executives working under him as its members.

Fixation of the Budget Period
Budget period' means the period for which a budget is prepared and employed. The budget period depends upon the nature of the business and the control techniques. For example, a seasonal industry will budget for each season, while an industry requiring long periods to complete work will budget for four, five or even larger number, of years. However, it is necessary for control purposes to prepare budgets both for long as well as short periods.

Budget procedures
Having established the budget organization and fixed the budget period, the actual work or budgetary control can be taken upon the following pattern:

Key factor
It is also termed as limiting factor. The extent of influence of this factor must first be assessed in order to ensure that the budget targets are met It would be desirable to prepare first the budget relating to this particular factor, and then prepare the other budgets. We are giving below an illustrative list of key factors in certain industries.

Industry	Key factor
Motor Car	Sales demand
Aluminum	Power
Petroleum Refinery	Supply of crude oil
Electro-optics	Skilled technicians
Hydral Power generation	Monsoon

The key factors should be correctly identified and examined. The key factors need not be a permanent nature. In the long run, the management may overcome the key factors by introducing new products, by changing material mix or by working overtime or extra shifts etc.

Making a Forecast

A forecast is an estimate of the future financial conditions or operating results. Any estimation is based on consideration of probabilities. An estimate differs from a budget in that the latter embodies an operating plan or an organization. A budget envisages a commitment to certain objectives or targets, which the management seeks to attain on the basis of the forecasts prepared. A forecast on the other hand is an estimate based on probabilities of an event. A forecast may be prepared in financial or physical terms for sales, production cost, or other resources required for business. Instead of just one forecast a number of alternative forecasts may be considered with a view to obtaining the most realistic overall plan.

Preparing budgets

After the forecasts have been finalized the preparation of budgets follows. The budget activity starts with the preparation of the said budget. Then, production budget is prepared on the basis of sales budget and the production capacity available. Financial budget (i.e. cash or working capital budget) will be prepared on the basis of sale forecast and production budget. All these budgets are combined and coordinated into -a master budget- The budgets may be revised in the course of the financial period if it becomes necessary to do so in view of the unexpected developments, which have already taken place or are likely to take place.

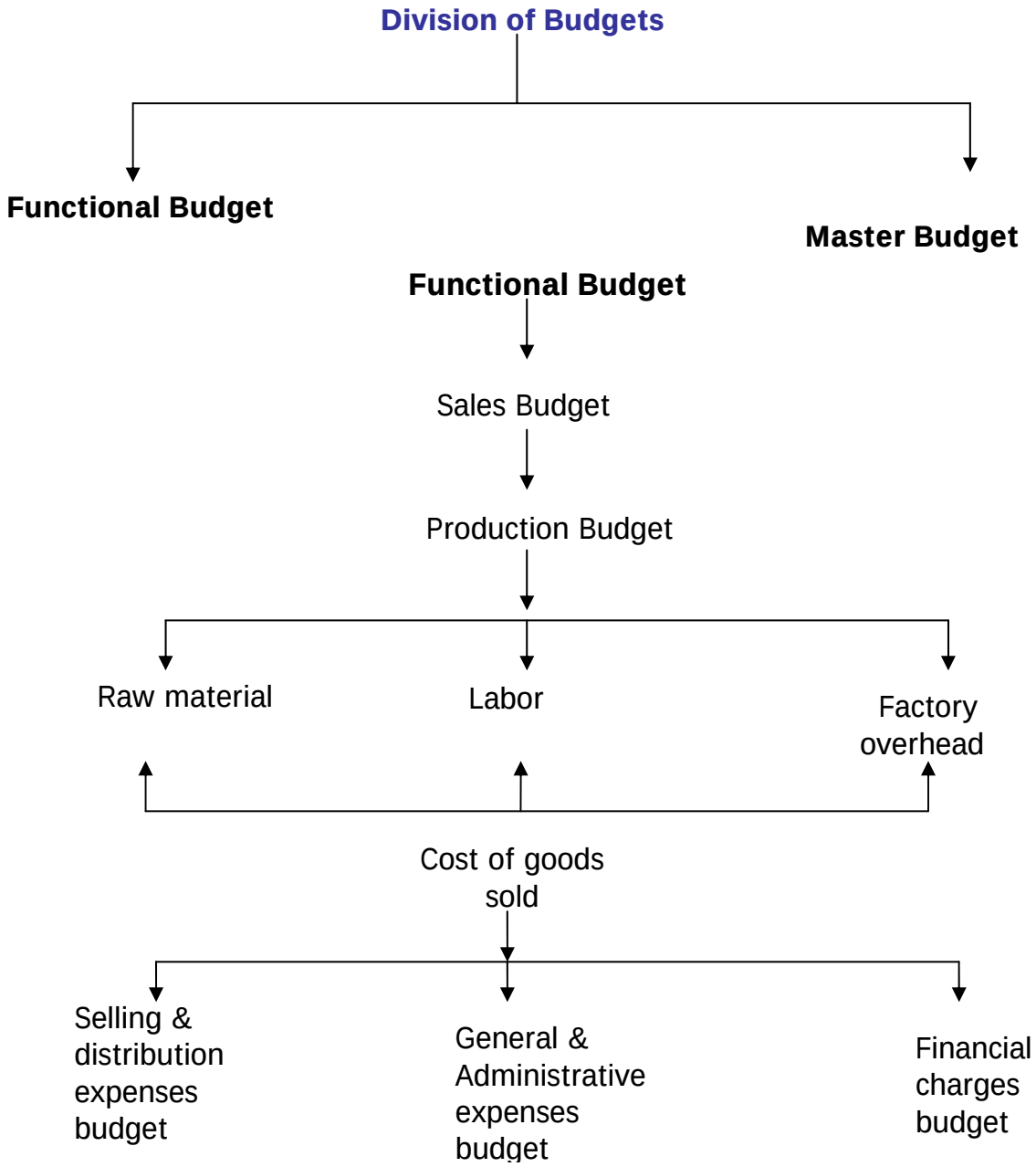
Choice between Fixed and Flexible Budgets

A budget may be fixed or flexible. A fixed budget is based on a fixed volume of activity, 11 may lose its effectiveness in planning and controlling if the actual capacity utilization is different from what was planned for any particular unit of time e.g. a month or a quarter. The flexible budget is more useful for changing levels of activity, as it considers fixed and variable costs separately. Fixed costs, as you are aware, remain unchanged over a certain range of output such costs change when there is a change in capacity level. The variable costs change in direct proportion to output if flexible budgeting approach is adopted, the budget controller can analyze the variance between actual costs and budgeted costs depending upon the actual level of activity attained during a period of time.

Objective of Budget

- Profit maximization.
- Maximization of sales.
- Volume growth.
- To compete with the competitors.
- Development of new areas of operation.
- Quality of service.
- Work-force efficiency.

Divisions of Budget



LESSON# 34

PRODUCTION & SALES BUDGET

Budgets can be classified into different categories on the basis of Time, Function, or Flexibility. The different budgets covered under each category are shown in the following chart:

Chart: clarification of Budgets

Time	Function	Flexibility
• Long term	Sales	Fixed
• Short term	Production	Flexible
• Current	Cost of Production	
• Rolling	Purchase	
	Personnel	
	Research	
	Capital Expenditure	
	Cash	
	Master	

Let us discuss some of the budgets covered in the above classification.

Rolling budget

Some organizations follow the practice of preparing a willing or progressive budget in such organizations; budget for a year in advance will always be there. Immediately after a month, or a quarter, passes, as-the case may be, a new budget is prepared for a twelve months. The figures for the month/quarter, which has rolled down, are dropped and the figures for the next month / quarter are added. For example, if a budget has been prepared for the year 19X7, after the expiry of the first quarter ending 31st March 19X7, a new budget forth full year ending 31ft March, 19X8 will be prepared by dropping the figures for the quarter which has past (i.e. quarter ending 31st March 19X7) and adding-the figures for the new quarter-ending 31st March 19X8. The figures for the remaining three quarters ending 31st December 19X7 may also be revised, if necessary. This process will continue whenever a quarter ends and a new quarter begins.

Sales budget

Sales Budget generally forms the fundamental basis on which all other budgets are built the budget is based on projected sales to be achieved in a budget period. The Sales Manager is directly responsible for the preparation and execution of this budget. Be usually taking into consideration the following organizational and environmental factors while preparing the tales budget:

Availability of material or supplies	
Internal	**External**
Past sales figures and trends	General trade prospects
Salesmen's estimates	Seasonal fluctuation
Plant capacity	Potential market
Orders on hand	Government controls, rule and regulator relating to the industry
Availability of material or supplies	Political situation and its impact on Market
Cost of distribution of goods	

It is desirable to break up the entire sales budget on the basis of different products, time periods and sales areas or territories.

Illustration 1

Shad on Ltd. has three sales divisions at A town, B town and C town. It sells two products – X and Y. The budgeted sales for the month Jan at each place are given blow:-

A	Product X	[50,000 units @ Rs. 16 each
	Product Y	[35,000 units @ Rs. 10 each
B	Product Y	[55,000 units @ Rs. 10 each
C	Product X	[75,000 units @ Rs. 16 each

The Budge sales during the Feb were:

Madras A	Product X	62,500 units @ Rs. 16 each
	Product Y	37,500 units @ Rs. 10 each
Bangalore B	Product Y	62,500 units @ Rs. 10 each
Hyderabad C	Product X	77,500 units @ Rs. 16 each

From the reports of the sales department it was estimated that the sales budget for the year ending. 31st March than 19x6 budget in the following respects:

Madras A	Product X	4,000 units
	Product Y	2,500 units
Bangalore B	Product Y	6,500 units
Hyderabad C	Product X	5,000 units

Intensive safes campaign in Bangalore and Hyderabad is likely to result in additional sales of 12,500 units of product I in Bangalore and 9,000 units of Product II in Hyderabad, Let us prepare a sales budget for the period ending 31st December, 19X7.

Division Product	Jan			Feb			Mar		
	Qty. (Units)	*Price (Rs.)*	*Value (Rs.)*	*Qty. (Units)*	*Price (Rs.)*	*Value (Rs.)*	*Qty. (Units)*	*Price (Rs.)*	*Value (Rs.)*
Town A X	54,000	16	8,64,000	50,000	16	8,00,000	62,500	16	10,00,000
Y	37,500	16	3,75,000	35,000	10	3,50,000	37,500	10	3,75,000
Total	91,500	----	12,2,9000	85,000	----	11,50,000		----	13,75,000
Banglore X Town B	12,500	10	2,00,000	----		-----		16	
Y	61,500	10	6,15,000	55,000	10	5,50,000	62,500	10	6,25,000
Total	74,500	---	8,15,000	55,000		5,50,000	62,500	----	6,25,000
Hyderabad I X	80,000	16	12,80,000	75,000	16	12,00,000	77,500	16	12,40,000
II Y	9,000	10	90,000	----		----		10	
Total	89,000	----	13,80,000	75,000		12,00,000		----	12,40,000
Product X Product II Y	1,46,500 1,08,500	16 10	23,44,000 10,80,000	1,25,000 90,000	16 10	20,00,000 9,00,000	1,40,000 1,00,000	16 10	22,40,000 10,00,000
Total	2,54,500	----	34,24,000	2,15,000		29,00,000	2,40,000	----	32,40,000

Production budget

This budget provides an estimate of the total volume of production distributed product-wise with the scheduling of operations by days, weeks and months and a forecast of the inventory of finished products. Generally, the production budget is based on the sales -budget. The responsibility for the overall production budget lies with Works Manager and that of departmental production budgets with departmental works management Production budget may be expressed in physical or financial terms or both in relation to production. The production budgets attempt to answer questions like:

(i) What is to be produced?
(ii) When it is to be produced?
(iii) How it is to be produced?
(iv) Where it is to be produced?

The production budget envisages the production program for achieving the sales target it serves as a basis Job preparation of related cost- budgets, e.g., materials cost budget, labor cost budget, etc. It easily facilities the preparation of a cash budget. The production budget is prepared after taking into consideration several factors like: **(i)** Inventory policies. **(II)** Sales requirements, **(iii)** Production stability, **(iv)** Plant capacity, **(v)** Availability of materials and labor, **(vi)** Time taken in production process, etc.

Activity 2

From the following details of Mysore Cement Works Limited, complete the production budget for the three-month period ending March 31, 19x6 (Production budget for product P has already been worked out.

Type of product	**Estimated stock on Jan 1, 19x6**	**Estimated sale during Jan-March 1986**	**Desired closing stock on March 31, 19x6**
	(Units)	(Units)	(Units)
P	1,000	5,000	1,500
Q	1,500	7,500	2,500
R	2,000	6,500	1,500
S	1,500	6,000	1,000

PRODUCTION COST BUDGET

LESSON# 35

Production cost budget

Production cost budget is also known as manufacturing budget. There are three components of manufacturing cost budget direct material cost, direct labour cost and Factory overhead cost. These budgets are based on standard rates or predetermined rates.

Following are Different scenarios for production cost budget

Scenario1- Sale at 120% of cost Rs. 96,000 (assumed sales value).
Required: Calculate Cost of Sales
Solution:

$$\text{Cost of Sales} = \text{given information} \times \frac{\%\text{age of required information}}{\%\text{age of given information}}$$

$$= 96{,}000 \times \frac{100}{120}$$

$$= \text{Rs. } 80{,}000$$

Scenario2- Normal sales at 120% of cost Rs. 60,000
Sales at cost 20,000
Sales at 90% of cost 27,000
1, 07,000

Solution:

$$\text{Cost goods to be sold} = \text{given information} \times \frac{\%\text{age of required information}}{\%\text{age of given information}}$$

$$60{,}000 \times \frac{100}{120} = \text{Rs. } 50{,}000$$

Cost goods to be sold = Rs. 20,000

Cost goods to be sold = $27000 \times \frac{100}{90}$ = Rs. 30,000

Total Cost goods to be sold = Rs. 100,000

Production cost budget consists on budget of its elementary budgets (Direct material cost budget, direct labour cost budget and Factory overhead cost budget)

Illustration 1

Goods are sold at 120% of cost. Sales were Rs. 360,000. Opening and closing finished goods inventory and units were Rs. 60,000 and Rs. 40,000, 600units and 500units respectively. Company had plan to sale 2,500 units.
You are required to calculate following with the help of above data.

- Number of units to be produced budget
- Cost of goods to be produced budget.

Solution

Total budgeted sales	Rs.	Units
Cost of goods sold 3,60,000 /120 x 100	3,00,000	2,500
+ Cost of closing finished goods stock	40,000	500
Cost of goods available for sale	3,40,000	3,000
- Cost of opening finished goods stock	(60,000)	(600)
Cost of goods to be produced	2,80,000	2,40

Illustration 2

It is continuation of illustration 1

Remember in the cost of Rs. 280,000, cost of direct material, cost of labour and factory overhead cost is inclusive.

In the following we'll come to the ratio of cost of direct material, cost of labour and factory overhead cost in cost of Rs.280, 000 as you know that it consists of the cost of direct material, cost of labour and factory overhead cost.

As it is already told you that f direct material cost budget, direct labour cost budget and Factory overhead cost budget are based on predetermined rate (these budget will be discussed in detail in coming lessons as well). predetermined rate direct material, direct labour and variable factory overhead were Rs. 30, Rs. 40, Rs. 20 respectively and fixed factory overhead Rs. 64,000.

Direct material consumed	2,400 units x Rs. 30=Rs. 72,000
Direct labor cost	2,400 units x Rs. 40= Rs. 96,000
Variable FOH cost	2,400 units x Rs. 20= Rs. 48,000
Fixed FOH cost	64,000
Total Cost	2, 80,000

Cost per unit = 2, 80,000 / 2,400 = 11.67 per unit

Direct Material Cost Budget

It is prepared both in units and quantity

Importance of material budget

1. It helps in determining minimum and maximum stock level
2. It helps to the purchasing department in developing and purchasing schedule.
3. It helps in financial arrangements.

Purchase of direct material Budget (units) = production budget (units) – beginning inventory (units) + ending inventory (units)

P**urchase of direct purchase Budget (cost)** = Purchase of direct material Budget (units) X purchase cost per unit

Illustration

Required production units were 770 and 650 for January and February respectively, desired direct material ending inventory was 30% of next months production. Cost per unit was Rs. 35. You are required to prepare direct material purchase budget and direct material cost budget.

Solution

Purchase of direct material Budget (units) = production budget (units) – beginning inventory (units) + ending inventory (units)

= 770 – 231 (30% of 770) + 195(30% 650)
= 734 units

Purchase of direct purchase Budget (cost) = Purchase of direct material Budget (units) X purchase cost per unit

= 734 units X Rs. 35 =Rs. 25,690

LESSON # 36

DIRECT LABOUR AND FACTORY OVERHEAD BUDGET

Direct Labour Budget

The direct labour budget is developed from the production budget. Direct labour requirements must be computed so that company will know whether sufficient time is available to meet production needs. By knowing in advance how much labour time will be needed throughout the budget year, the company can develop plans the labour force as the situation requires. Company that neglects budget faces labour shortages or having to hire and lay off workers at awkward times.

Importance of Direct Labor Cost Budget

- ❖ Provide the Human Resource Department about numbers & categories of the workforce required.
- ❖ Helps Human Resource Department for new recruitments or to identify surplus workforce.
- ❖ Helps Human Resource Department to hold worker training programs.

Following is the formula to determine the direct labour cost.

Production units required
X Direct labour hours per unit
X Rate per hour
= Direct labour cost

Illustration

Production units required for the month of January 900 units and required labour hour for the production of per unit was 5 hours and rate per hour was Rs. 3.50.

You are required to prepare direct labour cost budget for the month of January.

Particular	Rs.
Production units required	900
X Direct labour hours per unit	5
X Rate per hour	3.50
Direct labour cost	15,750

Factory Overhead Budget

Factory Overhead costs are budgeted for various levels of production. Total costs are divided into fixed components (assigned by rupees values) and variable components (assigned by rates and based on direct labour hours). **The formula used to determine total factory overhead is**

Fixed overhead per unit **+** (total budgeted direct labour hours **X** variable expenses rate per hour)

Factory overhead Budget
For the Year ended December 31st, 2009

	January	February	March
Budgeted direct labour	4,500	9,000	5,000
Variable overhead rate (Rs.)	x3	x2	x2.5
Variable overhead budget (Rs.)	13,500	18,000	12,500
Fixed Overhead (Rs.)	2,000	2,000	2,000
Total FOH (Rs.)	15,500	20,000	14,500

LESSON # 37

OPERATING EXPENSE BUDGET AND BUDGETED INCOME STATEMENT

Operating Expense Budget

It includes the selling and administrative expense budget. The selling and administrative expense lists the budgeted expenses for the areas other than manufacturing. In large organizations this budget would be a compilation of many smaller, individual budgets submitted by department heads and other persons responsible for selling and administrative expenses. For example, the marketing manager in large in a large organization would submit a budget a details of advertising expenses for each budget period.

Selling Expenses Budget

This budget is usually divided into its variable and fixed components. The variable costs fluctuate with sales and fixed costs remains constant per month. The formula used is

Fixed expenses per month + (Sales in Rs. x variable expense rate %)

FNS Company
Selling Expense Budget
For the month of January 2009

Types of Expense	Fixed (Rs.)	Variable (Rs.)	Total (Rs.)
Salaries	1,000		1,000
Commissions (5%of sales)		10,000	10,000
Advertising (1% of sale)		2,000	2,000
Total			13,000

It is assumed that sales are Rs. 200,000

Administration Expense Budget

Administration Expenses are generally fixed in nature; therefore, the budget prepared for one month can be used for every month.

FNS Company
Administration Expense Budget
For the month of January 2009

Types of Expense	Total (Rs.)
Executive Salaries	1,000
Other administrative expense	3,000
Total	**4,000**

Budgeted Income Statement

Particulars	Rs.	Rs.	Rs.
Sales			3,60,000
Less Cost of goods sold			
Direct material			72,000
Direct labor			96,000
Fixed FOH			64,000
Variable FOH			48,000
Cost of goods manufactured			280,000
Add opening finished goods inventory			-60,000
Less Closing finished goods inventory			40,000
Cost of goods sold			300,000
Gross profit			60,000
Less Operating expenses			
Selling expenses			
Fixed	5,000		
Variable	10,000	15,000	
Administrative expenses			
Fixed	12,000		
Variable	8,000	20,000	
Operating Expenses			35,000
Profit from operation			25,000
Less Financial charges			5,000
Profit before tax			20,000
Less Tax (20,000 x 40%)			8,000
Budgeted Net Profit			12,000

Budgeted Balance Sheet

Schedule for expected assets, liabilities, and stockholders' equity is known as budgeted balance sheet.

LESSON# 38

CASH BUDGET

Cash Budget

The cash budget the management in:

Determining the future is a summary of the firm's expected cash inflows and outflows over a particular period of time. In other words, cash budget involves a projection of future cash receipts and cash disbursements over various time intervals.

- A cash budget helps cash needs of the firm
- Planning for financing of those needs
- Exercising control over cash and liquidity of the firm.

The overall objective of a cash budget is to enable the firm to meet all its commitments in time and at the same time prevent accumulation at any lime of unnecessary large cash balances with it-

Format of Cash Budget

XYZ Ltd
Cash Budget
For the month of Jan-March

	Jan	Feb	March
Opening balance			
Add Receipts (Anticipated cash			
Receipt from all sources)			
Less Payments (Anticipated utilization of cash)			
Excess / Deficit			
Bank barrowing / Overdraft			
Closing balance			

Activity

D.A Corporation has following information relating to the month of January:

Opening cash balance Rs. 20,000. Cash receipts are: Credit sales Rs. 1, 40,000, Cash sales Rs. 80,000, Loan Rs. 2,00,000, Disposal of machine Rs. 60,000, further capital Rs. 1,20,000.

Cash payments are: Payment to creditor Rs. 60,000, Cash purchase Rs. 60,000, machine purchase Rs. 3,50,000, Administrative expenses Rs. 40,000, Selling expenses Rs. 75,000 and Interest on loan Rs. 5,000

Solution

		Jan
Opening balance		20,000
Add Receipts		
Receipt from sales:		
Credit sales	1, 40,000	
Cash sales	80,000	
Loan	2,00,000	
Further capital	1,20,000	
Disposal of machine	60,000	
		6,00,000
		6, 20,000
Less Payments		
Purchases:		
Payment to creditor	60,000	
Cash purchase	60,000	
Machine purchase	3,50,000	
Administrative expenses	40,000	
Selling expenses	75,000	
Interest on loan	5,000	
		5,90,000
Closing balance		**30,000**

LESSON# 39

COMPLEX CASH BUDGET & FLEXIBLE BUDGET

The cash budget is a summary of the firm's expected cash inflows and outflows over a particular period of time. In other words, cash budget involves a projection of future cash receipts and cash disbursements over various time intervals.

A cash budget helps the management in:

- Determining the future cash needs of the firm
- Planning for financing of those needs
- Exercising control over cash and liquidity of the firm.

The overall objective of a cash budget is to enable the firm to meet all its commitments in time and at the same time prevent accumulation at any lime of unnecessary large cash balances with it:

Practice Question---Complex Cash Budget

Question

Data relating to the months of February to June is available			
Prepare the cash budget for the month of April to June			
Months	**Sales**	**Purchases**	**Wages**
February	18,000	12,480	1,200
March	19,200	14,400	1,400
April	10,800	24,300	1,100
May	17,400	24,600	1,000
June	12,500	26,800	1,500

Additional Information

a). 40% cash sales.

b). 50% of credit sales is realized in the month following the sales and the remaining 50% in the second month following.

c). Creditors are paid in the month following the moth of purchase.

d). Cash at bank on the 1st April is Rs. 2,500.

Solution

Particulars	April	May	June
Opening Balance	2,500	2,480	0
Add Receipts			
Sales	15,480	15,960	13,460
Total (1)	**17,980**	**18,440**	**13,460**
Less Payments	**14,400**	**24,300**	**24,600**
Purchases	**1,100**	**1,000**	**1,500**
Wages			
Total (2)	**-15,500**	**-25,300**	**-26,100**
Closing Balance (1-2)	**2,480**	**-6,680**	**-12,640**
Bank O/D	**0**	**6,860**	**12,640**
Total Bank O/D = 6,860 + 12,640 = 19,500			

Working

Months	Sales	April	May	June
Feb	18,000	5,400	---	---
Mar	19,200	5,760	5,760	---
Apr	10,800	4,320	3,240	3,240
May	17,400	---	6,960	5,220
June	12,500	---	---	5,000
Total	---	15,480	15,960	13,460

Flexible budget:

When a company's activities can be estimated within close limits, the fixed budget is satisfactory. However, completely predictable situations exist in only a few cases. If business conditions change radically, causing actual operations to differ widely from fixed budget plans, this management tool is not reliable or effective. The fact that costs and expenses are affected by fluctuations in volume limits the use of the fixed budget and leads to the use of the flexible budget. To illustrate, the cost of operating an automobile per mile depends on the number of miles driven. The more a car is used per year, the more it costs to operate it but the less it costs per mile. If the owner prepares an estimate of the total cost and compares actual expenses with the budget at year-end, success in

mileage factor. The reason for this lies in the nature of the expenses, some of which arc fixed while others are variable or semi variable. Insurance, taxes, registration, and garaging are fixed costs, which remain the same whether the car is operated 1,000 or 20.000 miles. The costs of tires, gas, and repairs are variable costs, which depend largely upon the miles driven. Obsolescence and depreciation result in a semi-variable cost. Which fluctuates to some degree but does not vary directly with the usage of the car?

The underlying principle of a flexible budget is the need for some norm of expenditures for any given volume of business. This norm should be known beforehand in order to provide a guide to actual expenditures. To recognize this principle is to accept the fact that every business is dynamic, ever changing, and never static. It is erroneous, if not futile, to expect a business lo conform to a fixed, preconceived pattern.

The preparation of a flexible budget results from the development of formulas for each department and for each account within a department or cost center. The formula for each account indicates the fixed amount and/or a variable rate. The fixed amount and variable rate remain constant within prescribed ranges of activity. The variable portion of the formula is a rate expressed in relation to a base such as direct labor hours, direct labor cost or machine hours.

The application of the formulas to the level of activity actually experienced produces the allowable expenditures for the volume of activity attained. These budget figures are compared with actual costs in order to measure the performance of each department. This ready-made comparison makes the flexible budget a valuable instrument for cost control, because it assists in evaluating the effects of varying volumes of activity on profits and on the cash position,

Originally, the flexible budget idea was applied principally 10 the control of departmental factory overhead. Now however, the idea is applied lo the entire budget. So that production as well as marketing and administrative bud-gels is prepared on a flexible budget basis.

Capacity and volume

The discussion of the actual preparation of a flexible budget must be preceded by a basic understanding of the term "capacity." The terms "capacity" and "volume" (or activity) are used in connection with the construction and use of both fixed and flexible budgets. Capacity is that fixed amount of ' "plant and machinery and number of personnel for which management has committed itself and with which it expects to conduct the business. Volume is the variable factor in business. It is related to capacity by the fact that volume (activity) attempts to make the best use of existing capacity.

Any budget is a forecast of sales, costs, and expenses. Material, labor, factory overhead, marketing expenses, and administrative expenses must be brought into harmony with the sales volume. Sales volume is measured not only by sales the market could absorb, but also by plant capacity and machinery available to produce the goods. A plant or a department may produce the goods. A plant or department may produce 1,000 units or work 10.000 hours, but this volume (or activity) may not be ' compatible with the capacity of the plant or department. The production of 1.000'units or the working of 10.000 hours may be greater or smaller than the amount of sales the company can safely expect to achieve in a given market during a given period.

and normal. Current Internal Revenue Service regulations permit the use of practical, expected actual or normal capacity in assigning factory overhead costs to inventories.

Theoretical Capacity. The theoretical capacity of a department is its capacity to produce at full speed without interruptions. It is achieved if the plant-or department produces at 100 percent of its rated capacity,

Practical Capacity. It is highly improbable that any company can operate at theoretical capacity. Allowances must be made for unavoidable interruptions, such as time lost for repairs, inefficiencies, breakdowns, setups. failures, unsatisfactory materials, delays in delivery of materials or supplies, labor shortages and absences, Sundays, holidays, vacations, inventory taking, and pat-tern and model changes. The number of work shifts must also be considered. These allowances reduce theoretical capacity to the practical capacity level. This reduction is caused by internal influences and does not consider the chief external cause, lack of customers' orders. Reduction from theoretical to practical capacity typically ranges from 15 percent to 25 percent, which results in a practical capacity level or 75 percent lo 85 percent of theoretical capacity.

Expected Actual Capacity. Expected actual capacity is based on a short-range outlook. The use of expected actual capacity is feasible with firms whose products are of a seasonal nature» and market and style changes allow price adjustments according to competitive conditions and customer demands.

Normal Capacity. Firms may modify the above capacity levels by considering the Utilization of the plant or various departments in the light of meeting average sales demands over a period long enough to level out the peaks and valleys which come with seasonal and cyclical variations. Finding a satisfactory and logical balance between plant capacity and sales volume is one of the important problems of business management.

Once the normal (or average) capacity level has been established, overhead costs can be estimated and factory overhead rates computed. The use of these rates will cause all overhead of the period to be absorbed, provided normal capacity and normal expenses prevail during the period.

Purposes of Establishing Normal Capacity. Although there may be some differences between a normal long-run volume and the sales volume expected in the next period, normal capacity is useful in establishing sales prices and controlling costs. It is the basis for the entire budget system, and it can be used for the following purposes and aims:

1. Preparation of departmental flexible budgets and computation of predetermined factory overhead rates,
2. Compilation of the standard cost of each product.
3. Scheduling production.
4. Assigning cost to inventories.
5. Measurement of the effects of changing volumes of production.
6. Determination of the break-even point.

Although other capacity assumptions are sometimes used due to existing circumstances, normal capacity fulfills both long- and short-term purposes. The long-term utilization of the normal capacity level relates the marketing phase and therewith the pricing policy of the business 10 the production phase over a long period of time, leveling out fluctuations that are of short duration and of comparatively minor significance. The short-term utilization relates to management's analysis of changes or fluctuations that occur during an operating year. This short-term utilization

Factors Involved in Determining Normal Capacity. In determining the normal capacity of a plant, both its physical capacity and average sales expectancy must be considered; neither plant capacity nor sales potential alone is sufficient. As previously mentioned, sales expectancy should be determined for a period long enough to level out cyclical variations rather than on the sales expectancy for a short period of time. It should also be noted that outmoded machinery and machinery bought for future use must be excluded from the considerations which lead to the determination of the normal capacity level-Calculation of the normal capacity of a plant requires many different judgment factors. Normal capacity should be determined first for the business as a whole and then broken down by plants and departments. Determination of a departmental capacity figure might indicate that for a certain department the planned program is an overload while in another ii will result in excess capacity. The capacities of several departments will seldom be in such perfect balance as to produce an unhampered flow of production. For the department with the overload, often termed the "bottleneck" department, actions such as the following might have to be taken;

1. Working overtime.
2. Introducing an additional shift.
3. Temporarily transferring operations to another department where spare capacity is available.
4. Subcontracting the excess load.
5. Purchasing additional equipment.

On the other hand, the excess facilities of other departments might have to be reduced. Or the safes department might be asked lo search for additional orders to utilize the spare capacity in these departments.

The effect of the various capacity levels on predetermined factory overhead rates is illustrated below. If the 75 percent capacity level is considered to be the normal operating level, the overhead rate is $2.40 per direct labor hour.

EFFECT OF VARIOUS CAPACITY LEVELS ON PREDETERMINED FACTORY OVERHEAD RATES			
ITEM	NORMAL CAPACITY	PRACTICAL CAPACITY	*THEORETICAL CAPACITY*
Percentage of production capacity	75%	85%	*100%*
Direct labor hours	7,500 hrs.	8,500 hrs.	*10,000 hrs.*
Budgeted factory overhead			
Fixed	Rs. 12,000	Rs. 12,000	*Rs. 12,000*
Variable	6,000	6,800	*8,000*
Total	Rs. 18,000	Rs. 18,800	*Rs. 20,000*
Fixed factory overhead rate per direct labor hours	Rs. 1.60	Rs. 1.41	*Rs. 1.20*
Variable factory overhead rate per direct labor hour	.80	.80	*.80*
Total factory overhead rate per direct labor	*Rs. 2.40*	*Rs. 2.21*	*Rs. 2.00*

At higher capacity levels the rate is lower, because the fixed overhead is spread

A distinction must be made between idle and excess capacity. Idle capacity results from the temporary idleness of production or distribution facilities due to a lack of orders. Idle facilities are restored to full use as soon as the need arises. Their cost is usually part of the expense total used in selling up the overhead rate and is at all limes a part of the product cost. However, as explained in the factory overhead and standard cost chapters, the cost of idle capacity can be isolated both for control purposes and for the guidance of management-

Excess Capacity. Conversely, results either from greater productive capacity than the company could ever hope to use. or from an imbalance in equipment or machinery. This imbalance involves the excess capacity of one machine in contrast with the output of other machines with which it must be synchronized. Any expense arising from excess capacity should be excluded from the factory overhead rate and from the product cost. The expense should be treated as a deduction in the income statement. In many instances. It may be wise to dispose of excess plant and equipment.

The Flexible Budget is designed to change in accordance with the level of activity attained. Thus, when a budget is prepared in such a manner that the budgeted cost for any level of activity is available, it is termed as flexible budget. Such a budget is prepared after considering the fixed and variable elements of cost and the changes that may be expected for each item at various levels of operations. Flexible budgeting is desirable in the following cases:

- Where, because of the nature of business, sales are unpredictable, e.g. in luxury or semi-luxury trades.
- Where the venture is a new and, therefore, it is difficult to foresee the demand e.g., novelties and fashion products.
- Where business is subject to the vagaries of nature, such as soft drinks,
-

suffering forms shortage of labor.

Analysis of Cost Behavior

The success of a flexible budget depends upon careful study and analysis of the relationship of expenses to volume of activity or production and results in classifying expenses as fixed, variable, and semi variable,

Fixed Expenses

A fixed expense remains the same in total as activity increases or decreases. Fixed factory overhead includes conventional items such as straight-line depreciation, property insurance, and real estate taxes- Other expenses not inherently fixed acquire the fixed characteristic through the dictates of management policy.

The classification of an expense as fixed is valid only on the assumption that the underlying conditions remain unchanged. Thus, there is really nothing irrevocably fixed with respect to any expense classified as fixed. In the long run all expenses are variably. In the short run, some fixed expenses, some times called programmed fixed expenses, will change because of changes in the volume of activity or for such reasons as changes in the umber and salaries of the management groups. Other fixed expenses (e.g., depreciation or a long-term lease agreement) may commit management for a much longer period time; therefore, they have been labeled committed fixed expenses.

Variable Expenses

A variable expense is expected to increase proportionately with an increase in activity and decrease proportionately with a decrease in activity. Variable expenses include the cost of supplies, indirect factory labor, receiving, storing, rework, perishable tools, and maintenance of machinery and tools. A measure of activity – such as direct labor hour or dollars.

Normal capacity level 2,000 units

Original budget	
Fixed cost	10,000
Variable cost	40,000
	50,000

Actual capacity attained 1,500 units

Flexed budget	
Fixed cost	10,000
Variable cost	30,000
	40,000

Cost actually incurred

Flexed budget	
Fixed cost	11,000
Variable cost	33,000
	44,000

Comparing actual with original budget

	Actual	Budget	Variance
Fixed cost	11,000	10,000	(1,000) UF
Variable cost	33,000	40,000	7,000 F

Comparing actual with flexed budget

	Flexed	Actual	Variance
Fixed cost	10,000	11,000	(1,000) UF
Variable cost	30,000	33,000	(3,000) F
	40,000	44,000	4,000 UF

Production cost at normal capacity:

Direct cost	
Direct material	Rs. 30,000
Direct labor	20,000
Indirect cost	
Indirect material (Variable)	800
Other variable production OH cost	4,200
Deprecation (Fixed)	10,000
Other fixed OH cost	5,000
Total budgeted cost	70,000

Normal capacity at 20,000 units

Direct material	Rs. 26,900
Direct labor	19,540
Indirect material (Variable)	1,000
Other variable production OH cost	3,660
Deprecation (Fixed)	10,000
Other fixed OH cost	5,400
Total budgeted cost	66,500

Capacity attained 17,600 units

Prepare Flex budget at 16,000, 20,000 and 24,000 units

LESSON# 40

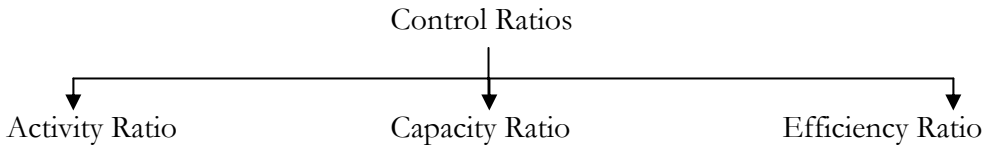
FLEXIBLE & ZERO BASE BUDGETING

The Flexible Budget is designed to change in accordance with the level of activity attained. Thus, when a budget is prepared in such a manner that the budgeted cost for any level of activity is available, it is termed as flexible budget. Such a budget is prepared after considering the fixed and variable elements of cost and the changes that may be expected for each item at various levels of operations. Flexible budgeting is desirable in the following cases:

- Where, because of the nature of business, sales are unpredictable, e.g. in luxury or semi-luxury trades.
- Where the venture is a new and, therefore, it is difficult to foresee the demand e.g., novelties and fashion products.
- Where business is subject to the vagaries of nature, such as soft drinks,
- Where progress depends on adequate supply of labor and the business is in an area which suffering forms shortage of labor.

Controlling ratios

Budget is a part of the planning process. After the various budgets, including the master budget, have been prepared, you may like to compare actual performance with the budget performance. This can be done by using three important ratios as shown on the next page.



The above ratios are expressed in terms of percentages, if the ratio works out to 100 per cent or more, the trend is taken as favorable, If the ratio is less than 100 per cent, the indication is taken as unfavorable. We shall discuss these ratios in some detail.

Activity Ratio:

Activity Ratio is a measure of the level of activity attained over a period of time. It is obtained by expressing the number of standard hours equivalent to the work produced as a percentage of the budgeted hours.

$$\text{Activity Ratio} = \frac{\text{Standard hours for actual production}}{\text{Budgeted hours}} \times 100$$

Capacity Ratio:

This ratio indicates whether and to what extent budgeted hours of activity are actually utilized. It shows the relationship between the actual number of working hours and the maximum possible number of working hours in a budget period.

$$\text{Capacity Ratio} = \frac{\text{Actual hours worked}}{\text{Budgeted hours}} \times 100$$

Efficiency Ratio:
This ratio indicates the degree of efficiency attained in production. It is obtain by expressing the standard hours equivalent to the work produced as a percentage of the actual hours spent in producing that work

$$\text{Efficiency Ratio} = \frac{\text{Standard hours for actual production}}{\text{Actual hours worked}} \times 100$$

Activity
Calculate: Efficiency, Activity and Capacity ratios and comment on the results obtained for a factory which produces two units of a commodity in one standard hour. Actual production during a particular- year is 34,000 units and the budgeted production for the year is 40,000 units. Actual hours operated are 16,000 (Some clues have been provided).

Two units are produced in one standard hour. Hence, for actual production of 34,000 units, standard hours required will be 17,000 (i.e. 34,000/2). For budgeted production of 40,000 units, budgeted hours will be 20.000
(i.e. 40,000/ 2).

Performance budgeting
As explained in the preceding pages, budgeting is nothing but the technique of expressing, largely in financial terms, the management's plans for operating and financing the enterprise during specific periods of time- Any system of budgeting, in order to be successful, must provide for performance appraisal, as well as follow up measures.

The traditional (also known as line-item or object-account) budget in government enumerates estimated expenditures by type (and quantity) for a specified period of time, usually one year, the expenditure is classified by object; the personnel are listed by type of position; the budget is divided into sections according to organizational units, departments, sections; and the types of expenditure are listed by category. The primary purpose of traditional budget particularly in government administration is to ensure financial control and meet the requirements of legal accountability, that is, to ensure that appropriation. Sanction or allotment limits for different items are not exceeded- 11 thus emphasize only the financial aspects. The expenditures are not related to the intended or planned outputs (or achievements). The necessity for finking the expenditures (or inputs in financial terms) to outputs (in physical terms), facilitating the evaluation of outcomes (or results of activities) cannot be over emphasized.

Performance budgeting (or programme budgeting) has been designed to correct the shortcomings of traditional budgeting by emphasizing management considerations/ approaches. Both the financial and physical aspects are incorporated into the budget- A performance budget presents the operations of an organization in terms of functions, programmes, activities, and projects.

In performance budgeting, Precise detail of job to be performed or services to be rendered is done. Secondly, the budget is prepared in terms of functional categories and their sub-division into programmes, activities, and projects. Thirdly, the budget becomes a comprehensive document. Since the financial and physical results are interwoven, it facilitates management control.

The main objectives of PB are; (1) to coordinate the physical and financial aspects; (ii) to improve the budget formulation, review and decision-making at all levels of management; (iii) to facilitate better appreciation and review by controlling.

Authorities (legislature, Board of Trustees or Governors, etc.) as the presentation is more purposeful and intelligible; (iv) to make more effective performance audit possible; and (v) to measure progress towards long-term objectives which are envisaged in a development plan.

Performance budgeting involves evaluation of the performance of the organisation in the context of both specific, as well as, overall objectives of the organisation. It presupposes a crystal clear perception of organizational objectives in general, and short-term business objectives as stipulated in the budget, in particular by each employee of the organisation, irrespective of his level. It, thus, provides a definite direction to each employee and also a control mechanism to higher management.

Performance budgeting requires preparation of periodic performance reports. Such reports compare budget and actual data, and show variances. Their preparation is greatly facilitated if the authority and responsibility for the incidence of each cost element is clearly defined within the firm's organizational structure- In addition, the accounting system should be sufficiently detailed and coordinated to provide necessary data for reports designed for the particular use of the individuals or cost centers having primary responsibility for specific cost.

The responsibility for preparing the performance budget of each department lies on the respective Department Head. Each Department Head will be supplied with a copy of the section of the master budget appropriate to his sphere. For example, the chief buyer will be supplied with the copy of the materials purchase budget so that he may arrange for purchase of necessary materials- Periodic reports from various sections of a department will be received by the departmental head who will submit a summary report about his department to the budget committee. The report may be daily, weekly or monthly, depending upon the size of business and the budget period. These reports will be in the form of comparison of budgeted and actual figures, both periodic and cumulative. The purpose of preparing these reports is to promptly inform about the deviations in actual and budgeted activity to the person who has the necessary authority and responsibility to take necessary action to correct the deviations from the budget,

Zero base budgeting

Earlier we have explained the formulation or different types of budgets. If the approach adopted in the formulation and preparation of budgets is based on current level of operations or activities, including current level of expenditure and revenue, such budgeting is known as traditional budgeting. This type of budgeting process generally assumes that the allocation of financial resources in the past was correct and will continue to hold good for the future as well. In most cases, an addition is made to the current figures of costs to allow for expected (or even unexpected) increases. Consequently, the budget generally takes an upward direction year after year, in spite of generally declining efficiency. Such a system of budgeting cannot be expected to promote operational efficiency. It may, on the other hand, create several problems for top management. Some of these problems are:

- Programmes and activities involving wasteful expenditure are not identified, resulting in avoidable financial and other costs.

- Inefficiencies of a prior year are carried forward in determining subsequent years' levels of performance.

- Managers are not encouraged to identify and evaluate alternate means of accomplishing the same objective.

- Decision-making is irrational in the absence of rigorous analysis of all proposed costs and benefits.

- Key problems and decision areas are not highlighted. Thus, no priorities are established throughout the organization.

- Managers tend to inflate their budget requests resulting in more demand for funds than their availability these results in recycling the entire budgeting process.

Thus, the traditional budgeting technique may be quite meaningless in the present context when management must review or re-evaluate every task with a view to better project which have a positive cost-benefit analysis or which are capable of meeting the objective of the organization.

The above analysis shows that zero base budgeting is in a way an extension of the method of cost-benefit analysis to the area of the corporate building.

Advantages of Zero Base Budgeting

Let us summaries the advantages of zero base budgeting:

- It provides the organization with a systematic way to evaluate different operations and programmes undertaken. It enables management to allocate resources according to the priority of the programmes.

- It ensures that each and every programme undertaken by management is really essential for the organization, and is being performed in the best possible way.

- It enables the management to approve departmental budgets on the basis of cost-benefit analysis. No arbitrary cuts or increases in budget estimates are made.

- It links budgets with the corporate objectives. Nothing will be allowed simply because it was being done in the past. An activity may be shelved it does not help in achieving the goals of the enterprises.

- It helps in identifying areas of wasteful expenditure and, desired, it can also be used for suggesting alternative courses of action.

It facilitates the introduction and- implement of the system of management by objectives. Thus, it can be used not only for the objective of traditional budgeting, but also for a variety of other purposes.

It is contended that zero base budgeting it happens only in the (initial stages when to be identified and decision packages have to be developed or completed. Once this is done, and the methodology is "clear, zero base budgeting is likely to take less time than the traditional budgeting. In any case, till such time the organisation is properly acclimatized to the technique of zero base budgeting, it may be done in a way that all responsibility centers are covered at least once in three or four years.
Zero base budgeting as a concept has become quite popular these days. The technique was first _used by the U.S. Department of Agriculture in 1962. Texas instruments, a multinational company, pioneered its use in the private sector. Today a number of major companies such as Zerox, BASF, International Harvester and Eastern Airlines in the United State are using the system. Some departments of government of India have recently introduced zero bases budgeting with a view to make the system of control more effective.

The responsibility for preparing the budget rests on the Budget Controller, who is assisted in his work by a Budget Committee. The Budget Committee may consist of heads of various departments, viz., Sales, Production, and Personnel. Purchase, Finance etc. Each head of the department is made responsible for preparing and executing the budget of his department. In a business organization, preparation of any budget is preceded by a sales forecast. Production budget is prepared after considering the forecasts embodied in the sales budget and the available productive capacity etc. Production budget includes the preparation of various cost budgets associated with production process. Budgets pertaining to different functions or units are then combined and coordinated into one Master Budget.

The budgets may be revised from time to time if the changed conditions or new developments so warrant. A budget may be fixed or flexible. A fixed budget is based on fixed volume of activity. If actual capacity utilization is likely to vary from period to period, flexible budgets are more desirable. A flexible budget is thus prepared for changing levels of activity. It considers fixed and variable costs separately and is therefore more useful to a business where the level of activity cannot be exactly predicted.

In a system of budgetary control, control ratios may be computed and used in order to compare the actual performance with the budgeted performance. These ratios are: activity ratio, capacity ratio and efficiency ratio. In case the ratio is hundred percent or more, it is considered favorable. If it is less than hundred per cent, it is taken as unfavorable.

The traditional budgeting technique which takes the current level of operations as the basis for estimating the future level of operations is slowly going out of date. It is being increasingly realized that the traditional technique has serious shortcomings in view of the constantly changing conditions of today; the management is expected to review and re-evaluate the tasks in view of the increasing pressures of environment. The concept of zero base budgeting is being considered as a suitable alternative to replacing the traditional method. Zero base Budgeting technique suggests that an organization should not only make decisions about the proposed new programmes, but should also, from time to time, review the appropriateness of the existing.

The concept of Zero base Budgeting has been accepted for adoption in the departments of the Central Government, and some State Governments.

Activity
ABC Co. wishes to arrange over draft facilities with its bankers during the period April to June when it will be manufacturing mostly for stock. Prepare a Cash Budget including the extent of

bank facilities the company will require at the end of each month for the above period from the following data.

	Sales Rs.	Purchases Rs.	Wages Rs.
February	18,000	12,480	1,200
March	19,200	14,400	1,400
April	10,800	24,300	1,100
May	17,400	24,600	1,000
June	12,500	26,800	1,500

a) 40% is cash sale.
b) 50 per cent of credit sales is realized in the month following the sale and the remaining 50 per cent in the second month following. Creditors are paid in the month following (he month of purchase.
c) Cash at bank on the 1st April (estimated) is Rs. 25, 00.

Activity

Jammu Manufacturing Company Ltd. is to start production on 1st January, 19x3- The prime cost of a unit is expected to be Rs. 40 out of which Rs. 16 is for materials and Rs. 24 for labour. In addition, variable expenses per unit are expected to be Rs. 8, and fixed expenses per month Rs, 30,000. Payment for materials is to be made in the month following the purchase. One-third of sales will be for cash and the rest on credit for settlement in the following month. Expenses are payable in the month in which they are incurred. The selling price is fixed at Rs. 80 per unit the number of units manufactured and sold is expected to be as under:

January	900	April	2,000
February	1,200	May	2,100
March	1,800	June	2,400

Draw a cash budget showing requirements of cash from month to month.

Activity

The Sudershan Chemicals Ltd., operates a system of flexible budgetary control.
A flexible budget is required to show levels of activity at 70%, 80% and 90%. The following is a summary of the relevant information:

a) Sales based on normal level of activity of 70% (3,50,000) units at Rs. 200 each. If output is increased to 80% and 90%, selling prices are to be reduced by 2.5% and 5% of the original selling price respectively in Order to reach a wider market.

b) Variable costs are Rs. 100 per unit (70% is the cost of raw material). In case output reaches 80% level of activity or above the effective purchase of raw material will be reduced by 5%.

c) Variable overheads: Salesman's commission is 2% of sale value.

d) Semi-variable overheads (total) at 3,50,000 units are Rs. 1,20,00,000. They are expected to increase by 5% if output reaches a level of activity of 80% and by a further 10% if it

e) Total fixed overheads are Rs. 2,00,000, which is likely to remain unchanged up to 100% capacity.

Activity

Calculate: (a) Efficiency Ratio (b) Activity Ratio (a) Capacity Ratio from the following figures:

Budgeted production	880 units
Standard hours per unit	10
Actual production	750 units
Actual working hours	6,000

LESSON # 41

DECISION MAKING IN MANAGEMENT ACCOUNTING

Relevant costs and decision-making

Relevance is one of the key characteristics of good management accounting information. This means that management accounting information produced for each manager must relate to the decisions, which he/she will have to make.

Relevant costs are the costs that meet this requirement of good management accounting information. The Chartered Institute of Management Accounting defines relevant costs as:

The costs appropriate to a specific management decision

This definition could be restated as 'the amount by which costs increase and benefits decrease as a direct result of a specific management decision'. Relevant benefits are 'the amounts by which costs decrease and benefits increase as a direct result of a specific management decision'.

Before the management of an enterprise can make an informed decision on any matter, they need to incorporate all of the relevant costs-which apply to the specific decision at hand in their decision-making process. To include any non-relevant costs or to exclude any relevant costs will result in management basing their decision on misleading information and ultimately to poor decisions being taken.

Relevant costs and benefits only deal with the quantitative aspects of decision. The qualitative aspects of decisions are of equal importance to the quantitative and no decision should be made in practice without full consideration being given to both aspects.

Identifying relevant and non-relevant costs

The identification of relevant and non-relevant costs in various decision-making situations is based primarily on common sense and the knowledge of the decision maker of the area in which the decision is being making. Armed with these two tools you should be able to sift through all the information that is available in respect of any decision and extract those costs (and benefits), which are appropriate to the decision at hand.

In identifying relevant costs for various decisions, you may find that some costs not included in the normal accounting records of an enterprise are relevant and some costs included in such records are non-relevant. It is important that you and relevant costs for decision-making, and while the latter may be recorded in the former this is not always the case.

Accounting records are used to record the incidence of actual costs and revenues as they arise. Decisions, on the other hand, are based only on the relevant costs and benefits appropriate to each decision while the decision is being made. This point is particularly appropriate when you come to examine opportunity costs and sunk costs that are dealt with below.

In practice, you may also find that the information presented in respect of a decision does not include all the relevant costs appropriate to the decision but the identification of this omission is very difficult unless you are familiar with the area in which the decision is being made.

Incremental costs

An incremental cost can be defined as a cost which is specifically incurred by following a course of action and which is avoidable if such action is not taken. Incremental costs are, by definition,

decision goes ahead and they will not incurred if the decision is scrapped). For example, if an enterprise is deciding whether or not to accept a special order for its product, the extra variable costs (i.e. number of units in special order x variable cost per unit) that would be incurred in filling the order are an incremental cost because they would not be incurred if the special order were to be rejected.

Non-incremental costs

These are costs, which will not be affected by the decision at hand. Non-incremental costs are non-relevant costs because they are not related to the decision at hand (i.e. non-incremental costs stay the same no matter what decision is taken). An example of non-incremental costs would be fixed costs, which by their very nature should not be affected by decisions (at least in the short-term). If, however, a decision gives rise to a specific increase in fixed costs then the increase in fixed costs would be an incremental and, hence, relevant cost. For example, in a decision on whether to extend the factory floor area of an enterprise, the extra rent to be incurred would be a relevant cost of that decision.

Spare capacity costs

Because of the recent advancements in manufacturing technology most enterprises have greatly increased their efficiency and as a result are often operating at below full capacity. Operating with spare capacity can have a significant impact on the relevant costs for any short-term production decision the management of such an enterprise might have to make.

If spare capacity exists in an enterprise, some costs which are generally considered incremental may in fact be non-incremental and thus, non-relevant, in the short-term. For example, if an enterprise is operating at less than full capacity then its work force is probably under utilized. If it is the policy of the enterprise to maintain the level of its work force would be a non-relevant cost for a decision on whether to accept or reject a once-off special order. The labour cost is non-relevant because the wages will have to be paid whether the order is accepted or not. If the special order involved and element of overtime then the cost of such overtime would of course be a relevant cost (as it is an incremental cost) for the decision.

Two further types of costs that have to be considered are opportunity costs and sunk costs.

Opportunity costs

An opportunity cost is a level of profit or benefit foregone by the pursuit of a particular course of action. In other words, it is the value of an option, which cannot be taken as a result of following a different option. For example, if an enterprise has a quantity of raw material in stock, which cost Rs. 7 per kg and it plans to use this material in the filling of a special order then you would normally, incorporate Rs. 7 per kg as part of your cost calculations for filling the order. If, however, this quantity of material could be resold without further processing for Rs. 8 per kg, then the opportunity cost of using this material in the special order is Rs. 8 per kg; by filling the order you forego the Rs. 8 per kg, which was available for a straight sale of the material. Opportunity costs are, therefore, the 'real' economic costs of taking one course of action as opposed to another.

In the above decision-making situation it is the opportunity cost which is the relevant cost and, hence, the cost which should be incorporated into your cost-versus-benefit analysis. It is because the loss of the Rs. 8 per kg is directly related to the filling of the order and the opportunity cost is greater than the book cost. Opportunity costs are relevant costs for a decision only when they exceed the costs of the same item in the option to the decision under consideration.

You may find the idea of opportunity costs difficult to grasp at first because they are notional costs, which may never be included in the books and records of an enterprise. They are, however, relevant in certain decision-making situation and you must bear in mind the fact that they exist when assessing any such situations.

Sunk cost

A sunk cost is a cost that the already been incurred and cannot be altered by any future decision. If sunk costs are not affected by a decision then they must be non-relevant costs for decision-making purposes. Common examples of sunk costs are market research costs and development expenditure incurred by enterprises in getting a product or service ready for sale. The final decision on whether to launch the product or service would regard these costs as 'sunk' (i.e. irrecoverable) and thus, not incorporate them into the launch decision.

Sunk costs are the opposite of opportunity costs in that they are not incorporated in the decision making process even though they have already been recorded in the books and records of the enterprise.

LESSON # 42

DECISION MAKING

Companies are often faced with the problem of whether to close down temporarily a part of the plant during periods of low demand.

How long operations should be continued?

As long as products contribute fixed expenses, a company seems to be better off than if the plant were shut down.

Size of fund

The fund required to continue production is the difference between the following:

(a) Fixed costs at normal operations,

(b) Fixed costs when plant is shut down.

Arguments against shut-down

(a) If the company continues operation, expenses that would be incurred with the closing down of the plant will be saved; e.g. an increase in factory security.

(b) Continued operation means saving (he expenses that will otherwise be incurred if the plant is reopened again at a later stage.

(c) A shut-down for a short period of fine will not eliminate all costs. Rent, rates, depreciation and insurance will have to be incurred during the shutdown period.

(d) If the factory is shut down, this will affect not only morale but also its market standing if it cannot meet consumer demand.

Illustration

Lanka Manufacturing Company is considering temporarily closing down a division due to an unexpected fall in demand. On the basis of the following information you are required by the board of directors to prepare a statement in such a way as to show clearly whether or not it is advisable to close down the division temporarily.

Production capacity	50%	70%	90%	100%
Units	50,000	70,000	90,000	100,000
Prime cost	Rs. 210,000	Rs. 294,000	Rs. 378,000	Rs. 420,000
Production overhead	200,000	240,000	290,000	300,000
Other overhead	90,000	102,000	114,000	120,000

The division is operating at 60 percent capacity with a turnover of Rs. 515,000. If it is decided to close the division temporarily, it is estimated that:

(a) expenses that would be incurred with the closing down of the division would amount to Rs. 60,000

(b) present fixed costs would be reduced by Rs. 54,000 per annum;

(c) plant maintenance during shut-down would be Rs 10,000 per annum;

(d) On reopening, the cost of overhauling plant, training and engagement of new personnel would be Rs. 30,000

It is expected that in about twelve month's time it may be possible to work at 80 percent capacity.

Differential Costing for Short-Term Decision Making

The role of fixed costs

If the decrease or increase in the level of activity affects fixed costs then these costs should be considered differential costs. It is generally accepted that if the plant has excess capacity then new or additional volume may be accepted if the selling price ii greater than variable costs. In such a situation, fixed costs arc not relevant if they remain fixed at an increased level of output. But if they are incurred because of the increased level of activity then they are certainly variable. Once incurred, if they arc committed fixed costs, they become a permanent feature and the company may find (hat it has capacity far in excess of requirements.

The following illustration has been prepared so as to place particular emphasis on the role of fixed costs.

Illustration

Sena of London operates at 100 percent of normal capacity. At this volume it produces 50,000 units of a product.

Income statement

Sales (50,000 units at Rs. 10 each)	Rs. 500,000
Prime cost (Rs. 5 per unit)	Rs. 250,000
	Rs. 250,000
Variable production overhead (Rs. 1 per unit)	Rs. 50,000
	Rs. 200,000
Fixed production overhead	Rs. 100,000
Factory profit	Rs. 100,000

The marketing director reports that an overseas customer has offered to pay Rs. 7.50 per unit for an additional 20,000 units. To produce the additional order fixed costs would increase by Rs. 25,000. Would you advise the company to accept the order?

Differential cost statement-method 1

	Present business	With additional business	Difference
Sales	Rs. 500,000	Rs. 650,000	Rs. 150,000
Prime cost	250,000	350,000	100,000
Variable production overhead	50,000	70,000	20,000
Fixed production overhead	100,000	125,000	25,000
Factory profit	Rs. 100,000	Rs. 105,000	Rs. 5,000

Differential cost statement – method 2

	Present	Additional	Total
Sales	Rs. 500,000	Rs. 150,000	Rs. 650,000
Prime cost	250,000	100,000	350,000
Variable production overhead	50,000	20,000	70,000
Fixed production overhead	100,000	25,000	125,000
Factory profit	100,000	5,000	105,000

Traditional statement for additional business

Sales (20,000 units at Rs. 7.50)	Rs. 150,000
Prime cost (20,000 at Rs. 5)	100,000
Variable production overhead (20,000 at Rs. 1)	20,000
Joint fixed production overhead (using a predetermined rate of absorption:	
Rs. 100,000/50,000 = Rs. 2 (20,000 at Rs. 2)	40,000
Separable fixed costs	25,000
Loss on additional business	(Rs. 35,000)

The traditional cost statement for additional business would cause management to reject the offer. Management may also not accept the offer because as computed under the traditional method absorption costing the price offered per unit is less than the total cost per unit and also because it is less than the current selling price of Rs. 10 per unit:

Price offered per unit	Rs. 7.50
Cost per unit	**Rs.**
Prime cost	5.00
Variable production overhead	1.00
Joint fixed costs	2.00
Separable fixed costs (Rs. 25,000/20,000)	1.25
Loss per unit	Rs. (1.75)

In the differential cost statements (methods 1 and 2) the additional business has been charged with differential cost only. It should be noted that the reason for the differential profit is that the regular sales were not affected by the acceptance of additional business. If the acceptance of additional business caused the price to be reduced to Rs. 7.50 per unit on all sales then the result would be a loss of Rs. 20,000 for the company:

Revised income statement – all sales at 7.50

Sales (70,000 units at Rs. 7.50)	Rs. 525,000
Variable costs (70,000 at Rs. 6)	420,000
Joint fixed production costs	100,000
Separable fixed production costs	25,000
Loss	Rs. (20,000)

The role of variable costs

In differential cost studies, if the plant is not operating at practical capacity owing to lack of orders, variable costs usually represent the differential cost whether they are incremental or avoidable. The term refers to those costs that will change. It is often assumed that the variable cost per unit will remain constant regardless of the level of activity.

One may question the validity of the above assumption. What if the variable cost per unit does not remain constant at various levels of activity? An increased level of activity may cause the variable cost per unit to change for a variety of reasons.

Examples are:

(a) At a higher level of output material cost per unit may be reduced by bulk buying at

(b) Direct labour cost per unit may increase as a result of overtime working if there is a labour shortage;
(c) Greater spoilage and waste with increase production.

Illustration that follows puts particular emphasis on the role of variable costs:
The following are assumed:
Sena of London produces 40,000 units operating at 50 per cent capacity.

Production fixed costs	Rs. 20,000
Other fixed costs	Rs. 40,000
Variable cost per unit:	
Direct material	Rs. 3.00
Direct labour	2.00
Variable overhead	1.00
	Rs. 6.00

Selling price per unit: Rs. 10
An overseas customers offer to buy increased quantities during the forthcoming year at the following prices:

10,000 units at Rs. 9
20,000 units at Rs. 8
30,000 units at Rs. 7
40,000 units at Rs. 6

If the offer is accepted then the variable cost per unit is expected to change as follows:

First 10,000 units	Would cause a drop in the material cost per unit due to large scale purchases
Next 10,000 units	A further reduction in the material cost per unit but an increase in direct wages
Next 10,000 units	Would involve some overtime and so variable overhead per unit would increase.
Next 10,000 units	A further reduction in material cost per unit, and increase labour cost per unit and variable cost per unit.

Summary of expected changes

Units	1st 10,000	2nd 10,000	3rd 10,000	4th 10,000
Material per unit	(5%)	(5%)	-	(5%)
Labour per unit	-	5% +	-	5% +
Variable overhead per unit	-	-	5% +	5% +

Variable cost per unit at various levels of activity

	Normal (Rs.)	Additional 10,000	Additional 20,000	Additional 30,000	Additional 40,000
Direct material	3.00	2.85	2.7075	2.7075	2.572
Direct labour	2.00	2.00	2.1000	2.1000	2.205
Direct expenses	1.00	1.00	1.0000	1.0500	1.1025
Variable cost	6.00	5.85	5.8075	5.8575	5.8795

Differential cost statement

	Normal 40,000	Additional 10,000	Additional 20,000	Additional 30,000	Additional 40,000
Sales value per unit	Rs. 10	Rs. 9.00	Rs. 8.00	Rs. 7.00	Rs. 6.00
Variable cost per unit	6	5.85	5.8075	5.8575	5.8795
Contribution per unit	Rs. 4	Rs. 3.15	Rs. 2.1925	Rs. 1.1425	Rs. 0.1205
Fund	160,000	31,500	43,850	34,275	4,820

LESSON # 43

DECISION MAKING (Contd.)

Relevant Costs

Relevant costs are future cash flows arising as a direct consequence of a decision.

- Relevant costs are future costs
- Relevant costs are cash flows
- Relevant costs are incremental costs

Decision making should be based on relevant costs.

a. Relevant Costs are future costs. A decision is about the future and it cannot alter what has been done already. Costs that have been incurred in the past are totally irrelevant to any decision that is being made 'now'. Such costs are past costs or sunk costs. Costs that have been incurred include not only costs that have already been paid, but also costs that have been committed. A committed cost is a future cash flow that will be incurred anyway, regardless of the decision taken now.
b. Relevant costs are cash flows. Only cash flow information is required. This means that costs or charges which do not reflect additional cash spending (such as deprecation and national costs) should be ignored for the purpose of decision making.
c. Relevant costs are incremental costs. For example, if an employee is expected to have no other work to do during the next week, but will be paid his basic wage (of, say, Rs. 100 per week)(for attending work and doing nothing, his manager might decide to give him a job which earns the organization Rs. 40. The net gain is Rs. 40 and the Rs. 100 is irrelevant to the decision because although it is a future cash flow, it will be incurred anyway whether the employee is given work or not.

Avoidable Costs

One of the situations in which it is necessary to identify the avoidable costs is in deciding whether or not to discontinue a product. The only costs which would be saved are the avoidable costs which are usually the variable costs and sometimes some specific costs. Costs which would be incurred whether or not the product is discontinued are known as unavoidable costs.

Differential Costs and Opportunity Costs

Relevant costs are also differential costs and opportunity costs.

- Differential cost is the difference in total cost between alternatives.
- An opportunity cost is the value of the benefit sacrificed when one course of action is chosen in preference to an alternative.

For example, if decision option A costs Rs. 300 and decision option B costs Rs. 360, the differential costs is Rs. 60.

Example: Differential Costs and Opportunity Costs

Suppose for example that there are three options, A, B and C, only one of which can be chosen. The net profit from each would be Rs. 80, Rs. 100 and Rs. 70 respectively.
Since only one option can be selected option B would be chosen because it offers the biggest benefit.

	Rs.
Profit from option B	100
Less opportunity cost (i.e. the benefit from the most profitable alternative, A)	80
Differential benefit of option B	20

The decision to choose option B would not be taken simply because it offers a profit of Rs. 100, but because it offers a differential profit of Rs. 20 in excess of the next best alternative.

Controllable and Uncontrollable Costs

We came across the term controllable costs at the beginning of this study text. Controllable costs are items of expenditure which can be directly influenced by a given manger within a given time span.
As a general rule, committed fixed costs such as those costs arising form the possession of plant, equipment and buildings (giving rise to deprecation and rent) are largely uncontrollable in the short term because they have been committed by longer-term decisions.
Discretionary fixed costs, for example, advertising and research and development costs can be thought of as being controllable because they are incurred as a result of decision made by management and can be raised or lowered at fairly short notice.

Sunk Costs

A sunk cost is a past cost which is not directly relevant in decision making. The principle underlying decision accounting is the management decisions can only affect the future. In decision making, managers therefore required information about future cots and revenues which would be affected by the decision under review. They must not be misled by events, costs and revenues in the past, about which they can do nothing.
Sunk costs, which have been charged already as a cost of sales in a previous accounting period or will be charged in a future accounting period although the expenditure had already been incurred, are irrelevant to decision making.

Example: Sunk Costs
An example of a sunk cost is development costs which have already been incurred. Suppose that a company has spent Rs. 250,000 in developing a new service for customers, but the marketing department's most recent findings are that the service might not gain customer acceptance and could be a commercial failure. The decision whether or not to abandon the development of the new service would have to be taken, but the Rs. 250,000 spent so far should be ignored by the decision makers because it is a sunk cost.

Fixed and Variable Costs

Unless you are given an indication to the contrary, you should assume the following:

- Variable costs will be relevant costs.
- Fixed costs are irrelevant to a decision.

This need not be the case, however, and you should analyze variable and fixed cost data carefully. Do not forget that 'fixed' costs may only be fixed in the short term.

Non-Relevant Variable Costs

There might be occasions when a variable cost is in fact a sunk cost (and therefore a non-relevant variable cost). For example, suppose that a company has some units of raw material in stock. They have been paid for already, and originally cost Rs. 2,000. They are now obsolete and are no longer used in regular production, and they have no scrap value. However, they could be used in a special job which the company is trying to decide whether to undertake. The special job is a 'non-off' customer order, and would use up all these materials in stock.

a. In deciding whether the job should be undertaken, the relevant cost of the materials to the special job is nil. Their original cost of Rs. 2,000 is a sunk cost, and should be ignored in the decision.
b. However, if the materials did have scrap value of, say, Rs. 300, then their relevant cost to the job would be the opportunity cost of being unable to sell them for scrap, i.e. Rs. 300.

Attributable Fixed Costs

There might be occasions when a fixed cost is a relevant cost, and you must be aware of the distinction 'specific' or 'directly attributable' fixed costs, and general fixed overheads.

Directly attributable fixed costs are those costs which, although fixed within a relevant range of activity level are relevant to a decision for either of the following reasons.

a. They could increase if certain extra activities were undertaken. For example, it may be necessary to employ an extra supervisor if a particular order is accepted. The extra salary would be an attributable fixed cost.
b. They would decrease or be eliminated entirely if a decision were taken either to reduce the scale of operations or shut down entirely.

General fixed overheads are those fixed overheads which will be unaffected by decisions to increase or decreased the scale of operations, perhaps because they are an apportioned share of the fixed costs of items which would be completely unaffected by the decision. General fixed overheads are not relevant in decision making.

Absorbed Overhead

Absorbed overhead is a national accounting cost and hence should be ignored for decision making purposes. It is overhead incurred which may be relevant to a decision.

The Relevant Cost of Materials

The relevant cost of raw materials is generally their current replacement cost, unless the materials have already been purchased and would not be replaced once used. In this case the relevant cost of using them is the higher of the following:

- Their current resale value
- The value they would obtain if they were put to an alternative use.

If the materials have no resale value and no other possible use, then the relevant cost of using them for the opportunity under consideration would be nil.

Question

Majeed Ltd. has been approached by customer who would like a special job to be done for him, and who is willing to pay Rs. 22,000 for it. The job would require the following materials:

Material	Total units required	Units already in stock	Book value of units in stock Rs./unit	Realizable value Rs./unit	Replacement cost Rs./unit
A	1,000	0	-	-	6
B	1,000	600	2	2.50	5
C	1,000	700	3	2.50	4
D	200	200	4	6.00	9

Material B is used regularly by Majeed Ltd, and if units of B are required for this job, they would need to be replaced to meet other production demand.

Materials C and D are in stock as the result of previous over-buying, and they have a restricted use. No other use could be found for material C, but the units of material D could be used in another job as substitute for 300 units of material E, which currently costs Rs. 5 per unit (of which the company has no units in stock at the moment).

Required: Calculate the relevant costs of material for deciding whether or not to accept the contract.

Answer

a. Material A is not yet owned. It would have to be bought in full at the replacement cost of Rs. 6 per unit.

b. Material B is used regularly by the company. There are existing stocks (600 units) but if these are used on the contract under review a further 600 units would be bought to replace them. Relevant costs are therefore 1,000 units at the replacement cost of Rs. 5 per unit.

c. 1,000 units of material C are needed and 700 are already in stock. If used for the contract, a further 300 units must be bought at Rs. 4 each. The existing stocks of 700 will not be replaced. If they are used for the contract, they could not be sold at Rs. 2.50 each. The realizable value of these 700 units is an opportunity cost of sales revenue forgone.

d. The required units of material D are already in stock and will not be replaced. There is an opportunity cost of using D in the contract because there are alternative opportunities either to sell the existing stocks for Rs. 6 per unit (Rs. 1,200 in total) or avoid other purchases (of material E), which would cost 300 x Rs. 5 = Rs. 1,500. Since substitution for E is more beneficial, Rs. 1,500 is the opportunity cost.

e. Summary of relevant costs:

	Rs.
Material A (1,000 x Rs. 6)	6,000
Material B (1,000 x Rs. 5)	5,000
Material C (300 x Rs. 4) plus (700 x Rs. 2.50)	2,950
Material D	1,500
Total	15,450

The Relevant Cost of Labor

The relevant cost of labor, in different situation, is best explained by an example:

Example: Relevant Cost of Labor

LW plc is currently deciding whether to undertake a new contract. 15 hours of labor will be required for the contract. LW plc currently products product L, the standard cost details of which are shown below.

STANDARD COST CARD	PRODUCT L
	Rs. /Unit
Direct Materials (10kg @ Rs. 2)	20
Direct Labor (5 hrs @ Rs. 6)	30
	50
Selling price	72
Contribution	22

c. What is the relevant cost of labor if the labor must be hired form outside the organization?
d. What is the relevant cost of labor if LW plc expects to have 5 hours spare capacity?
e. What is the relevant cost of labor if labor is in short supply?

Solution

a. Where labor must be hired from outside the organization, the relevant cost of labor will be the variable costs incurred.
Relevant cost of labor on new contract = 15 hours @ Rs. 6 = Rs. 90.

b. It is assumed that the 5 hours spare capacity will be paid anyway, and so if these 5 hours are used on another contract, there is no additional cost to LW plc.

	Rs.
Direct labor (10 hours @ Rs. 6)	60
Spare capacity (5 hours @ Rs. 0)	0
	60

c. Contribution earned per unit of Product L produced = Rs. 22
If it requires 5 hours of labor to make one unit of product L, the contribution earned per labor hour = Rs. 22/5 = Rs. 4.40.

	Rs.
Direct labor (15 hours @ Rs. 6)	90
Contribution lost by not making product L (Rs. 4.40 x 15 hours)	66
	156

It is important that you should be able to identify the relevant costs which are appropriate to a decision. In many cases, this is a fairly straightforward problem, but there are cases where great care should be taken. Attempt the following question:

Question:

A company has been making a machine to order for a customer, but the customer has since gone into liquidation, and there is no prospect that nay money will be obtained from the winding up of the company. Costs incurred to date in manufacturing the machine are Rs. 50,000 and progress payments of Rs. 15,000 had been received from the customer prior to the liquidation.
The sales department has found another company willing to buy the machine for Rs. 34,000 once it has been completed.
To complete the work, the following costs would be incurred.

a. Materials: These have been bought at a cost of Rs. 6,000. They have no other use, and if the machine is not finished, they would be sold for scrape for Rs. 2,000.

b. Further labor costs would be Rs. 8,000. Labor is in short supply, and if the machine is not finished, the work force would be switched to another job, which would earn Rs. 30,000 in revenue, and incur direct costs of Rs. 12,000 and absorbed (fixed) overhead of Rs. 8,000.
c. Consultancy fees Rs. 4,000. If the work is not completed, the consultant's contract would be cancelled at a cost at Rs. 1,500.
d. General overheads of Rs. 8,000 would be added to the cost of the additional work.

Required:

Assess whether the new customer's offer should be accepted.

Answer:

a. Costs incurred in the past, or revenue received in the past are not relevant because they cannot affect a decision about what is best for the future. Costs incurred to date of Rs. 50,000 and revenue received of Rs. 15,000 are 'water under the bridge' and should be ignored.
b. Similarly, the price paid in the past for the materials is irrelevant. The only relevant cost of materials affecting the decision is the opportunity cost of the revenue from scrap which would be forgone – Rs. 2,000.

c. Labor costs Rs Labor costs required to complete work 8,000 opportunity costs: Contribution forgone by losing other work Rs. (30,000 – 12,000) 18,000
Relevant cot of labor 26,000

d. The incremental cost of consultancy from completing the work is Rs. 2,500.

	Rs.
Cost of completing work	4,000
Cost of canceling contract	1,500
Incremental cost of completing work	2,500

e. Absorbed overhead is a national accounting cost and should be ignored. Actual overhead incurred is the only overhead cost to consider. General overhead costs (and the absorbed overhead of the alternative work for the labor force) should be ignored.

f.

Relevant costs may be summarized as follows:		Rs.	Rs.
Revenue from completing work			34,000
Relevant Costs:			
Materials:	Opportunity cost	2,000	
Labor:	Basic pay	8,000	
	Opportunity Cost	18,000	
Incremental cost of consultant		2,500	
			30,500
Extra profit to be earned by accepting the order			3,500

The Deprival Value of an Asset

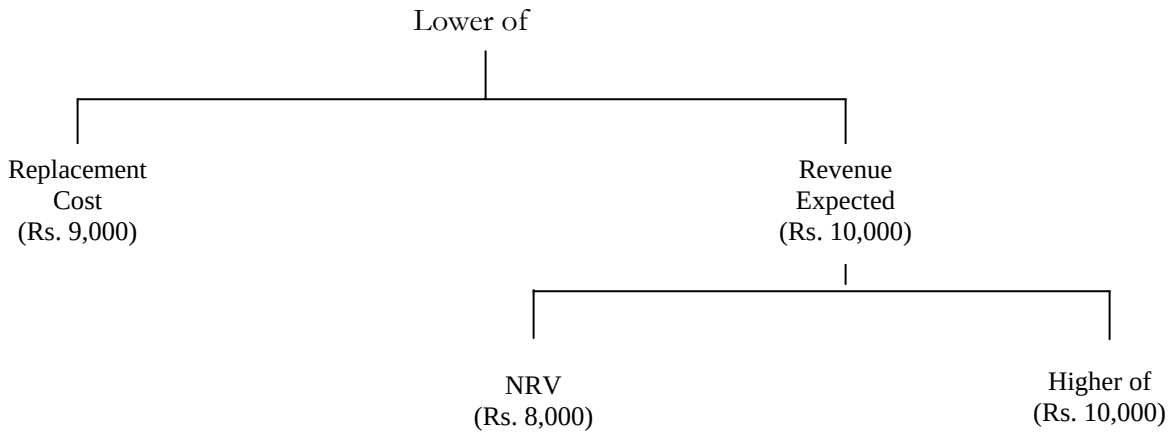
The deprival value of an asset represents the amount of money that a company would have to receive if it were deprived of an asset in order to be no worse off than it already is.
The deprival value of an asset is best demonstrated by means of an example.

Example: Deprival Value of an Asset

A machine cost Rs. 14,000 ten years ago. It is expected that the machine will generate future revenues of Rs. 10,000. Alternatively, the machine could be scrapped for Rs. 8,000. An equivalent machine in the same condition would cost Rs. 9,000 to buy now. What is the deprival value of the machine?

Solution

Firstly, let us think about the relevance of the costs given to us in the question.
Cost of machine = Rs. 14,000 = past/sunk cost
Future revenues = Rs. 10,000 = revenue expected to be generated
Net realizable value = Rs. 8,000 = scrap proceeds
Replacement cost = Rs. 9,000
When calculating the deprival value of an asset, use the following diagram.



Therefore, the deprival value of the machine is the lower of the replacement cost and Rs. 10,000. The deprival value is therefore Rs. 9,000.

LESSON # 44

DECISION MAKING
CHOICE OF PRODUCT (PRODUCT MIX) DECISIONS

Introduction

One of the more common decision-making problems is a situation where there are not enough resources to meet the potential sales demand, and so a decision has to be made about what mix of products to produce, using what resources there are as effectively as possible.

A limiting factor could be sales if there is a limit to sales demand but any one of the organization's resources (labor, materials and so on) may be insufficient to meet the level of production demanded. It is assumed in limiting factor accounting that management wishes to maximize profit and that profit will be maximized when contribution is maximized (given no change in fixed cost expenditure incurred). In other words, marginal costing ideas are applied.

Contribution will be maximized by earning the biggest possible contribution from each unit of limiting factor. For example if grade A labor is the limiting factor, contribution will e maximized by earning the biggest contribution from each hour of grade A labor worked.

The limiting factor decision therefore invoices the determination of the contribution earned by each different product from each unit of the limiting factor.

Example: Limiting Factor

AB Ltd makes two products, the Ay and the Be. Unit variable costs are as follows.

	Ay Rs.	Be Rs.
Direct Materials	1	3
Direct Labor (Rs. 3 per hour)	6	3
Variable Overhead	1	1
	8	7

The sales price per unit is Rs. 14 per Ay and Rs. 11 per Be. During July 20X2 the available direct labor is limited to 8,000 hours. Sales demand in July is expected to be 3,000 units for Ays and 5,000 units for Bes.

Required:

Determine the profit-maximizing production mix, assuming that monthly fixed costs are Rs. 20,000, and that opening stocks of finished goods and work in progress are nil.

Solution:

Step 1. Confirm that the limiting factor is something other than sales demand.

	Ays	**Bes**	**Total**
Labor hours per unit	2hrs	1hr	
Sales demand	3,000 units	5,000 units	8,000hrs
Labor hours needed	6,000 hrs	5,000 hrs	11,000hrs
Labor hours available			
Shortfall			3,000hrs

Labor is the limiting factor on production.

Step 2. Identify the contribution earned by each product per unit of limiting factor that is per labor hour worked.

	Ays	Bes
	Rs.	Rs.
Sales price	14	11
Variable Cost	8	7
Unit contribution	6	4
Labor hours per unit	2 hrs	1 hrs
Contribution per labor hour (=unit of limiting factor)	Rs. 3	Rs. 4

Although Ays have a higher unit contribution than Bes, two Bes can be made in the time it takes to make one Ay. Because labor is in short supply it is more profitable to make Bes than Ays.

Step 3. Determine the optimum production plan. Sufficient Bes will be made ot meet the full sales demand, and the remaining labor hours available will then be used to make Ays.

(a).

Product	**Demand**	**Hours required**	**Hours available**	**Priority of manufacture**
Bes	5,000	5,000	5,000	1st
Ays	3,000	6,000	3,000 (bal)	2nd
		11,000	8,000	

(b).

Product	**Units**	**Hours needed**	**Contribution per unit**	**Total**
			Rs.	**Rs.**
Bes	5,000	5,000	4	20,000
Ays	1,500	3,000	6	9,000
		8,000		29,000
Less fixed costs				20,000
Profit				9,000

In conclusion

a. Unit contribution is not the correct way to decide priorities.
b. Labor hours are the scarce resources, and therefore contribution per labor is the correct way to decide priorities.

The Be earns Rs. 4 contribution per labor hour, and the Ay earns Rs. 3 contribution per labor hour. Bes therefore make more profitable use of the scarce resource, and should be manufactured first.

Exam Focus Point

If an examination question asks you to determine the optimum production plan, follow the five-step approach shown below.

Step 1. Identify the limiting factor.
Step 2. Calculate contribution per unit for each product.
Step 3. Calculate contribution per unit of limiting factor.
Step 4. Rank products (make product with highest contribution per unit of limiting factor first).
Step 5. Make products in rank order until scare resource is used up (optimal production plan).

MAKE OR BUY DECISIONS

Introduction

In a make or buy situation with no limiting factors, the relevant costs for the decision are the differential costs between the two options.

A make or buy problem involves a decision by an organization about whether it should make a product/carry out an activity with its own internal resources, or whether it should pay another organization to make the production/carry out the activity. Examples of make or buy decisions would be as follows.

a. Whether a company should manufacture its own components, or buy the components from an outside supplier.
b. Whether a construction company should do some work with its own employees, or whether it should subcontract the work to another company.

It an organization has the freedom of choice about whether to make internally or buy externally and has no scarce resources that put a restriction on what it can do itself, the relevant costs for the decision will be the differential costs between the two options.

Example: Make or Buy

Buster Ltd makes four components, W, X, Y and Z, for which costs in the forthcoming year are expected to be as follows.

	W	**X**	**Y**	**Z**
Production (units)	1,000	2,000	4,000	3,000
Unit marginal costs	**Rs.**	**Rs.**	**Rs.**	**Rs.**
Direct materials	4	5	2	4
Direct labor	8	9	4	6
Variable production overheads	2	3	1	2
	14	17	7	12

Directly attributable fixed cost per annum and committed fixed costs are as follows:

	Rs.
Incurred as a direct consequence of making W	1,000
Incurred as a direct consequence of making X	5,000
Incurred as a direct consequence of making Y	6,000
Incurred as a direct consequence of making Z	8,000
Other fixed costs (committed)	30,000
	50,000

A subcontractor has offered to supply units of W, X, Y and Z for Rs. 12, Rs. 21, Rs. 10, and Rs. 14 respectively.

Required:

Decide whether Buster Ltd should make or buy the components.

Solution:

a. The relevant cots are the differential costs between making and buying, and they consist of difference in unit variable costs plus differences in directly attributable fixed costs. Subcontracting will result in some fixed cost savings.

	W	**X**	**Y**	**Z**
	Rs.	**Rs.**	**Rs.**	**Rs.**
Unit variable cost of making	14	17	7	12
Unit variable cost of buying	12	21	10	14

	W	X	Y	Z
Annual requirements (units)	1,000	2,000	4,000	3,000
	Rs.	**Rs.**	**Rs.**	**Rs.**
Extra variable cost of buying (per annum)	(2,000)	8,000	12,000	6,000
Fixed costs saved by buying	(1,000)	(5,000)	(6,000)	(8,000)
Extra total cost of buying	(3,000)	3,000	6,000	(2,000)

b. The company would save Rs. 3,000 pa by subcontracting component W (where the purchase cost would be less than the marginal cost per unit to make internally) and would save Rs. 2,000 pa by subcontracting component Z (because of the savings in fixed costs of Rs. 8,000).
c. In this example, relevant costs are the variable cots in-house manufacture the variable costs of subcontracted units, and the saving in fixed costs.

Other factors to consider in the make or buy decision.

a. If components W and Z are subcontracted, how will the company most profitably use the spare capacity? Would the company's workforce resent the loss of work to an outside subcontractor?
b. Would the subcontractor be reliable with delivery times, and would he supply components of the same quality as those manufactured internally?
c. Does the company wish to be flexible and maintain better control over operations by making everything itself?
d. Are the estimates of fixed cost savings reliable? In the case of Product W, buying is clearly cheaper than making in-house. In the case of product Z, the decision to buy rather than make would only be financially beneficial if the fixed cost savings of Rs. 8,000 could really be 'delivered' by management.

Question

B Limited makes three components – S, T and W. The following costs have been recorded.

	Components S	Component T	Component W
	Units Cost	**Unit Cost**	**Unit Cost**
	Rs.	**Rs.**	**Rs.**
Variable Cost	2.50	8.00	5.00
Fixed Cost	2.00	8.30	3.75
Total Cost	4.50	16.30	8.75

Another company has offered to supply the components to BB Limited at the following prices

	Components S	Component T	Component W
Price each	Rs. 4	Rs. 7	Rs. 5.50

Which component(s), if any, should BB Limited consider buying in?

A Buy in all three components
B Do not buy any
C Buy in S and W
D Buy in T only

Answer

BB Limited should buy the component if the variable cost of making the component is more than the variable cost of buying the component.

	Components S	Component T	Component W
	Rs.	Rs.	Rs.
Variable Cost of Making	2.50	8.00	5.00
Variable Cost of Buying	4.00	7.00	5.50
	(1.50)	1.00	(0.50)

The variable cost of making component T is greater than the variable cost of buying it.
BB Ltd should consider buying in component T only.
The correct answer is D.

Make or Buy Decisions and Limiting Factors

In a situation where a company must subcontract work to make up a shortfall in its won production capability, its total costs are minimized if those components/products subcontracted are those with the lowest extra variable cost of buying per unit of limiting factor saved by buying.

Example: Make or Buy and Limiting Factors

Green Ltd manufactures two components, the Alpha and Beta, using the same machines for each. The budget for the next year calls for the production and assembly of 4,000 of each component. The variable production cost per unit of the final product, the gamma, is as follows.

	Machine hours	Variable cost
		Rs.
1 unit of Alpha	3	20
1 unit of Beta	2	36
Assembly		20
		76

Only 16,000 hours of machine time will be available during the year, and a sub-contactor has quoted the following unit prices for supplying components; Alpha Rs. 29, Beta Rs. 40. Advise Green Ltd.

Solution:

a. There is a shortfall in machine hours available, and some products must be sub-contracted.

Product	Units		Machine hours
Alpha	4,000		12,000
Beta	4,000		8,000
		Required	20,000
		Available	16,000
		Shortfall	4,000

b. The assembly costs are not relevant costs because they are unaffected by the make or buy decision. The units subcontracted should be those which will add least to the costs of Green Ltd. Since 4,000 hours of work must be sub-contracted, the cheapest policy is to subcontract work

c.

	Alpha	Beta
	Rs.	Rs.
Variable cost of making	20	36
Variable cost of buying	29	40
Extra variable cost of buying		
Machine hours saved by buying	3 hours	2 hours
Extra variable cost of buying, per hours saved	Rs. 3	Rs. 2

It is cheaper to buy Betas than to buy Alphas and so the priority for making the components in-house will be in the reverse order the preference for buying them form a subcontractor.

d.

Component	Hours per unit to make in-house	Hours required in total	Cumulative hours
Alpha	3 hours	12,000	12,000
Beta	2 hours	8,000	20,000
		20,000	
Hours available		16,000	
Shortfall		4,000	

There are enough machine hours to make all 4,000 units of Alpha and 2,000 units of Beta. 4,000 hours production of Beta must be sub-contracted. This will be the cheapest production policy available.

e.

Component	Machine hours	Number of units	Units variable cost	Total variable cost
Make			Rs.	Rs.
Alpha	12,000	4,000	20	80,000
Beta (balance)	4,000	2,000	36	72,000
	16,000			152,000
Buy	Hours saved			
Beta (balance)	4,000	2,000	40	80,000
		Total variable cost of components		232,000
		Assembly costs (4,000 x Rs. 20)		80,000
		Total variable costs		312,000

LESSON # 45

DECISION MAKING (Contd.)

Shut Down Decisions

Shut down decisions involve the following:

- Whether or not to shut down a factory, department, or product line either because it is making a loss or it is too expensive to run.
- If the decision is to shut down, whether the closure should be permanent or temporary.

Example: Shut Down Decisions

Suppose that a company manufactured three products, Corfus, Cretes and Zantes. The present net profit from these is as follows.

	Corfus	Cretes	Zantes	Total
	Rs.	Rs.	Rs.	Rs.
Sales	50,000	40,000	60,000	150,000
Variable costs	30,000	25,000	35,000	90,000
Contribution	20,000	15,000	25,000	60,000
Fixed costs	17,000	18,000	20,000	55,000
Profit/loss	3,000	(3,000)	5,000	5,000

The company is concerned about its poor profit performance, and is considering whether or not to cease selling Cretes. It is felt that selling prices cannot be raised or lowered without adversely affecting net income. Rs. 5,000 of the fixed costs of Cretes are attributable fixed costs which would be saved if production ceased. All other fixed costs would remain the same.

Solution:

a. By stopping production of Cretes, the consequences would be a Rs. 10,000 fall in profits.

	Rs.
Loss of contribution	(15,000)
Savings in fixed costs	5,000
Incremental loss	(10,000)

b. Suppose, however, it were possible to use the resources realized by stopping production of Cretes and switch to producing a new item, Rhodes, which would sell for Rs. 50,000 and incur variable costs of s. 30,000 and extra direct fixed costs of Rs. 6,000. A new decision is now required.

	Cretes	Rhodes
	Rs.	Rs.
Sales	40,000	50,000
Less variable costs	25,000	30,000
Contribution	15,000	20,000
Less direct fixed costs	5,000	6,000
Contribution to shared fixed costs and profit	10,000	14,000

It would be more profitable to shut down production of Cretes and switch resources to making Rhodes, in order to boost contribution to shared fixed costs and profit from Rs. 10,000 (from Cretes) to Rs. 14,000 (from Rhodes).

ONE-OFF CONTRACTS

i. Introduction

The decision to accept or reject a contract should be made on the basis of whether or not the contract increases contribution and profit.

This type of decision-making situation will concern a contract which would utilize an organization's spare capacity but which would have to be accepted at a price lower than that normally required by the organization. In general you can assume that a contract will probably be accepted if it increases contribution and hence profit, and rejected it reduces contribution (and hence profit). Let us consider an example,

ii. Example: One-off Contracts

Belt and Braces Ltd makes a single product which sells for Rs. 20. It has a full cost of Rs. 15 which is made up as follows:

	Rs.
Direct Material	4
Direct Labor	6
Variable Overhead	2
General Fixed Overhead	3
	15

The labor force is currently working at 90% of capacity and so there is a spare capacity for 2,000 units. A customer has approached the company with a request for the manufacture of a special order of 2,000 units for which he is willing pay Rs. 25,000. Assess whether the contract should be accepted.

Solution:

	Rs.	**Rs.**
Value of order		25,000
Cost of order		
Direct materials (Rs. 4 x 2,000)	8,000	
Direct labor (Rs. 6 x 2,000)	12,000	
Variable overhead (Rs. 2 x 2,000)	4,000	
Relevant cost of order		24,000
Profit form order acceptance		1,000

Fixed costs will be incurred regardless of whether the contract is accepted and so are not relevant to the decision. The contract should be accepted since it increases contribution to profit by Rs. 1,000.

Other factors to consider in the one-off contract decision.

a. The acceptance of the contract at a lower price may lead other customers to demand lower prices as well.
b. There may be more profitable ways of using the spare capacity.
c. Accepting the contract may lock up capacity that could be used for future full-price business.
d. Fixed costs may, in fact, if the contract is accepted.

----------THE END----------