

LABOUR CONTROL

DIRECT LABOUR UNIT II

MATERIALS

Introduction

Material is very important factor of production. It includes physical commodities used to manufacture the final product. It is the starting point from which the first operation starts. It is inventorial and does not get waste and exhaust (unless it is deteriorated) with the passage of time as labour is wasted with the passage of time whether in use or not. Another feature of material is that it can be purchased in varying quantities according to the requirements of the firm whereas other elements of cost like labour and other services cannot be easily varied once they are established. From this, it can be concluded that material is most flexible and controllable input.

Proper control of material is necessary from the time orders for purchase of materials are placed with suppliers until they have been consumed. The object of material control is to attack material cost on all fronts so that cost of material may be reduced. In other words, efforts are to be made to reduce the cost of material when it is purchased, stored and used.

MEANING OF MATERIAL CONTROL

Material control is a system, which ensures that right quality of material is available in the right quantity at the right time and right place with the right amount of investment. It can be defined as a comprehensive framework for the accounting and control of material cost designed to maintaining material supplies at a level to ensure uninterrupted production but at the same time minimizing investment of funds. In simple words, material control is a systematic control over the purchasing, storing and using of materials to have the minimum possible cost of materials.

LEVELS OF MATERIAL CONTROL

Two levels of material control exist: quantity or unit control and rupee or financial control. Production executive and storekeeper are primarily interested in quantity control because their interest is to see that there should be no stock out problem. On the other hand, financial executives are interested that too much money should not be invested in materials and every rupee spent in materials should be efficiently and effectively utilized. Keeping in view unit control and financial control, material control should meet these two conflicting objectives: (1) the maintenance of sufficient quantity of every item of material for efficient operations, and (2) maintenance of an inventory that is not detrimental financially.

ASPECTS OF MATERIAL CONTROL

There are two aspects of material control as given below:

(a) Accounting Aspect: This aspect of material control is concerned with maintaining documentary evidence of movement of materials at every state right from the time sales and production budgets are approved to the point when materials are purchased and actually used in production operations.

(b) Operational Aspect: This aspect of material control is concerned with the maintenance of material supplies at a level to ensure that material is available for use in production and production services as and when required by minimizing investment in materials.

PURCHASING PROCEDURE

Purchasing of materials involves a number of steps, which may be different from one company to another. Generally, following steps are involved in purchasing and receiving materials.

1. Purchase Requisition

A purchase requisition is a formal request initiated by the store-keeper. The purchase requisition can also be initiated by other departments for purchase of special items not normally stocked. With the help of purchase requisition, the purchase manager comes to know the types of materials required for different departments. Generally, printed forms are used for this purpose. It is prepared in three copies. Each of the three copies is sent to the purchasing department, initiating department and accounting department respectively. Only an authorized person should sign a purchase requisition. Purchase requisition has three purposes

- * To inform purchasing department of the need to purchase materials.
- * To fix the responsibility of the department making the purchase requisition.
- * To use for further reference.

2. Request For Quotations Or Tenders

After receiving a purchase requisition, the next step of purchase procedure is to find the convenient and economical sources of supply. The purchase department must maintain a list of suppliers. Selection of a particular supplier is usually made after inviting tenders or quotations from possible sources of supply. Invitations for tender in a prescribed format are sent to prospective suppliers. It contains detailed information about the availability of goods, price of materials and terms and conditions of purchasing. Tenders are received in sealed covers before the due date expires and are opened on the date fixed for the purpose.

3. Purchase Order

After completion of the above procedure, the purchase department prepares a purchase order for the supply of materials. The purchase order is a contractual agreement with the supplier for the supply of materials. Purchase order is prepared in five copies, the original copy is sent to the supplier, the second copy for receiving department, third for account department, fourth for initiating department and fifth one is retained in the purchasing department for reference.

4. Receiving And Inspecting Materials

The receiving department should perform the function of unloading and receiving of materials dispatched by the supplier. The receiving department verifies the materials with the help of a delivery note and the copy of the purchase order after receiving the delivery of goods. The supplier sends detailed information and an invoice of the materials supplied by it. It has to verify and check the quantity and physical condition of materials by making a comparison of the purchase order and the materials received.

5. Checking And Passing Bills For Payment

When the invoices are received from the supplier, they are sent to the store and accounting departments for the verification of the quality and price of materials mentioned in the invoices. After checking the required documents, the store

department requests the accounting department for making the payment of the invoice to the supplier.

NEED FOR MATERIAL CONTROL

- To ensure regular and uninterrupted supply of materials
- To purchase materials of right quality under favourable terms
- To minimize wastage of materials
- To ensure optimum use of tools equipment and machines
- To introduce the system of production control and ensure timely production of goods of required quality
- To check over-stocking and under-stocking of materials
- To ensure proper storage and handling of materials

ESSENTIAL FEATURES OF MATERIAL CONTROL

The following are the essentials of a good system of material control

There should be proper co-ordination and co-operation among the departments dealing with materials

- All purchases must be centralized and must be made through an expert purchase manager
- All items in the stores should be classified with codes
- Receiving and inspection procedure should be chalked out
- Ideal storage and preservation facilities will have to be provided
- Stores control measures like ABC analysis, perpetual inventory system stock verification should be introduced
- There should be an efficient system of internal audit and internal check
- Minimum level, Maximum level and Re-order level of stock should be fixed to avoid over-stocking or shortage of materials.
- Appropriate records should be maintained to control issues and utilization of stores in production.

MATERIAL CONTROL TECHNIQUES

The following are the main techniques of material control

1. Determination of various Levels Setting
2. Economic Order Quantity (EOQ)
3. Just-in-Time Inventory System
4. ABC Analysis
5. VED Analysis
6. Perpetual Inventory System
7. Material (or Inventory) Turnover Ratio
8. Material (or Inventory) Cost Reports

STOCK LEVELS

The store is divided into different sections, each is meant for one particular type of material. Each section has some containers for keeping different varieties of that particular type of material. These containers are termed as Bins or Racks, Each bin/rack should be appropriately numbered and indexed for easy identification. For example, the store has a separate section for bolts. The different sizes of bolts are kept in the different bins. To facilitate the location of section and various materials, it is better if location plans are exhibited at the entrance of the store room.

Stocks levels

Maximum and minimum stock Level

To avoid over and under investment in materials, the management decides the maximum quantity of materials to be kept in the store. The limits of minimum/maximum quantity set by the management should be strictly observed by the storekeeper.

Maximum stock Level

The maximum level is the largest quantity of a certain material which should be kept in the store at any point of time. Maximum stock level is computed as follows:

$$\text{Maximum stock level} = \text{Reorder level} + \text{Reorder quantity} - [\text{Minimum consumption} \times \text{minimum reorder period}] \quad (\text{Or})$$

$$\text{Maximum stock level} = \text{Economic order quantity} + \text{Minimum stock}$$

Minimum stock Level

The minimum stock level is the lowest quantitative balance of material which must be kept at all times so that the assembly line may not be stopped on account of non-availability of materials. It is decided by taking into account the followings:

- Re-order level
- Average stock level

Minimum stock level is computed as follows:

$$\text{Minimum stock level} = \text{Re-order level} - [\text{Normal consumption} \times \text{average Reorder period}]$$

Re-order level

It is the point at which if material in store is reached, the order of further supply of material must be placed. This point is fixed between maximum level and minimum level. This point automatically initiates the process of placing a fresh order. Re-order level depends on the following factors:

- (i) Maximum usage
- (ii) Time interval i.e. the anticipated time lag between the date of issuing orders and the receipt of materials.

$$\text{Re-order level} = \text{Maximum usage} \times \text{Maximum re-order period}$$

Average stock level

This level indicates the average stock held by the firm. It is calculated with the help of following:

$$\text{Average stock level} = 1/2 [\text{Maximum stock level} + \text{Minimum stock level}] \quad \text{Or} \\ \text{Average stock level} = \text{Minimum stock level} + 1/2 \text{ Re-order Quantity}$$

ECONOMIC ORDER QUANTITY

The economic order quantity (EOQ) is the size of the purchase order which gives maximum economy in purchasing material. It is also termed as standard order quantity. It is fixed after taking into consideration the following points:

(i) Ordering cost

Cost of placing a order refers to the cost incurred for acquiring materials. It depends upon number of orders placed and the number of items ordered. If the order size is larger in quantity, orders placing cost per unit is lower and if order size is smaller in quantity, order placing cost per unit is higher: It includes cost of preparing and placing an order, cost of transportation, cost of receiving and inspecting the materials.

(ii) Carrying cost

It is the cost that is incurred in maintaining a given level of stock. It includes cost of handling materials, insurance premium, cost of storage space, obsolescence losses etc., larger size of stock, higher the stock carrying cost per unit per annum and vice versa.

EOQ is calculated as follows:

$$EOQ = \frac{\sqrt{2AB}}{C}$$

Where, A = Annual consumption
B = Buying cost per order
C = Carrying cost per unit per annum

ABC ANALYSIS

This technique of inventory control is also known as Always Better Control technique. ABC analysis is an analytical method of control which aims at concentrating efforts on those areas where attention is needed most.

This is a principle of selective control. The emphasis of ABC analysis technique is that the management should concentrate its energy in controlling those items that mostly affect the organisational objects. Manufacturing concerns find it useful to group the materials into three classes on the basis of investment involved.

Materials having higher values but constitute small percentage of total items, are grouped in 'A' category. On the other hand, a large percentage of items of materials which represent a smaller percentage of the values, are grouped in 'C' category. Items of materials having moderate value and moderate size are grouped in 'B' category. On the basis of physical quantities and value of materials used, the following table illustrates the above classification:

After the items of materials are classified into A, B and C category, control can be exercised in a selective manner as follows:

- (i) Greater care and strict control should be exercised on the items of category 'A' as any loss or breakage or wastage of any item of this category may prove to be very costly. Economic order quantity and re-order level should be carefully fixed for such category of items.
- (ii) Moderate and relaxed control is required for the items of category 'B'.
- (iii) There is not much need for exercising control over the items of category 'C' Periodic or annual verification is required for this category of materials.

Advantages of ABC Analysis:

The advantages of ABC analysis are given below:'

- Close and strict control of costly items is ensured.
- Investment in inventory can be regulated and funds can be utilised in the, best possible way.
- Economy is achieved in respect of stock carrying cost.
- It helps to keep enough safely stock for 'C' category items.
- Clerical cost can be reduced and inventory is maintained at optimum level.
- Scientific and selective control helps in maintenance of high stock turnover rate.

VED Analysis:

VED – Vital, Essential, Desirable – analysis is used primarily for control of spare parts. The spare, parts can be divided into three categories – vital, essential or desirable – keeping in view the critically to production.

STORES LEDGER Vs BIN CARD:

Bin Card :

Bin is a place, rack, or cupboard, where materials are kept. Each bin has a card to show the position of stock in the bin. This card is known as bin card. Only quantities are entered in the bin card. These cards are used not only for recording of receipts and issues of stores but also to assist the store keeper to control the stock.

Stores ledger:

Stores ledger is kept in the costing department. It contains accounts for each class of material. It is usually maintained in the loose leaf form. It is written up by a stores accountant or stores clerk. In the stores ledger, stores received and issued are recorded both in quantity and value. As the ledger contains a continuous record of stores received issued and also the balance on hand at any time.

Bin Card	Stores Ledger
It is maintained by storekeeper	It is maintained by the cost accounting department
It is record of quantities only	It records both quantity and quality
Entries are recorded at the time when the transaction takes place	Entries are made only after the transactions has taken place
It is attached with bin	It is kept in cost office
Each transaction are individually posted	Transactions may be summarized and posted periodically

DIFFERENT METHODS PRICIN MATERIAL ISSUES

1. First In First Out Method (FIFO)

Under this method, materials are issued in the order in which they are received in the store. It means that the material received first will be issued first. This method is suitable in times of falling prices

Advantages

1. This method is simple to understand and easy to operate.
2. The closing stock is valued at the current market price.
3. Since issues are priced at cost, no profit or loss arises from pricing.

4. This method is more suitable in times of falling prices.
5. Deterioration and obsolescence can be avoided.

Disadvantages

1. When prices fluctuate, calculation becomes complicated. This increases the possibility of clerical errors.
2. During the period of price fluctuations, materials charged to jobs vary. Therefore, comparison between jobs is difficult.
3. During the period of rising prices, product costs are understated and profits are overstated. This may result in payment of higher dividend out of capital.

2. Last In First Out Method (LIFO)

This method is opposite to FIFO. Here materials received last are issued first. Issues are made from the latest purchases.

Advantages

1. Issues are based on actual cost.
2. Issue prices reflect current market price.
3. Product cost will be based on current market price and hence will be more realistic.
4. There is no unrealized profit or loss.
5. Simple to operate if purchases are not many and prices are steady or rising
6. When prices are, raising this method is helpful in preparation of quotation or estimates.

Disadvantages

1. This method involves considerable clerical work.
2. Under falling prices, issues are priced at lower prices and stocks are valued at higher rates.
3. Stock of material shown in the balance sheet will not reflect market price.
4. Due to variation in prices, comparison of cost of similar job is difficult.
5. This method is not accepted by the income tax authorities.

3. Base Stock Method

Each business concern usually maintains a minimum quantity of material in stock. This minimum quantity is known as base stock. This stock will be used only when emergency arises. This base stock is considered a fixed asset valued at cost price irrespective of the price fluctuations. The quantity in excess of this stock may be valued either by using FIFO or LIFO method. Base stock is a dependent method. It operates in conjunction with either FIFO or LIFO.

4. Simple Average Method

The simple average is determined by adding different prices of materials in stock and dividing the total by number of prices. Quantity purchased in each lot is ignored.

Advantages

1. This method is simple to understand and easy to operate.
2. It reduces clerical work.
3. It is suitable when prices are stable.

Disadvantages

1. It does not take into account the quantities purchased.
2. The value of closing stock becomes unrealistic.
3. Material cost does not represent actual cost price.
4. When price fluctuate, this method will give incorrect result.

5. Weighted Average Method

This is an improvement over the simple average method. This method takes into account both quantity and price for arriving at the average price. The weighted average is

obtained by dividing the total cost of material in the stock by total quantity of material in the stock.

Advantages

1. It gives more accurate results than simple average price because it considers both quantity as well as price.
2. It evens out the effect of price fluctuations. All jobs are charged at average price. Therefore, comparison between jobs is more easy and realistic.
3. It is acceptable to income tax authorities.

Disadvantages

1. Stock on hand does not represent current market prices.
2. When large number of purchases is made at different rates, the calculation is tedious. Therefore, there are more chances of clerical errors.
3. With some approximation in average price, there will be profit or loss due to over or under charging of material cost to jobs.

6. Market Price Method

This method is called as replacement price method. Under this method, material issues are priced at the market price prevailing on the date of the issue of material.

Advantages

1. It is simple to operate.
2. Issues are priced at current market price.
3. It is suitable for giving quotations on competitive basis.

Disadvantages

1. Issues are not based on actual cost.
2. Profit or loss may arise because of rise or fall in prices of materials.
3. It is not acceptable to income tax authorities.

7. Standard Price Method

Under this method, a standard or a fixed price is used for pricing the issues. A standard price is fixed after considering all factors affecting the price such as market conditions, quantity to be purchased and future trend of the prices.

Advantages

1. This method is simple and easy to work, as all the issues are valued at the same price.
2. Material cost for a job can be determined in advance.
3. Control over purchases is possible.
4. Price variation is eliminated from cost. Hence, fair comparison between job is possible.
5. It reduces clerical work and is less expensive.

Disadvantages

1. The issues may not reflect current market price.
2. The fixation of standard cost is very difficult when prices fluctuate violently.
3. It does not conform to the accepted accounting practices.

8. Inflated Price Method

This method is dependent on pricing of issues. This is used in conjunction with any one of the other methods. Under this method, material issues are valued at an inflated price to cover the cost of contingencies or related costs. These costs include carriage on material, cost of carrying inventory and normal wastages such as evaporation, shrinkage, loss in weight etc.

9. Specific Cost Method

When materials are purchased for a particular job, its costs should be charged only to that particular job. This method is suitable for industries, which carry out individual jobs or contracts against specific orders.

PERPETUAL INVENTORY SYSTEM Vs CONTINUOUS STOCK TAKING

PERPETUAL INVENTORY SYSTEM

Perpetual inventory system is defined as "a system of records maintains by controlling department which reflect the physical movement of stocks and their current balances". Bin card and store accuracy, physical verification may also be made which must have to agree with the balances of Bin Card and store ledger.

CONTINUOUS STOCK TAKING

It is an essential features of the perpetual inventory system. Under continuous stock taking system a permanent stock taking team is appointed. This team daily or at frequent intervals verifies the physical stock of different items selected at random.

Merits of perpetual inventory control:

- It ensures availability of material as & when required.
- There will be continuity in the flow of production.
- Only required quantity of material will be purchased.
- It avoids physical verification of each and every item of store.
- Investment in purchasing raw materials will be minimized.
- A proper system of material control will save the organization from losses like wastage and obsolescence.
- A detailed & reliable check on the store is obtained.
- Planning of the production can be done as the management is continuously in forward about the store position.

COMPUTATION OF STOCK LEVELS

Illustration 1

The following information received from Monika industries in respect of Material No.ST45:

Normal consumption 400 units per week

Maximum consumption 600 units per week

Minimum consumption 200 units per week

Re-order period 6 to 8 weeks

Re-order Quantity 2000 units

Calculate:

(a) Re-order level (b) Maximum level

(c) Minimum level (d) Average stock level

Solution

$$\begin{aligned} \text{(a) Re-order level} &= \text{Maximum reorder period} \times \text{Maximum usage} \\ &= 600 \times 8 = 4800 \text{ units} \end{aligned}$$

$$\begin{aligned} \text{(b) Maximum stock level} &= \text{Reorder level} + \text{Reorder quantity} - [\text{Minimum consumption} \times \\ & \hspace{15em} \text{Minimum reorder period}] \\ &= 4800 + 2000 - [200 \times 6] \\ &= 6800 - 1200 \\ &= 5600 \text{ units} \end{aligned}$$

$$\begin{aligned} \text{(c) Minimum stock level} &= \text{Reorder level} - [\text{Normal consumption} \times \text{average Reorder period}] \\ &= 4800 - [400 \times 7] \\ &= 4800 - 2800 \\ &= 2000 \text{ units.} \end{aligned}$$

$$\begin{aligned}
 \text{(d) Average stock level} &= 1/2 [\text{Maximum stock level} + \text{Minimum stock level}] \\
 &= 1/2 [5600 + 2000] \\
 &= 7600/2 \\
 &= 3800 \text{ units. } \mathbf{Or}
 \end{aligned}$$

$$\begin{aligned}
 \text{Average stock level} &= \text{Minimum stock level} + 1/2 \text{ Re-order Quantity} \\
 &= 2000 + 1/2 [2000] \\
 &= 2000 + 1000 = 3000 \text{ units}
 \end{aligned}$$

Note : The number of units of the average stock as per the alternative method need not be same.

Illustration 2

Two components 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:300 units B:500 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) Average stock level |

Solution

Re-order level = Maximum consumption X maximum re-order period

$$\text{Component A} = 75 \times 6 = 450 \text{ units}$$

$$\text{Component B} = 75 \times 4 = 300 \text{ units}$$

Minimum level = Re-order level – (Normal consumption X Normal re-order period)

$$\text{Component A} = 450 - (50 \times 5) = 200 \text{ units}$$

$$\text{Component B} = 300 - (50 \times 3) = 150 \text{ units}$$

Maximum level = Re-order level + Reorder Quantity –
(Minimum consumption X Minimum re-order period)

$$\text{Component A} = 450 + 300 - (25 \times 4) = 650 \text{ units}$$

$$\text{Component B} = 300 + 500 - (26 \times 2) = 750 \text{ units}$$

Average Stock level = $\frac{1}{2}$ (Minimum level + Maximum level)

$$\text{Component A} = \frac{1}{2}(200+650) = 425 \text{ units}$$

$$\text{Component B} = \frac{1}{2}(150+750) = 450 \text{ units}$$

Illustration 3

Two components A & B are used as follows:

Normal Usage	120 per week each
Minimum Usage	60 per week each
Maximum Usage	180 per week each
Re-ordering quantity	A- 2000; B-3200
Re-ordered period	B- 6 to 10 weeks; B-4 to 8 weeks

For each component, calculate:

1. Re-ordering level; (b) Minimum level; (c) Maximum level; (d) Average stock level

Solution:

(a) Re-ordering level = Maximum usage X maximum re-order period

$$A = 180 \times 10 = 1800 \text{ units}$$

$$B = 180 \times 8 = 1440 \text{ units}$$

(b) Minimum level = Re-ordering level - (Normal usage X Normal re-order period)

Normal Re-order period is to be taken as the average re-order period

$$A = 1800 - (120 \times 8) = 840 \text{ units}$$

$$B = 1440 - (120 \times 6) = 720 \text{ units.}$$

(c) Maximum level = Re-ordering level + Re-ordering quantity - (Minimum usage \times minimum re-order period)

$$A = 1800 + 2000 - (60 \times 6) = 3440 \text{ units}$$

$$B = 1440 + 3200 - (60 \times 4) = 4400 \text{ units.}$$

(d) Average stock level = (Minimum level + Maximum level) / 2

$$A = (840 + 3440) / 2 = 2140 \text{ units}$$

$$B = (720 + 4400) / 2 = 2560 \text{ units.}$$

Illustration 4

Satyam, a machine manufacturer, purchases 3600 units of a certain component for his annual usage. The order placing cost is Rs.200 and cost of carrying one unit for a year is Rs.

4. Calculate the economic order quantity.

Solution

$$EOQ = \sqrt{\frac{2AB}{C}}$$

where A = 3600 units

$$B = \text{Rs } 200$$

$$C = \text{Rs } 4$$

$$\begin{aligned} EOQ &= \sqrt{\frac{2 \times 3600 \times 200}{4}} \\ &= \sqrt{3,60,000} \\ &= 600 \text{ units} \end{aligned}$$

Illustration 5

Suppose the annual consumption is 675 units, 10% is the interest and cost of storing an article costing Rs. 30 per unit, cost of placing and order is Rs. 18. Calculate the E.O.Q.

Solution:

$$EOQ = \sqrt{\frac{2AB}{C}}$$

Where A = Annual usage

B = Ordering cost for one order

C = Inventory carrying costs per unit per year.

$$E.O.Q. = \sqrt{\frac{2 \times 675 \times 18}{3}} = 90 \text{ units}$$

Methods of pricing material issues

Illustration 6

The following is the record of receipts and issues a certain material in the factory during a week.

April 1997

1. Opening Balance 50 tonnes @ Rs. 10 per tone.
Issued 30 tonnes @ Rs. 10 per tones

2. Received 60 tonnes @ Rs. 10.20 per tone.
3. Issued 25 tonnes @ Rs. 10.20 per tone (stock verification reveals loss of tone)
4. Received back from orders 10 tonnes @ Rs. 10.20 per tone (previously issued at Rs. 9.15 per tone)
5. Issued 40 tonnes @ Rs. 10.20 per tone.
6. Received 22 tonnes @ Rs. 10.30 per tone.
7. Issued 38 tonnes @ Rs. 10.30 per tone.

Solution

Stores Ledger Account Under LIFO

Date	Receipts			Issues			Balance		
	Qty	Rate	Amt	Qty	Rate	Amt	Qty	Rate	Amt
1				30			50	10	500
1				30	10	300	20	10	200
2	60	10.20	612	-	-	-	20	10	200
							60	10.20	612
3	-	-	-	25	10.20	255	20	10	200
				1	10.20	10.20	35	10.20	357
							20	10	200
4	10	9.15	91.5				34	10.20	346.80
				-	-	-	20	10	200
							34	10.20	346.80
							10	9.15	91.50
5	-	-	-	10	9.15	31.50	20	10	200
				3	10.20	306.0	4	10.20	40.80
6	22	10.30	226.6				20	10	200
							4	10.20	40.80
7	-	-	-	22	10.30	226.6			
				4	10.20	40.80	8	10.00	80.00
				12	10.00	120.0			

Closing Stock 8 tonnes @ Rs. 10 = Rs. 80/-

Stores Ledger Under FIFO

Date	Receipts			Issues			Balance		
	Qty	Rate	Amt	Qty	Rate	Amt	Qty	Rate	Amt
1				30			50	10	500
1				30	10	300	20	10	200
2	60	10.20	612	-	-	-	20	10	200
							60	10.20	612
3	-	-	-	20	10	200			
				5	10.20	51	55	10.20	561
				1(loss)	10.20	10.20	54	10.20	550.80
4	10	9.15	91.5	-			54	10.20	550.80
					-	-	10	9.15	91.50
5	-	-	-	40	10.20	408	14	10.20	142.80
							10	9.15	91.50
6	22	10.30	226.6	-			14	10.20	142.80
							10	9.15	31.50

							22	10.30	226.60
7	-	-	-	14	10.20	142.80			
				10	9.15	91.50	8	10.3	82.40
				22	10.30	226.60			
Closing stock 8 tonnes @ Rs. 10.30 = 82.40									

Illustration 7

Show the Store Ledger entries as they would appear when using

- i) FIFO
- ii) LIFO
- iii) Weighted average method
- iv) Simple average method

April	1.	Balance	300 units	Rs. 600/-
	2.	Purchase	200 units	Rs. 440/-
	4.	Issued	150 units	
	6.	Purchase	200 units	Rs. 460/-
	11.	Issued	150 units	
	19.	Issued	200 units	
	22.	Purchase	200 units	Rs. 480/-
	27.	Issued	250 units	

Solution

1) Stores Ledger Account as per FIFO METHOD

Date	Details	Receipt			Issued			Balance		
		Qty	Rate	Amt	Qty	Rate	Amt	Qty	Rate	Amt
April 1	Balance	300	2/-	600	-	-	-	300	2/-	600
2	Purchase	200	2.20	440	-	-	-	300	2.00	600
								200	2.20	440
4	Issue				150	2.00	300	150	2.00	300
								200	2.20	440
6	Purchase	200	2.30	460				150	2.00	300
								200	2.20	440
								200	2.30	460
11	Issue				150	2.00	300	200	2.20	440
								200	2.30	460
19	Issue				200	2.20	440	200	2.30	460
22	Purchase	200	2.40	480				200	2.30	460
								200	2.40	480
27	Issue				200	2.30	460	150	2.40	360
					50	2.40	120			

Value of Closing Stock : 150 units at the rate of Rs. 2.40 value Rs. 360/-

2) LIFO METHOD

Date	Details	Receipt			Issued			Balance		
		Unit	Rate	Amt	Unit	Rate	Amt	Unit	Rate	Amt
April 1	Balance	300	2.00	600	-	-	-	300	2.00	600
2	Purchase	200	2.20	440	-	-	-	300	2.00	600
								200	2.20	440
4	Issue				150	2.20	330	300	2.00	600
								50	2.20	110
6	Purchase	200	2.30	460				300	2.00	600
								50	2.20	110
								200	2.30	460
11	Issue				150	2.30	345	300	2.00	600
								50	2.20	600
								50	2.30	115
19	Issue				50	2.30	115	200	2.00	400
					50	2.20	110			
					100	2.00	200			
22	Purchase	200	2.40	480	-	-	-	200	2.00	400
								200	2.40	480
27	Issue				200	2.40	480	150	2.00	300
					50	2.00	100			

Value of Closing Stock : 150 units @ Rs. 2.00 value is Rs. 300/-

3) WEIGHTED AVERAGE METHOD

Date	Details	Receipt			Issued			Balance		
		Unit	Rate	Amt	Unit	Rate	Amt	Unit	Rate	Amt
April 1	Balance	300	2.00	600	-	-	-	300	2.00	600
2	Purchase	200	2.20	440	-	-	-	500	2.08	1040
4	Issue	-	-	-	150	2.08	312	350	2.08	728
6	Purchase	200	2.30	460	-	-	-	550	2.16	1118
11	Issue	-	-	-	150	2.16	324	400	2.16	864
19	Issue	-	-	-	200	2.16	432	200	2.16	432
22	Purchase	200	2.40	480	-	-	-	400	2.28	912
27	Issue	-	-	-	250	2.28	570	150	2.28	342

Value of Closing Stock : 150 units at the rate of Rs. 2.28 value Rs. 342.00/

4) SIMPLE AVERAGE METHOD

Date	Details	Receipt			Issued			Balance		
		Unit	Rate	Amt	Unit	Rate	Amt	Unit	Rate	Amt
April 1	Balance	300	2.00	600	-	-	-	300	2.00	600

2	Purchase	200	2.20	440	-	-	-	500	2.10	1050
4	Issue	-	-	-	150	2.10	315	350	2.10	35
6	Purchase	200	2.30	460	-	-	-	550	2.17	1193..50
11	Issue	-	-	-	150	2.17	325.50	400	2.17	868
19	Issue	-	-	-	200	2.17	434	200	2.17	434
22	Purchase	200	2.40	480	-	-	-	400	2.23	892
27	Issue	-	-	-	250	2.23	557.50	150	2.23	334.50

Value of Closing Stock : 150 units at the rate of Rs. 2.23 value Rs. 334.50

Direct labor is that labor which is directly engaged in the production of goods and services. The wages of such labor are known as direct wages. These labor cost or direct wages can be identified with and allocated to a particular product, process, or job. It is a part of the prime cost. Example: wages of spinners and weavers in a textile factory

INDIRECT LABOR

Indirect labor is that labor which is not directly engaged in production of goods or services. It indirectly helps the direct labor engaged in production. The wages paid for indirect labor is known as indirect wages. Indirect wages are those which cannot be identified with and allocated but can be apportioned to a particular product, process or job. Example: wages of supervisor, supervisors etc.,

CONTROL OVER LABOUR COST

Labour cost control permeates recruitment of workers, fixation of wages and other incentives ,time recording ,work study,time and motion study,job evaluation and promotion of workers etc.In Large companies labour cost control in undertaken by the following departments

- Personnel department
- Time recording department
- Payroll department
- Engineering and work study department
- Cost accounting department

Time Keeping

Time keeping is the recording of each workers time coming in and going out of the factory for the purpose of attendance and wage calculations.

Methods of time keeping

1. Manual Methods
 - Attendance register
 - Token or disc method
2. Mechanical methods
 - Card time recorder
 - Dial time recorder

IDLE TIME

- **INTRODUCTION**

Idle time may be defined as the difference between the time for which the workers are paid and the time that they actually spend on production. It is the time for which payment is made even without any production was carried out. Idle time arises only when the wages are paid on time basis and not on piece rate basis.

➤ **CAUSES FOR IDLE TIME**

Idle time may arise due to waiting for job, waiting for instructions, waiting for materials, power failure, machinery break down, time taken for machine settings and adjustments etc.,

➤ **TYPES OF IDLE TIME**

Idle time is of two types. They are

1. Normal Idle Time
2. Abnormal Idle Time

1. NORMAL IDLE TIME:

Normal idle time is a wasted time, which cannot be avoided and is bound to arise. It is regular and uncontrollable.

EXAMPLE: Time taken to reach the place of work from factory gate, time taken for machine setting and adjustments, time taken for tea break and power failure.

2. ABNORMAL IDLE TIME:

Abnormal idle time is wasted time, which can be avoided and controlled.

EXAMPLE: The time wasted due to break down of machinery on account of the inefficiency of the works engineer, the time wasted on account of the failure of the power supply, the time wasted due to unnecessary waiting for instructions, the time wasted due to unnecessary waiting for tools and raw materials and the time wasted due to strikes etc.

TREATMENT OF IDLE TIME

COST OF NORMAL IDLE TIME

1. The labor cost of normal idle time may be treated as an item of factory expenses and recovered as an indirect charge.
2. It may be charged direct to production at a grossed up rate to include normal idle time.

COST OF ABNORMAL IDLE TIME

It is a principle of costing that not all abnormal expenses and losses should be included in costs and as such, wages paid for abnormal idle time should not form part of cost of production. The wages paid for abnormal idle time should not form part of cost of production and so debited to costing profit and loss. The main objective of transferring to costing profit and loss is to have a meaningful comparison of cost of production at different times by keeping away abnormal wages from cost of production. It is to be noted that idle time can be isolated only in case of direct workers. In case of indirect or non-productive workers i.e. fitter, ward staff etc., the whole of their wages will be shown as indirect expenses and so wages for idle time will be absorbed automatically.

➤ **CONTROL OF IDLE TIME**

Production should be planned and supervised so that idle time can be reduced to a minimum, all the jobs in hand should be properly planned so that the workers may complete them in sequence and may not have to wait for getting the work.

METHOD OF CONTROL

1. The instructions should be clearly laid down for all the jobs so that the workers may not wait for getting instructions.
2. Idle time due to internal power failure should be reduced by keeping a proper inspection and maintenance of power plant.
3. Idle time cards should be prepared to know the reasons, which are responsible for such a time.
4. Timely provisioning of materials and regular maintenance of plant will also go a long way in reducing the idle time.
5. Tendency to conceal idle time should be discouraged so that preventive steps may be taken in time.
6. Idle time due to seasonal production, trade depression, strike and lock out is controllable.

FEATURES OF GOOD WAGE SYSTEM

There are two principal wage systems. They are

- a. Time wage system
- b. Piece wage system

Under time wage system, the workers are paid on hourly, monthly, daily, weekly basis. It is not related to units produced but related to the hours worked.

Under piece rate system, the workers are paid for work performed.

FEATURES

1. It should guarantee minimum wage irrespective of the work done.
2. It should be based on scientific time and motion study.
3. It should enable efficient worker to earn more.
4. It should encourage productivity.
5. It should ensure equal pay for equal work.
6. It should be flexible.
7. It should reduce labor turnover.
8. It should be accepted by the trade unions.
9. It should not be in violation of the government policy.
10. It should be fair to both employee and employer.
11. It should minimize absenteeism.

TIME WAGE SYSTEM

Under this system, the worker is paid on hourly, daily, weekly or monthly basis. The payment is made according to the time worked irrespective of the quantity of the work done.

Time Wages = Hours worked x rate per hour.

SUITABILITY OF THIS METHOD

1. Where quality of work is more important than the quantity of work.\
2. Where the work requires high degree of skill
3. Where the output of indirect workers cannot be measures
4. Where production involves delay and interruption due to unavoidable factors

MERITS

1. It is simple to understand and easy to operate.
2. Each worker is assured of minimum wages.
3. Standard of the quality is maintained.
4. It is preferred by trade unions.
5. There is no discrimination among workers.
6. Average and below average workers are benefited.

DEMERITS

1. Efficient and inefficient workers get the same wages.
2. Equality in wages to all will depress superior workers.
3. Labor cost cannot be estimated in advance. Therefore, it is difficult to submit tenders.
4. Slow workers go slow further leading to overtime.
5. Effective supervision is necessary in order to reduce idle time. This increases the cost of production.

PIECE RATE SYSTEM

It is also called payments by results method. Under this method, payment is made for the quantity of work done rather than the time spent on the jobs. Earnings under piece rate are calculated as follows:

$$\text{Piece Wages} = \text{No. of units produced} \times \text{Rate per unit.}$$

SUITABILITY

1. Quality of work is not important.
2. Work is of repetitive nature.
3. Quantity of work can be measured.
4. Where it is not possible to control effectively the wasting of time by workers

MERITS

1. This system is simple to understand and easy to operate.
2. No payment is made for idle time.
3. It requires less supervision.
4. It gives encouragement for higher production by rewarding efficient workers.
5. Increased volume of production reduces cost per unit.

DEMERITS

1. Fixation of satisfactory piece rate is a difficult task.
2. It does not assure minimum wages.
3. Inefficient workers are penalized.
4. Increase in production is likely to affect the quality of work.
5. High speed of work is injurious to the health of the workers.
6. It cannot be adopted in cases where work is measurable.

DIFFERENCE BETWEEN TIME AND PIECE RATE SYSTEM

TIME RATE SYSTEM	PIECE RATE SYSTEM
Minimum wages are not guaranteed	Minimum wages are guaranteed
It is suitable to learners and beginners	It is not suitable for learners and beginners
This pertains to hours of work	This pertains to output
Cost reduction is not possible	Cost reduction is possible
Individual efficiency is not accounted for	Individual efficiency is measured and accounted
Idle time is also paid	Idle time is not paid
Quality of work is more important than the quantity	Quantity is given more importance

Inefficiency is not penalized	Inefficiency is penalized
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INCENTIVE WAGE PLAN

An incentive may be defined as a benefit either monetary or otherwise offered to stimulate effort. An incentive may be either monetary or non monetary. It may be given either individually or collectively. The main object is to induce the worker to produce more and to earn more.

INCENTIVES SCHEMES

HALSEY PLAN:

This plan was introduced by F.A. Taylor, an American engineer. Under this plan, an hourly rate is guaranteed. A standard time is set for each job. The worker is paid for the hours worked at the agreed rate plus bonus depending on time saved. The bonus is 50% of time saved.

Formula:

Hours worked X Rate per hour + 50% of (Time saved x rate per hour).

MERITS

1. It is simple to understand and easy to calculate.
2. It guarantees time wages.
3. Both employer and employees get equal benefit from the time saved by workers.
4. Savings in time reduce both labor cost and overhead expenses.
5. The inefficient worker is not penalized.

For efficient worker, this plan is more profitable than the time wage system.

DEMERITS

1. Fixation of standard time is very difficult.
2. At higher level of efficiency, the earnings are reduced.

ROWAN PLAN:

This plan was introduced in the year 1901 by David Rowan. Under this plan, time rate is guaranteed. The worker is paid for the hours worked at an agreed hourly rate plus bonus depending upon the time saved. Here, bonus payable is not a fixed percentage but payable in proportion of time saved which time taken bears to the standard time.

FORUMLA:

Hours worked X Rate per hour + Time Taken Time allowed X Time saved X Rate per hour.

MERITS

1. It guarantees time wages.
2. It pays higher bonus to workers when compared with Halsey plan.
3. The employer is protected even if there is an error in fixing standard.

DEMERITS

1. Workers find it difficult to understand and calculate wages.
2. If time saved is more than half of the standard time, the total earnings starts decreasing. This affects extra ordinary efficiency.

TAYLORS DIFFERENTIAL PIECE RATE SYSTEM:

F.W. Taylor, the father of Scientific Management introduced this system. Under this system, minimum time rate is not guaranteed. It provides two piece rate, a low piece rate for output below standard and high piece rate for output above standard.

MERITS

1. It is simple to understand and easy to operate.
2. It attracts efficient workers.
3. It helps employer much in increasing production by offering higher rates to efficient workers.
4. As the production increases, cost per unit of production decreases.

DEMERITS

1. It does not guarantee minimum wages.
2. It penalizes inefficient workers.
3. It creates disparity among workers and may weaken their unity.

MERRICK DIFFERENTIAL PIECE RATE SYSTEM:

This system differs from Taylor’s Piece Rate system. While the Taylor system offers two-piece rates, this plan offers three-piece rates. They are as follows:

Efficiency	Piece rate applicable
Up to 83% efficiency	Ordinary Piece Rate
From 83% to 100%	110% of Piece Rate
Above 100%	120% of Piece Rate

MERITS

1. Workers who are below standard are not penalized.
2. It is beneficial to beginners and trainees.
3. It rewards workers with more than 100% efficiency.

DEMERITS

1. It does not guarantee day wages.
2. The standards set may be too high to be reached by workers of average efficiency.

GANTT’S TASK BONUS PLAN:

This plan is also known as Progressive Rate System. This system combines time, piece rate and bonus. Time wages guaranteed to workers, who fail to reach the standard. If the workers complete the work within the standard time, he gets his daily wages plus stipulated bonus.

OUTPUT	REMUNERATION
Below Standard	Time rate guaranteed
At Standard	Bonus 20% of the time rate

Above Standard	High Piece rate on workers whole output
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MERITS

1. It is simple to understand and easy to operate.
2. It guarantees day wages.
3. It is a good system for beginners.
4. It gives higher incentives to efficient workers.
5. This system is useful where overhead costs are quite high.

DEMERITS

1. Standard time and guaranteed time rate may not be fixed.
2. It creates disparity among workers and creates disunity among them.

EMERSON’S EFFICIENCY PLAN:

This scheme guarantees time wages. A standard output is fixed representing 100% efficiency.

EFFICIENCY	BONUS
Below 662/3% efficiency	Only time wages
From 662/3% to 100% efficiency	Bonus increases 1% to 20%
At 100%	Bonus is 20%
Above 100% efficiency	Bonus 20% of the basic plus 1% for each 1% increase in efficiency

EFFICIENCY = Actual/Standard X 100.

MERITS

1. Time wages are guaranteed.
2. There is not much disparity among the wages of workers as in case of Taylor’s plan.
3. Workers get bonus even if their output is less than standard output.

LABOR TURNOVER

INTRODUCTION

Workers may come and go. This is a normal feature in every organization. However, higher level of labor shifting is not desirable for an organization. The movement of shifting into and out of the organization by employees is known as labor turnover.

MEANING

Labor turnover denotes the percentage of change in the labor force of an organization. High percentage denotes that labor is not stable.

CAUSES OF LABOR TURNOVER

I. PERSONAL CAUSES

Workers may leave the organization on personal grounds. Examples: domestic troubles and family responsibilities, retirement due to old age, accident making workers permanently incapable of doing work, death, workers finding better jobs at some other places. In all such cases, labor turnover is unavoidable and the employer can do nothing to reduce the labor turnover.

II. UNAVOIDABLE CAUSES

In certain circumstances, it becomes necessary for the management to ask some of the workers to leave the organization. The circumstances may be:

- i. Workers may be discharged due to their inefficiency.
- ii. Workers may be discharged due to continuous or long absence.
- iii. Workers may be retrenched due to shortage of work.

III. AVOIDABLE CAUSES

The avoidable causes are low wages, job dissatisfaction, poor working conditions, unsuitable working hours, lack of job security, lack of proper training facilities, lack of promotion, unfair method of promotion, and unsympathetic attitude of management.

EFFECTS OF LABOR TURNOVER

A high rate of labor turnover results in loss of output and higher cost of production due to following reasons:

- i. Frequent changes in labor force causes disturbance in the continuous flow of production. This leads to reduced output.
- ii. Cost of selection and training of new workers increase the cost of production.
- iii. Newly employed workers are likely to mishandle tools and machines results in break down which affects production.
- iv. Inefficiency and inexperience of newly recruited workers lead to defective work and increase wastage in production.
- v. Lack of cooperation and coordination between old and new workers resulting in fall in output and increased cost of production

COST OF LABOR TURNOVER

The effect of labor turnover when it is expressed in terms of money, it can be called as the cost of labor turnover the cost of labor turnover may be classified into preventive costs and replacement costs.

1. PREVENTIVE COSTS:

These are costs, which are incurred to prevent excessive labor turnover. The aim of these costs is to keep the workers satisfied so that they may not leave the job. These costs include:

- i. Cost of providing good working conditions.
- ii. Cost of providing medical, housing and recreation.
- iii. Cost of providing educational facilities to the children of the employees.
- iv. Cost of providing subsidized meals.
- v. Cost of providing benefits like gratuity, pension etc.

2. REPLACEMENT COSTS:

These costs include the following:

- i. loss of output due to delay in recruiting new workers.
- ii. Loss of output due to the inefficiency of new workers
- iii. Cost of recruitment and training of new workers

- iv. Cost of tools and machine breakages.
- v. Cost of accidents.
- vi. Cost of supervision.

CONTROL OF EXCESSIVE LABOR TURNOVER

1. An adequate and satisfactory wage system should be adopted.
2. Better working conditions and welfare facilities should be provided.
3. Scientific method of recruitment, training and job placement should be introduced.
4. Job security and promotion opportunities must be provided.
5. Qualified personnel officers should be appointed for dealing with workers grievances.
6. Men management relationship should be improved encouraging labor participation in management.
7. Attractive pension and gratuity scheme should be introduced.
8. In order to encourage efficient workers, incentive schemes must be introduced.

METHODS OF MEASUREMENT OF LABOUR TURNOVER

1. SEPARATION METHOD:

This is the most commonly used method. Under this method, labor turnover is measured by dividing the total number of separations during the period by the average number of workers on the payroll during the same period.

2. REPLACEMENT METHOD:

This method takes into account only the actual replacement of labor during the period irrespective of the number of workers leaving. While calculating the number of replacements, new workers employed because of expansion of business should not be taken.

3. FLUX METHOD:

This method is the combination of the above two methods.

Illustration 1

Calculate the earnings of a worker from the following information as under.

Time Rate Method: Standard time 30 hours Time taken 20 hours. Hourly rate of wages of Re. 1 per hour plus a dearness allowance 50 paise per hour worked.

Solution

Time Rate Method:-

Time Put in by workers x Rate per hour = 30 x 1 = Rs. 30

Illustration 2

On the basis of the following information calculate the earnings of A and B on the straight price Rate basis and Taylor's differential piece rate system.

Standard Production	8 units per hour
Normal time rate	Rs. 0.40 per hour

Differential to be applied:-

80% of piece rate below standard

120% of piece rate at or above standard. In a 9 hour day, A produces 54 units and B products 75 units.

Solution

Standard production per hour 8 units
Normal time rate per hour Rs. 0.40
Piece Rate Rs. $0.40/8 =$ Rs. 0.05

Earnings under the straight piece rate system:-

A: 54 units @ Rs. 0.05 = Rs. 2.70
B: 75 units @ Rs. 0.05 = Rs. 3.75

Differential Piece Rate:-

Low Piece rate: 80% of piece rate $(0.05 \times 80 / 100) =$ Rs. 0.04
High Piece rate: 120% of piece rate $= (0.05 \times 120 / 100) =$ Rs. 0.06

Standard output per hour is 8 units, So Standard Output for a 9 hour day is 72 units. A produces only 54 units which is less than the standard output of 72 units. So he is entitled to get a lower price rate of Rs. 0.04 per unit. On the other hand, B's output of 75 units is more than the standard output of 72 units. So SA is to get higher piece rate of Re. 0.06 per unit.

A's earning: 54 units @ Re. 0.04 = Rs. 2.16
B's earning: 75 units @ Re. 0.06 = Rs. 4.50

Illustration 3

Calculate the earning of workers A,B and C under Merrick's multiple piece system from the following particulars.

Normal rate per Hour Rs. 1.80
Standard time per unit 1 minute

Output per day as follows:-

Worker A: 384 units
Worker B: 450 units
Worker C: 552 units
Working rows per day are 8

Solution

Standard output per minute	= 1 units
Standard Production per hour	= 60 units
Standard Production per day of 8 hour	= 480 units
	i.e. (60×8)
Normal rate per hour	= Rs. 1.80
Normal output per hour	= 60 units
Therefore Normal piece rate	= $(1080/60) \times 5$ paise

Calculation of level of Performance:-

Standard output per day	= 480 units
Worker A's Output per day	= 384 units
Worker A's level of performance	= $(384/480) \times 100 = 80\%$
Worker B's Output per day	= 450 units
Worker B's level of performance	= $(450/480) \times 100 = 43\%$

Worker C's Output per day = 550 units
 Worker A's level of performance = $(550/480) \times 100 = 1150\%$

Earnings of workers A:-

Merrick's multiple piece rate system:-

For 384 units @ 3 paise per unit = $(384 \times 3) / 100 = 11.50$

Normal piece rate has been applied because worker A's level of performance is 807. Which is below 83%.

Earning of Worker B:-

For 450 units @ 3.3 Paise per unit = $450 \times 3.3 / 100 = \text{Rs. } 14.85$

Worker B's level of Performance is 93.75% which is between 83% and 100%. So he is entitled to get 110% of normal piece rate.

Earning of Worker C:-

For 552 units @ 3.6 paise per unit = $(552 \times 3.6) / 100$
 Rs. 19.87

Worker C's level of performance is 115% which is more than 100% of standard output. So it is entitled to get 120% of normal Piece rate.

Illustration 4

Calculate the earnings of workers A and B under straight piece rate system and Taylor's differential piece rate system from the following particulars.

Normal Rate per hour Rs. 2.40
 Standard time per unit 30 seconds

Differentials to be applied:-

80% of piece rate below standard
 120% of piece rate at above standard
 Worker A produces 800 units per day and
 Worker B produces 1000 units per day.

Solution

Hourly Production = $\frac{3600}{1000} = 120 \text{ units}$

Piece rate = $\frac{120}{1000} = 0.005$

Low piece rate:-

LPR = 2.210 of normal piece rate
 = $0.005 \times 0.8 = 0.004$
 = 0.004

Earning of Worker B:-

Worker B's level of performance is 100% so he will get piece wages for 1000 units plus 20% bonus

Piece Wages for 1000 units @ 50 paise per unit	Rs. 500
Add: 20% bonus i.e. $(500 \times 20) / 100$	Rs. 100
Total earning	Rs. 600

Earning or Worker C:-

Worker C's level of Performance is 110% which is more than the standard Performance so he will get piece wage prices 20% bonus.

Thus dis earnings are as follows:-

Price wages for 1,100 units @ 50 paise per unit	Rs. 550
Add: 20% bonus $(550 \times 20) / 100$	Rs. 110
Total earning	Rs. 660

Illustration 6

The existing incentives system of a certain factory is

Normal working week – 5 days of 9 hours plus 3 rate shifts of 3 hrs each.

Rate Payment - Daywork = Re. 1 per hour
Late shift = Rs. 1.50 per hour
Additional bonus payable – Rs. 2.50 per day shift
Rs. 1.50 per Late shift

Average output per operative for 54 hour week – 120 articles i.e. including 3 Late shifts

In order to increase output and eliminated overtime it was decided to with on to a system of payment by results the following information is obtained.

Time rate Re. 1 per hour
Basic time allowed for 15 articles 5 hours
Piece work rate – Add 20% to piece
Premium – Add 50% to time

You are required to show

- i) Hours worked
 - ii) Weekly earnings
 - iii) Number of articles produce and
 - iv) Labor cost per article for one operative under the following system
- a) Existing time rte

- b) Straight piece work
- c) Rowan system
- d) Halsay weir system

Assume that 135 articles produces in a 45 hours work under (b) (c) and (d) and that the worker earns half time saved under the Halsay system. The additional bonus under the existing system will be discontinued on the proposed incentive scheme.

Solution

a) Existing time Rate:-	Rs.
Weekly wages 45 hrs. @ Re. 1 per hour	4500
9 hrs @ Re. 1.50 per hour	13.50
Day shift bonus 5 x 2.50	12.50
Late shift bonus 3 x 1.50	4.50
Total Earning	75.50

b) Piece rate system:-

Basic time : 5 hours for 15 articles	
Therefore cost of 15 articles	5.00
Add: 20%	1.00
Total Earning	6.00

Therefore Rare per article Rs. $6.00 / 15 = \text{Rs. } 0.40$
 Articles products in a week = $45 \times 15/5 = 135$

Hence Earning = $135 \times 0.40 = \text{Rs. } 54.00$

c) Rowan Premium System:-

Basic time = 5 hrs for 15 articles
 Adding 50% = $7\frac{1}{2}$ has for 15 articles
 Therefore time for producing one articles
 = $7\frac{1}{2} \text{ hrs} / 15 = 30 \text{ minutes}$
 Therefore time allowed for 135 articles = $67\frac{1}{2} \text{ hrs}$
 Actual time taken for 135 articles 45 hrs
 Therefore time saved = $22\frac{1}{2} \text{ hrs}$
 Earning = Time wages x (% of time saved / Standard Time) x Time wage
 = $45 \times 1 + (22\frac{1}{2} / 67\frac{1}{2}) \times 45 = 45 + 15 = 60$

d) Halsay-Weir Premium System:-

Earning = Time wage + 50% (Time saved x Time rate)
 = $45 \times 1 + 50\% (67\frac{1}{2} - 45) \times 1$
 = $45 + 11.25 = \text{Rs. } 56.25$

The other requirements of the problems have been shown in the following table:-

Methods:-

	a	B	c	d
i) Hours worked	45	54	45	45
ii) Weekly earning Rs.	75.50	54.00	60.00	56.25

iii) Articles produces	120	135	135	135
iv) Labour cost per article	0.629	0.400	0.444	0.417

Illustration 7

The Worker earns Rs. 2 as bonus @ 50%. So total bonus at 100% should be Rs. 4. The hourly rate of wages being Re. 1. The time saves should be 4 hours.

Standard time allowed	-	10 hours
Less: time saved	-	4 hours
Time taken	-	6 hours

A worker completes a job in a certain number of hours. The standard time allowed for the job is 10 hrs, and the hourly rate of wages (i.e. Re. 1 the worker earns at the 50% rate of bonus Rs. Under Halsay plan.

Ascertain dis total wages under the Rowan premium plan:-

Solution

The worker earns Rs. 2 as bonus at 50% so total bonus at 100% should be Rs. 4. The hourly rate of wages being Re. 1 the time saved should be 4 hrs.

Standard time allowed	10 hours
Less: Time saved	4 hours
Time taken	6 hours

Earning under the roman Premium Plan:-

$$\text{Earning} = T \times R + (S - T / S) \times T \times R$$

$$\text{Where } T = \text{Time taken i.e., 6 hours}$$

$$S = \text{Standard time i.e. 10 hours}$$

$$R = \text{Rate per hour i.e. Re. 1}$$

$$\text{Therefore Earning} = 6 \times 1 + (10-6/10) \times 6 \times 1$$

$$= \text{Rs. 6} + \text{Rs. 2.40}$$

$$= \text{Rs. 8.40}$$

Illustration 8

For a certain work order the Standard time is 20 hours, wages Rs. 5 per hour the actual time taken is 13 hours and factory overhead charges are 80% of standard time.

So out a comparative statement showing the effect on paying wages Halsay plan.

Solution

$$\text{Earning} = A.T \times T.R + 50\% (T.S. \times T.R)$$

$$= 13 \times 5 + 50\% (7 \times 5)$$

$$= 65 + 17.5$$

$$= \text{Rs. } 82.50$$

Illustration 9

A Workman whose basic rate of pay is Re. 1 per hour of working under the 'Rowan' system of premium bonus. In addition he gets dearness allowance of Rs. 20 per week of 48 hours. During one week he does the following jobs.

- i) Job 101 for which 25 hours are allowed. He takes 20 hours.
- ii) Job 102 for which 30 hours are allowed he takes 24 hours.

During the week, his waiting time amounts to 4 hours. Find the worker's earning and the amounts to be charged to each job and to overhead.

Solution

Workers earning from Job 101 :-

Standard time 25 hours

Time taken 20 hours

Rate per hour Re. 1

Wages for actual time = 20 hrs @ 1 Re.

Premium according to Roman System

$$= \text{Time taken} \times \text{Rate per hr.} + (\text{Time saved} / \text{Standard time}) \times \text{Actual time} \times \text{Rate per hr}$$

$$= 20 \times 1 + (5/25) \times 20$$

$$= \text{Rs. } 24 \qquad \qquad \qquad \text{Rs. } 24.00$$

Proportion of dearness allowances:-

$$= 20 \times (25/55)$$

$$\text{Earning from job 101} \qquad \qquad \qquad \text{Rs. } 9.09$$

$$\text{Total} \qquad \qquad \qquad \text{Rs. } 33.09$$

The workers earning from job 102:-

Standard time = 30 hours

Time taken = 24 hours

Rate per hour = 1 Re.

Earning = $T \times R + (T.S / \text{Std}) \times A.T \times R$

$$= 24 \times 1 + (6/30) \times 24$$

$$= 24 + 4.8$$

$$= \text{Rs. } 28.80$$

Proportion of Dearness allowance:-

$$= 20 \times (30 / 55)$$

$$= \text{Rs. } 10.91$$

Earning from job 102 Rs. 39.71

Total earning of the worker:-

$$\text{Job 101} \qquad = \qquad \text{Rs. } 33.09$$

$$\text{Job 102} \qquad = \qquad \text{Rs. } 39.71$$

$$\text{Read} \qquad = \qquad \text{Rs. } 4.00$$

Total = Rs. 76.80

Illustration 10

The guaranteed time table is Re. 1 per hour high piece rate is Re. 0.20 per unit and standard output is 10 units per hour. In a day of 8 hours, A produces 70 units and B produces 80 units and C produces 90 units. Calculate the earning of A,B and C under Gantt task plan.

Solution

Standard Output at 10 units per hour is 80 units.

A's output is below the Standard

B's output is at the standard and C's output is above the standard.

Accordingly A gets time wages, B gets a bonus of 20% of the time rate and C gets high piece rate.

Earnings:	A	=	8 hours x Re. 1	=	Rs. 8
	B	=	8 hours x Re. 1.20	=	Rs. 9.60
	C	=	90 hours x Re. 0.20	=	Rs. 18

Illustration 11

Standard output is 10 units per hour and basic wage rate is Re. 1.50 per hour. In a day of 8 hours. A produces 40 units. B 75 units and C produces 90 units. Calculate the wages of A,B and C under Merrick's differential piece rate.

Solution

Standard output	=	10 units per hour
Basic wage Rate	=	Rs. 1.50 per hour
Piece rate	=	1.50 / 10 = Rs. 0.15

Percentage efficiency:-

	=	(Actual output / Standard output) x 100
For A	=	(40 x 100/80) = 50%
For B	=	(75 x (100/80)) = 93.75%
For C	=	(90 x 100/80) = 112.5%

A's efficiency being less than 83% he is paid the ordinary piece rate. B's efficiency being 83% to 100%. He is paid at 110% of ordinary piece rate. C's efficiency being more than 100% he is paid at 120%.

Thus:	A gets 40 x Re. 0.15	=	Rs. 6.00
	B gets 75 x 0.165	=	Rs. 12.37
	C gets 90 x Re. 0.18	=	Rs. 16.20

