

Materials Management

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Importance - Materials productivity has a significant and direct impact on company's profitability. In some industries 60-70% of the total production cost is due to materials. This makes material management the biggest single area having tremendous scope for cost reduction.

Functions of materials management:

- ① Material planning → Purchasing → Inventory Control → Store keeping.
- Stores accounting → Transportation → Disposal of surplus materials.
- Materials Economics → Waste Management.

Objective of Materials Management:

- ① To maintain steady flow of materials to uninterrupted production.
- ② To achieve economy in cost of materials.
- ③ To ensure consistency of quality.
- ④ To reduce inventory investment.
- ⑤ To maintain good records of purchase, stores, traffic etc.
- ⑥ To preserve/conserve materials in stock.
- ⑦ To reduce operating cost by minimising/eliminating wastage and improving productivity of materials.
- ⑧ To improve competitive strength.

Objectives of Scientific Purchasing:

- ① To procure at a competitive price the needed materials, supplier tools and services of the right quality, in the right quantity and at the right time.
- ② To maintain continuity of supply to ensure production schedule at minimum inventory investment.
- ③ To ensure the good production of goods of better quality at the competitive price by procuring materials which best suit the product and purpose for which they are intended.
- ④ To suggest better substitutes to materials which are currently being used with a view to lower cost and maintain quality of the products.

cumulative item percentages and segregate the

④ To render assistance in standardisation, variety reduction, analysis and other cost reduction programmes.

Functions of purchase department:-

- ① Locating, selecting, and developing qualified sources of supply.
- ② Scrutinising purchase indents and deciding method of purchase.
- ③ Float Floating enquiries processing quotations, conducting negotiations and releasing purchase orders.
- ④ Pre delivery follow up and shortage chasing.
- ⑤ Co-ordination with inward inspection including timely return of defective materials back to suppliers.
- ⑥ Attending supplier's representative and travelling salesman.
- ⑦ Acting as a link between company's finance department and suppliers for timely payment/settlement of suppliers' bills.
- ⑧ Attending to periodical activities like applying for import license, quota etc.

Methods of buying:-

1. Hand-to-mouth buying → Purchases are made only when demand arises.
Adv. - Lower inventory investment; low carrying charges.
Disadv. - Comparatively high prices due to urgencies and loss of quantity discount.
2. Scheduled buying: A purchase order covering annual requirements is placed with the supplier.
Adv. - Both buyer sellers enjoy the savings resulting from regularity of production and smaller inventories.
3. Market purchasing: refers to the procurement of sufficient quantity of an item at a time when prices are low.
Adv. - lower purchase price Disadv. - may not serve entirely the needs of the production.
4. Speculative Buying: Refers to the buying large requirements of an item when its price is low with the intention to sell bulk of it at a higher price for speculative profits.
5. Contract Buying:
6. Blanket Orders: Blanket orders refers to the purchase of variety of items from a single source, usually a middle man.
7. Tender Buying: Contd., 8. Seasonal Buying: ④ Group purchasing
⑩ Sub Contracting 11. Central purchase Organisation.

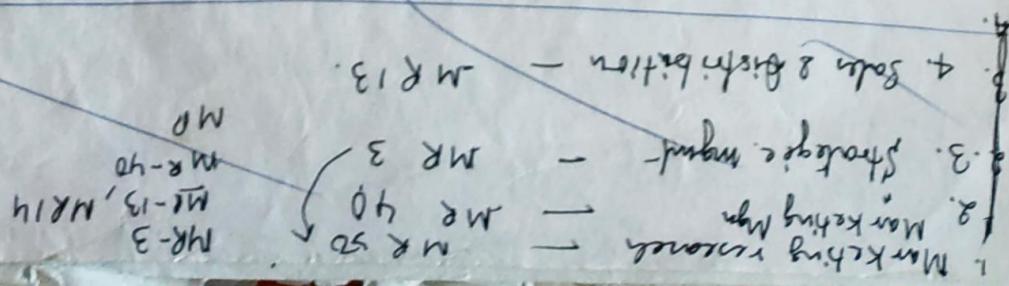
CENTRALIZED VS DECENTRALISED BUYING

Merits of centralised purchasing

- ① Consistency in buying policies
- ④ Uniformity in purchase records.
- ② Economy in buying
- ⑤ Economy in maintenance of records.
- ③ Low inventory investment
- ⑥ Reduction in handling and storage costs.
- ⑦ Performance of specialists
- ⑧ Avoidance of irritation of Vendors.

Merits of Decentralised Buying :-

- ① Greater flexibility
- ⑩ Close liaison
- ⑪ Accountability



- Requisitioning from purchasing department an economical quantity of material for delivery at the most appropriate time.
- (i) Exercising control on quantity of materials received.
 - (ii) Storing and protecting materials against hazardous condition, weather.
 - (iii) Issuing materials against properly authorised material requisitions.
 - (iv) Maintaining exact records of receipt, issue, and balanced expenditure.
 - (v) Maintaining adequate stocks.
 - (vi) Keeping inventory investment within desired limits.

LOGISTICS MANAGEMENT:

Logistics management encompasses all materials flows management from the inflow of purchased materials into works, material flow through manufacturing processes and material flow to customers.

Logistics functions includes following:-

- (i) Order processing (ii) Transport management.
- (iii) Inventory management (iv) Warehousing.
- (v) Materials handling (vi) Packaging.
- (vii) Production scheduling (viii) Information system.

Inventory Management :

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ABC analysis → Usage value. ✓

VED analysis → Criticality of the item. ✓

FSN analysis → Issues from store ✎

ABC → A holds the key business. The other item B & C on the basis of their annual usage.

A items - 5-10% of total items account for 70-75% of total money spent on the materials. These items should be procured frequently.

B items - 10-15% of total items and represent 10-15% of the total expenditure of the materials.

C items 70-80% of total items 5-10% of total value.

- Steps:
- ① Prepare the list of the items and estimate their annual consumption.
 - ② Determine unit price (or cost) of each item.
 - ③ Multiply each annual consumption by its unit price (or cost) to obtain its annual consumption in rupees (annual stage).
 - ④ Arrange items in the descending order of their annual usage starting with the highest annual usage down to the smallest usage.
 - ⑤ Calculate cumulative annual usages and express the same as cumulative usage percentages.
 - ⑥ Graph cumulative usage percentages against cumulative item percentages and segregate the

~~VED Analysis~~ :- VED analysis represents classification

② : items based on their criticality.

steps
(Vital - Essential - Desirable)

~~Vital~~ vital for number of reasons:-

- ① It the non-availability of the item can cause serious production losses.
- ② Lead time for procurement is very large.
- ③ It is non-standard item and is procured to buyer's design.
- ④ The source of supply is only one and is located far off from the buyer's plant.

steps

- ① Identify the factors to be considered
Identify factors
The commonly considered factors → effect on production, lead time, nature of the item, source of supply.
- ② Assign points/weightages to the factors according to their importance.
- ③ Divide each factor into three degrees and allocate points to each degree
- ④ Prepare Categorisation plan. Which
- ⑤ Evaluate items one by one against each factor and assign points to the item depending upon the extent of presence of the factor, in the item
- ⑥ Place the items into V&ED.

	<u>First Degree</u>	<u>Second degree</u>	<u>Third Degree</u>
1. Stock out cost in the event of non availability (30)	Above Rs. X (30) ✓	Between Rs. x to y (60)	Above Rs. Y (90)
2. Lead time for procurement (30)	1-4 wks (30)	4-8 wks (60) ✓	over 8 wks (90)
3. Nature of the item. (20)	Produced to Commercial standard or off the shelf availability (20)	Produced to Suppliers design (10)	Produced to buyer's design or proprietary items (60) ✓
4. Source of Supply (20)	Local (20)	out station (40) ✓	Imported, quota item, i.e controlled supply.
	<u>Points</u>	<u>Classification</u>	
	100 - 160	Desirable	
	161 - 230	Essential	
	231 - 300	Vital	

* Evaluate items one by one against each factor and assign points to the item depending upon the extent of presence of the factor in the item.

FSN → based on Consumption figures.

F → Fast moving, S → Slow moving, N → non-moving.

store → To conduct analysis, the date should be last date of receipt or last date of issue can be taken and the period is one month / 1 yr / 2 yr.

helps to identify {
 (i) Active items which require to be reviewed regularly.
 (ii) Surplus items whose stocks also higher than their rate of consumption.
 (iii) Non moving items which are not being consumed. Last two categories are reviewed further to decide on disposal action to deplete their stocks and thereby release company's productive capital.

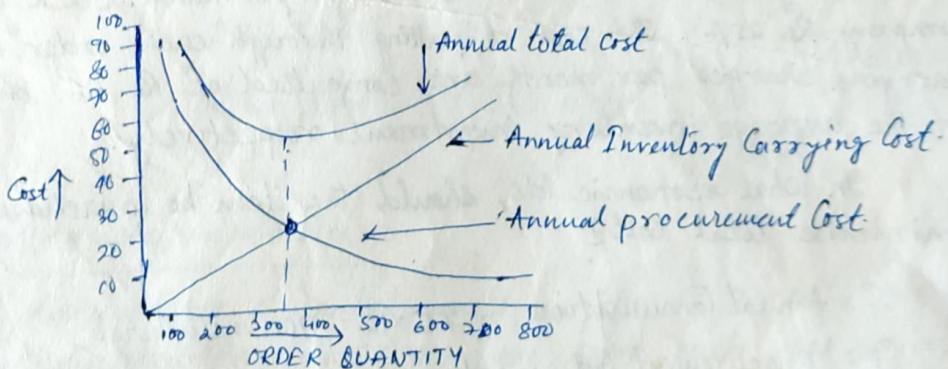
STANDARD INVENTORY MODELS:-

EOB → Effective Order Quantity:

Assumptions:-

- ① The demand of the items occurs uniformly over the period at the known rate.
- ② The replenishment of stocks is instantaneous.
- ③ The price per unit is fixed and is independent of the order size.
- ④ The cost to place an order and process the delivery is fixed and does not vary with the lot size.
- ⑤ The inventory carrying charges vary directly and linearly with the size of the inventory and are expressed as percentage of average inventory investment.
- ⑥ The item can be procured free from restrictions of any kind.

TWO MAJOR COSTS :- ① Procurement Cost ② Inventory carrying Cost.



Procurement Cost is high if the item is procured frequently in small lots and is less if the item is procured less frequently and in big lots.

Inventory carrying cost (the product of average inventory investment and the carrying cost) on the contrary falls when the quantity ordered per batch is small because of low capital investment.

The right quantity to order will be the one that strikes an optimum balance between these two opposing costs, when the costs have been balanced, the total cost is minimum and the resultant quantity is termed as Order quantity which is economy abbreviated as EOB.

MATHEMATICAL TREATMENT OF THE MODEL:-

Annual Consumption of the items (units)	: S
Unit price (Rs)	: Cu
Procurement cost/order (Rs)	: CP.
Inventory carrying cost expressed as a percentage of avg inventory investment	: i
Order quantity	: q

$$q_0 = \sqrt{\frac{2 \cdot S \cdot C_p}{C_u \cdot i}}$$

Economic Order quantity

$$= \sqrt{\frac{2 \times \text{Annual requirement} \times \text{Procurement cost/order}}{\text{Price/unit} \times \text{Inventory Carrying Cost}}}.$$

Ex A Company uses 75 numbers of an item per month. Each unit costs the company Rs. 25/. The cost of putting through each order and inventory carrying charges per month are computed at Rs 36 and 1.5% of the average inventory investment respectively.

In what economic lots, should the item be purchased to minimise total cost?

Ans $S = \text{Annual Consumption} = 75 \times 12 = 900 \text{ numbers.}$

$C_p = \text{Procurement cost per order (Rs)} = \text{Rs. } 36/-$

$C_u = \text{Price of Cost per unit (Rs)} = \text{Rs. } 25/-$

$i = \text{Inventory carrying cost per year (decimals)}$

$$= \frac{1.5}{100} \times 12 = 0.18.$$

$$q_0 = \sqrt{\frac{2 \times 900 \times 36}{25 \times 0.18}} = 120 \text{ numbers.}$$

NoB: Some firms prefer to specify the inventory carrying cost in "Rs per unit" in place of "percentage figure". So the formula will be

$$q_0 = \sqrt{\frac{2 \cdot S \cdot C_p}{C_u \cdot i}} = \sqrt{\frac{2 \times S \times C_p}{C_u}} \quad C_h = C_u \times i$$

Q. ③

Impellers are procured by the water pumps manufacturer from a local firm and are consumed at an average rate of 500 nos. per month. If the procurement cost is Rs. 36 per order and the cost of holding it in stock is Rs. 1.20 per unit per year, determine the quantity that should be procured at a time to optimise the costs involved.

If the consumption of the above item increases to 40 numbers per day and its actual inventory carrying cost is Rs. ~~0.02~~^{0.02} per unit per day, what shall be its revised EOQ quantity?

Ans ④ Economic Order quantity when inventory car.

$$\text{Ans } ④ = 600 \text{ nos.}$$

$$④ Q_0 = \sqrt{\frac{2 \times 600 \times 36}{1.20}} = 600 \text{ nos.}$$

⑤ Ans. - Assuming 300 working days in a year and

$$S = 10 \times 300 = 12000 \text{ nos.}$$

$$C_p = \text{Rs. 36}$$

$$C_h = 0.02 \times 36 \cancel{0.5} = \text{Rs. 6.}$$

as holding cost is for 365 days.

$$Q_0 = \sqrt{\frac{2 \times S \times C_p}{C_h}}$$

$$= \sqrt{\frac{2 \times 12000 \times 36}{6}}$$

$$= 1087.$$

Inventory Cost not specified directly

Ex-3 A manufacturer of control panels spends Rs 34000/- per annum on its purchasing activities, Rs. 67,200/- are spent each year in maintaining inventory of Rs. 4.2 Lacs (expenses referred above are only the variable portion of the total expenses). Around 850 orders are placed every year to replenish stocks of the various items.

One of the items whose annual consumption is 9600 nos. is bought by the company at the rate of Rs 30 each. The company has entered into an annual contract with the supplier of the item based on staggered deliveries. How frequently should the company receive the staggered deliveries and what quantities?

$$\text{Ans } q_0 = \sqrt{\frac{2 \times S \times C_p}{C_u \times i}}$$

$$q_0 = \sqrt{\frac{2 \times 9600 \times 40}{30 \times 0.16}} \\ = \underline{400}$$

C_p : expenses on procurement function per

No of orders per period

$$= \frac{34000}{850} = 40$$

i : Inventory Carrying Cost per annum (decimal)

= Inventory carrying expenses per period

Average inventory investment during the period

$$= \frac{67200}{420000} = 0.16$$

ECONOMIC LOT SIZE DETERMINATION WITH QUANTITY DISCOUNT

RATIONAL QUANTITY DISCOUNT : Basic economic order quantity formula is based on the assumption that price per unit is fixed irrespective of the order quantity. This is not always true. Often suppliers offer discount if higher quantities are purchased.

Quantity discounts reduce material cost and procurement cost but increase investment in inventories (i.e. inventory carrying cost). A decision therefore is to be made whether the buyer should stick to economic order quantity or raise the same to take advantage of the price break.

While making comparison on the basis of annual total cost, we must consider annual mat. cost ($S \times C_u$)

$$\text{Annual Total Cost } ATC = S \times C_u + \frac{S}{q} \times C_p + \frac{q}{2} \times C_u \times i \quad \text{--- (1)}$$

Annual Procurement Cost + inventory Carrying Cost. $\rightarrow T_f$

$$\text{Annual Procurement Cost} = \text{No of order per year.} \times \text{procurement Cost per order} \rightarrow \text{Example} \\ = \frac{S}{q} \times C_p.$$

Annual inventory Carrying Cost

$$ATC = \frac{S}{q} \times C_p + \frac{q}{2} \times C_u \times i$$

= Average inventory investment \times Inventory Carrying Cost
 = $\frac{1}{2} \times \text{order qty.} \times \text{price/unit} \times \text{Inventory Carrying Cost}$
 = $\frac{1}{2} \times q \times C_u \times i$

OF PRICE DISCOUNT

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A chemical firm buys 25000 units annually of a particular item from a vendor at a cost of Rs. 3 per unit. It has now received a revised price schedule from the vendor which is as follows.

Order Quantity	Price per unit
Less than 500 units	Rs. 3.00
500 to 1250 units	Rs. 2.90.
1250 units or more	Rs. 2.85

The cost of placing an order and executing the delivery one = Rs. 25
 Inventory carrying cost as a percentage of average inventory = 20%.
 investment

Determine economic order quantity of the item.

Soln:

S = Annual Consumption = 2500 units

C_p = procurement cost per order = Rs. 25

i = Inventory carrying cost (decimals) = 0.20

C_{U_1} = Basic price = Rs. 3.00

C_{U_2} = Rs. 2.90

C_{U_3} = Rs. 2.85

The above prices are valid for quantities shown below.

Price	Range of purchase quantity
C_{U_1}	$0 < q \leq 500$
C_{U_2}	$500 \leq q \leq 1250$
C_{U_3}	$q > 1250$



Step - 1.

Price (Rs)	Range of Purchase quantity (q)	E.O.Q.	Quantity to be purchased at the indicated price
3.00	$0 \leq q < 500$	$\sqrt{\frac{2 \times 2800 \times 25}{0.20 \times 3.00}}$ 156	156
2.90	$500 \leq q < 1250$	$\sqrt{\frac{2 \times 2800 \times 25}{0.20 \times 2.90}}$ 164	500
2.80	$1250 \leq q$	468	1250

Step 2

Cost elements

Price discount

Rs. 3.00	Rs. 2.90	Rs. 2.85
Quantity to be purchased		
456	500	1250

1. Annual Cost of Materials (SxCu)	7500	7250	7125
2. Annual Procurement Cost $(\frac{S}{q} \times Cp)$	$\frac{2500 \times 25}{456}$ 137	$\frac{2500 \times 25}{500}$ 125	$\frac{2500 \times 25}{1250}$ 50
3. Annual Inventory Carrying Cost. $(\frac{1}{2} \times q \times Cu \times i)$	137	145	356
Annual Total Cost	7774	7520	7531

So \$ 500 was will be economic purchase quantity