INVENTORY MANAGEMENT

by

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PURPOSE BEHIND MAINTAINING INVENTORIES

- To avoid lost sales
- To gain quantity discounts
- To reduce ordering costs
- To achieve efficient production run

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CLASSIFICATION OF INVENTORIES

- **RAW MATERIALS INVENTORY:** Consists of basic inputs that are to be converted into finished goods.

- **WORK-IN-PROCESS INVENTORY:** Consists of semi-manufactured products

- **FINISHED GOODS INVENTORY:** Consists of completely manufactured products that are ready for sale.

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COSTS ASSOCIATED WITH INVENTORIES

- **DIRECT COSTS**:
  - Material costs
  - Ordering costs
  - Carrying costs
- **INDIRECT COSTS**
  - Cost funds tied up in inventories
  - Cost of running out of goods

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OBJECTIVE OF INVENTORY MANAGEMENT

- **Objective:** To maintain an optimum level of inventory at which the total inventory costs are minimized.

- It involves trade-off between two conflicting goals:

  - To maintain a adequate level of inventory for ensuring efficient and smooth production and sales operations.

  - To maintain a minimum investment in inventories in order to maximize profitability.

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INVENTORY MANAGEMENT TECHNIQUES

- ECONOMIC ORDER QUANTITY
- REORDER POINT SUBSYSTEM
- STOCK-LEVEL SUBSYSTEM

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ECONOMIC ORDER QUANTITY (EOQ)

- EOQ is the optimal order size that minimizes the total costs (ordering costs + carrying costs) associated with maintaining inventory.
- EOQ = $\sqrt{\frac{2UF}{PC}}$

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where,

U is the annual usage

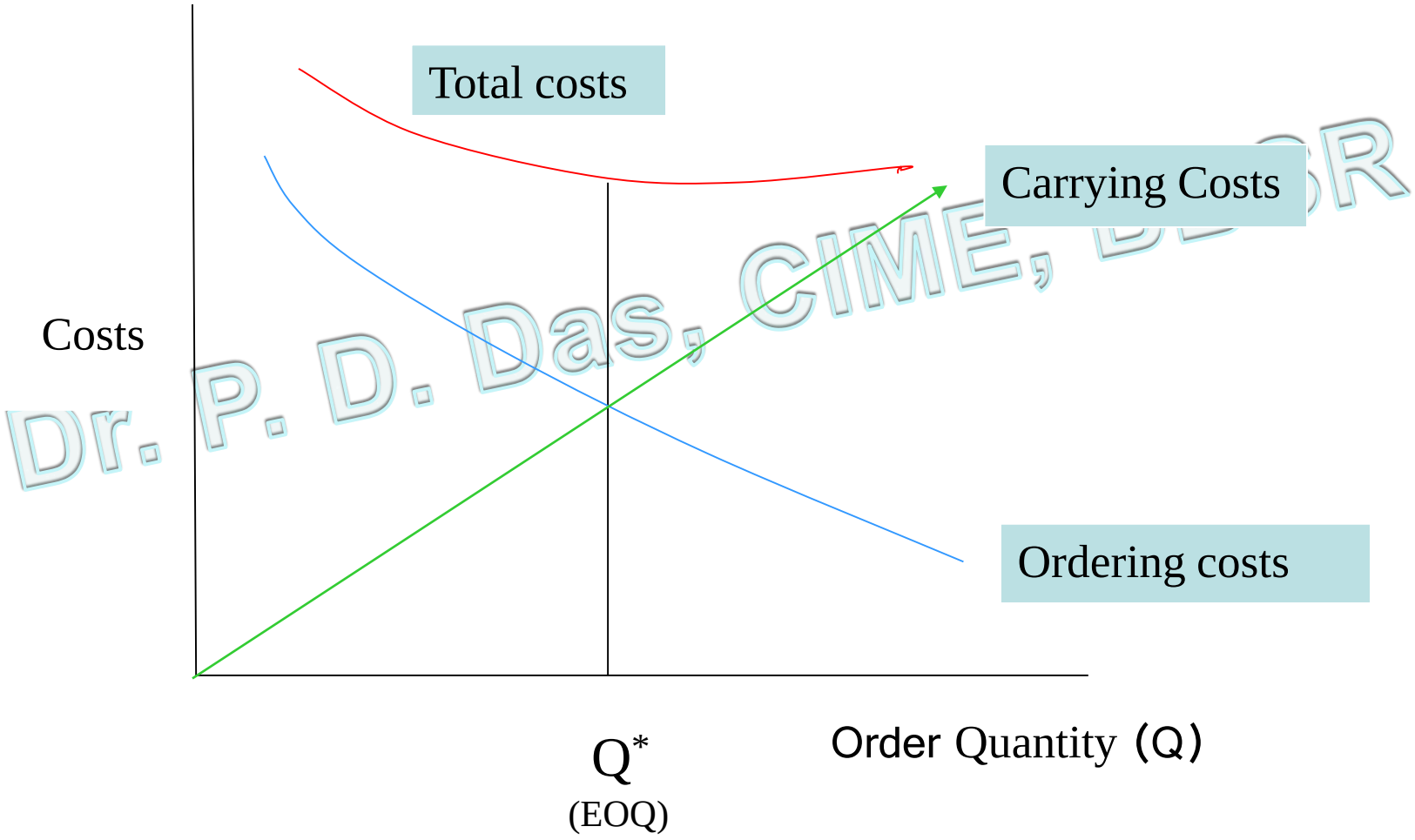
Q is the quantity ordered

F is the fixed cost per order

P is the purchase price per unit

C is the carrying costs expressed as a percentage of purchase price

ECONOMIC ORDER QUANTITY (EOQ)



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Example: The annual usage of material for Beta Ltd. is 8,500 units. The carrying cost is 2% of the purchase price. The purchase price is Rs. 85 and the cost per order is Rs. 550. What quantity should the firm order so that the total costs are minimized?

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Solution:

$$EOQ = \sqrt{\frac{2UF}{PC}}$$

$$= \sqrt{\frac{2 \times 8500 \times 550}{85 \times 0.02}}$$

= 2345.21 i.e. 2345 units approximately.

Using EOQ approach for making decisions about utilizing price discount

Notations

Q': Minimum quantity to be ordered for utilizing cash discount

$\mathbf{Q^*}$: Economic Order Quantity

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If $Q^* > Q'$, then EOQ is the quantity to be ordered

If $Q' > Q^*$, then order Q' only if the net incremental benefits are positive.

Net Incremental benefits = $UD + \left(\frac{U}{Q^*} - \frac{U}{Q'}\right) \times F$ - $\left[\frac{Q'(P-D)C}{2} - \frac{Q^*PC}{2}\right]$

where U is the annual usage; F is the cost per order

D is the cash discount offered and P is the purchase price

Example: The supplier of KR Ltd. is offering a cash discount of 2%, if the firm orders 2,800 units. The annual usage of KR Ltd. is 8,000 units and the cost per order is Rs. 650. The cost of each unit is Rs. 90 and the carrying cost per unit is 4% of the inventory. Should the firm accept the cash discount offered by the supplier?

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Solution:

$$EOQ = \sqrt{\frac{2UF}{PC}} = \sqrt{\frac{2\times 8000\times 650}{0.04\times 90}}$$

$= 1{,}699.60 \approx 1{,}700$ units.

Net profit if the cash discount is utilized is computed as:

$$UD + \left(\frac{U}{Q^*} - \frac{U}{Q'}\right)\times F - \frac{Q'(P-D)C}{2} - \frac{Q^*PC}{2}$$

$$= 8000 \text{ x } 1.8 + \left(\frac{8000}{1700} - \frac{8000}{2800}\right)\times 650 - \left[\frac{2800(90-1.8)0.04}{2} - \frac{1700\times 90\times 0.04}{2}\right]$$

$= 14{,}400 + 1201.68 - 1879.20 = \text{Rs. } 13{,}722.48.$

Hence, the firm should accept the discount as the incremental profit associated with it is positive.

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- **INVENTORY MANAGEMENT TECHNIQUES (Contd…)**
  - REORDER POINT SUBSYSTEM
  - STOCK LEVEL SUBSYSTEM

- INVENTORY PRICING TECHNIQUES

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REORDER POINT SUBSYSTEM

- **Reorder point**: The inventory level at which an order should be placed to replenish the inventory.

- It depends on:
  - Inventory required during lead time.
  - Minimum level of inventory held to prevent shortage

  i.e. Reorder Point = Normal consumption during lead time + Safety stock

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FORMULAE FOR COMPUTING REORDER POINT

1.Reorder Point =

Average daily usage rate x lead time in days + Safety stock

2. Reorder Point = $S \times L + F \times \sqrt{S \times R \times L}$

where,

S is the usage in units

L is the lead time in days

R is the average number of units per order

F is the stock out acceptance factor

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Example: M/s Sunderesh Ltd. manufactures steel nuts and bolts. The probability distributions of the daily usage rate of the raw material (steel) and the lead time are given below:

Daily usage rate (in tonnes)	Probability	Lead time (in days)	Probability
10	0.20	20	0.20
20	0.60	25	0.60
25	0.20	30	0.20

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These distributions are independent of each other. The stock-out cost is estimated to be Rs.18,000 per tonne and the carrying cost is Rs.3,000 per tonne for the period under consideration.

a. Calculate the probability of stock-out when no safety stock is maintained

b. Find out the optimal level of safety stock.

Solution:

Expected daily usage rate = 10 (0.20) + 20 (0.60) + 25 (0.20)

= 19 tonnes

Expected lead time = 20 (0.20) + 25 (0.60) + 30 (0.20) = 25 days

Expected usage during lead time = 19 x 25 = 475 tonnes

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Daily usage rate		Lead time (in days)		Possible levels of usage	
Tonnes	Probability	Days	Probability	Tonnes	Probability
10	0.20	20	0.20	200	0.04
		25	0.60	250	0.12
		30	0.20	300	0.04
20	0.60	20	0.20	400	0.12
		25	0.60	500	0.36
		30	0.20	600	0.12
25	0.20	20	0.20	500	0.04
		25	0.60	625	0.12
		30	0.20	750	0.04

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Situations of stock-out will occur only if the usage during the lead time exceeds the expected usage during the lead time (i.e. 475 tonnes). This occurs when the actual usage is 500 tonnes, 600 tonnes, 625 tonnes or 750 tonnes.

$\therefore$ The probability of stock-out = (0.36 + 0.04) + 0.12 + 0.12 + 0.04 = 0.68

The levels of stock-outs are 25 tonnes, 125 tonnes, 150 tonnes and 275 tonnes.

Safety Stock (tonnes)	Stock-outs (tonnes)	Prob.	Expected stock-out (tonnes)	Expected stock-out costs (Rs.)	Carrying cost (Rs.)	Total cost (Rs.)
275	0	0	0	0	8,25,000	8,25,000
150	125	0.04	5	90,000	4,50,000	5,40,000
125	25	0.12	3			
	150	0.04	6			
			9	1,62,000	3,75,000	5,37,000
25	100	0.12	12			
	125	0.12	15			
	250	0.04	10			
			37	6,66,000	75,000	7,41,000
0	25	0.40	10			
	125	0.12	15			
	150	0.12	18			
	275	0.04	11			
			54	9,72,000	0	9,72,000

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From the above table it can be seen that the total of stock-out cost and carrying cost is minimized at a safety stock level of 125 tonnes (total cost = Rs.5,37,000). Hence the optimal level of safety stock is 125 tonnes.

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STOCK-LEVEL SUBSYSTEM

Functions of a stock-level subsystem:

- Keeping a record of the existing level of inventory
- Issuance of goods
- Maintaining record of the arrival of goods.

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ABC SYSTEM

Under this system more control is exercised over items which are more expensive.

Inventories are classified into three categories:

Category A: Items included in this class are those that require the largest investment. Therefore these items require more rigorous and intensive control.

Category B: Items in this group are comparatively less expensive than the items in the group B and require relatively less control.

Category C: Items in this group involve relatively small investments although the number of items will be fairly large. Minimum control is required for items in this category.

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Example: A firm has 7 different items in its inventory. The average number of each of these items held, along with their unit costs are listed below. Suggest a break down of the items into A,B and C classifications using the ABC inventory system.

Item Number	Average number of units inventory	Average cost per unit (Rs.)
1	20,000	60.80
2	10,000	102.40
3	32,000	11.00
4	28,000	10.28
5	60,000	3.40
6	30,000	3.00
7	20,000	1.30

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Solution:

Item	Units	% of total		Unit Cost (Rs.)	Total Cost	% of total costs	
1	20,000	10		60.80	12,16,000	38.00	70
2	10,000	5	15	102.40	10,24,000	32.00	
3	32,000	16		11.00	3,52,000	11.00	
4	28,000	14	30	10.28	2,88,000	9.00	20
5	60,000	30		3.40	2,04,000	6.38	
6	30,000	15	55	3.00	90,000	2.80	10
7	20,000	10		1.30	26,000	0.82	

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INVENTORY PRICING TECHNIQUES

- First In First Out (FIFO) Method
- Last In First Out (LIFO) Method
- Weighted Average Cost Method
- Standard Price Method
- Replacement/Current Price Method

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VALUATION OF WORK-IN-PROCESS AND FINISHED GOODS INVENTORY

It depends on:

(a) Method used for pricing raw materials: (i.e. FIFO, LIFO , Standard price method, weighted average cost method and replacement method).

(b) Method used for apportioning the fixed manufacturing overheads:

- Direct costing: Fixed manufacturing overheads are charged directly to income statement and are not reflected in inventory valuation.

- Absorption costing: Fixed manufacturing overheads are treated as product costs and are reflected in inventory valuation.

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END OF SESSION

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