

Material Cost

Questions:

- Q.1** ZED Company supplies plastic crockery to fast food restaurants in metropolitan city. One of its products is a special bowl, disposable after initial use, for serving soups to its customers. Bowls are sold in pack 10 pieces at a price of Rs. 50 per pack.

The demand for plastic bowl has been forecasted at a fairly steady rate of 40,000 packs every year. The company purchase the bowl direct from manufacturer at Rs. 40 per pack within a three days lead time. The ordering and related cost is Rs. 8 per order .The storage cost is 10% per annum of average inventory investment.

Required:

- (i) Calculate Economic Order Quantity.
- (ii) Calculate number of orders needed every year.
- (iii) Calculate the total cost of ordering and storage bowls for the year.
- (iv) Determine when should the next order to be placed (Assuming that the company does maintain a safety stock and that the present inventory level is 333 packs with a year of 360 working days.

Q.2

to a is	Annual demand	2000 units	The following
	Unit price	Rs.20.00	information relating
	Ordering cost per order	Rs. 20.00	type of Raw material
	Storage cost	2% p.a	available:
	Interest rate	8% p.a	
	Lead time	Half-month	
	Calculate economic order quantity and total annual inventory cost on the raw material.		

- Q.3** KL Limited produces product 'M' which has a quarterly demand of 8, 000 units. The product requires 3 kgs . Quantity of material 'X' for every finished unit of product .The other information are follows:

Cost of material 'X'	Rs.20 per kg.
Cost of placing an order	Rs. 1000 per order
Carrying Cost	15% per annum of average inventory

You are required:

- (i) Calculate the Economic Order Quantity for material 'X'.
- (ii) Should the company accept an offer of 2 percent discount by the supplier, if he wants to supply the annual requirements of material 'x' in 4 equal quarterly instalments?

- Q.4** A company manufactures a product from a raw material, which is purchased at Rs. 80 per kg. The company incurs a handling cost of Rs. 370 plus freight of Rs. 380 per order. The incremental carrying cost of inventory of raw material is Rs. 0.25 per kg per month. In addition, the cost of working capital finance on the investment in inventory of raw material is Rs. 12 per kg per annum. The annual production of the product is 1,00,000 units and 2.5 units are obtained from one kg. Of raw material.

Required:

- (i) Calculate the economic order quantity of raw materials.
- (ii) Advice, how frequently company should order for procurement be placed.
- (iii) If the company proposes to rationalize placement of orders on quarterly basis, what percentage of discount in the price of raw materials should be negotiated?

Assume 360 days in a year.

- Q.5** Supreme Limited is a manufacturer of energy saving bulbs. To manufacture the finished product one unit of component 'LED' is required. Annual requirement of component 'LED' is 72,000 units, the cost being Rs. 300 per unit. Other relevant details for the year 2015-2016 are:

Cost of placing an order	Rs.2,250
Carrying cost of inventory	12% per annum
Lead time -	
Maximum	20 days
Minimum	8 days
Average	14 days
Emergency purchase	5 days
Consumption-	
Maximum	400 units per day
Minimum	200 units per day
Average	300 units per day

You are required to calculate:

- (i) Re-order quantity
- (ii) Re-ordering level
- (iii) Minimum stock level
- (iv) Maximum stock level
- (v) Danger level

- Q.6** Following details are related to a manufacturing concern:

Re-order Level	160000 units
Economic Order Quantity	90000 units
Minimum Stock Level	100000 units
Maximum Stock Level	190000 units
Average Lead time	6 days
Difference between Minimum lead time and Maximum lead time	4 days

Calculate:

- (i) Maximum consumption per day
- (ii) Minimum consumption per day

Q.7 Re-order quantity of material 'X' is 5,000 kg. ; Maximum level 8,000 kg. ; Minimum usage 50 kg. Per hour; minimum re-order period 4 days; daily working hours in the factory is 8 hours. You are required to calculate the re-order level of material 'X'.

Answer

Q.1 Ans:

(i) Computation of EOQ

$$U = \text{Annual requirement} = 40,000$$

$$B = \text{Buying Cost} = 40\sqrt{2,50,000}$$

$$O = \text{Ordering Cost} = \text{Rs. } 8$$

$$PC = \text{Carrying cost permit} \times \% \text{ cost of cost price}$$

$$= \text{Rs. } 40 \times 10\% = \text{Rs. } 4$$

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

$$= \sqrt{\frac{2 \times 40,000 \times 8}{4}} = 400$$

Therefore, EOQ = 400 units

$$\text{(ii) No. of orders needed} = \frac{40,000}{400} = 100 \text{ orders}$$

(iii) Total Cost of Ordering

At EOQ level

$$\text{Carrying cost} = \text{ordering cost}$$

$$\text{Ordering cost} = 100 \times 8 = 800$$

$$\text{Carrying cost} = \underline{800}$$

$$\text{Total cost} = \underline{1600}$$

Alternatively :	$\text{Total Cost} = \sqrt{2UOPC}$ $= \sqrt{2 \times 40,000 \times 8 \times 4} = 1,600$
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(iv) Timing of next order

(a) Day's requirement served by each order.

$$\text{Number of days requirements} = \frac{\text{No. of working days}}{\text{No. of order in year}} = \frac{360}{100} = 3.6 \text{ days}$$

Supply

This implies that each order of 400 packs supplies for requirements of 3.6 days only.

(b) Days requirement covered by inventory

$$\frac{\text{Unit in inventory}}{\text{Economic order quantity}} \times (\text{Day's requirement served by an order})$$

$$\frac{333 \text{ packs}}{400 \text{ packs}} \times 3.6 \text{ days} = 3 \text{ days requirement}$$

(c) Time interval for placing next order

Inventory left for day's requirement - Lead time of delivery

$$3 \text{ days} - 3 \text{ days} = 0 \text{ days}$$

This means that next order for the replenishment of supplies has to be placed immediately.

Q.2 Ans:

$$\text{EOQ} = \sqrt{\frac{2 \times \text{Annual Consumption} \times \text{Buying Cost per order}}{\text{Storage Cost per unit}}}$$

$$= \sqrt{\frac{2 \times 2,000 \times 20}{\text{Rs. } 20 \times \left(\frac{2+8}{100}\right)}} = \sqrt{\frac{80,000}{2}} = 200 \text{ units}$$

Total Annual Inventory Cost

Cost of 2,000 Units @ Rs. 20 (2,000 × 20) = Rs. 40,000

$$\text{No. of Order } \frac{2,000}{200} = \text{Rs. } 10$$

Ordering Cost 10 × 20 = Rs. 200

$$\text{Carrying cost of average inventory } \frac{200}{2} \times 20 \times \frac{10}{100} = \text{Rs. } 200$$

$$= \text{Rs. } 40,400$$

Q.3 Ans:

Annual demand of material 'X'

= 8000 units (per quarter) × 4 (No. of Quarter in a year) × 3 kgs. (For every finished product) = 96,000 kgs.

(i) Calculation of Economic Order Quantity (EOQ) for material 'X'

$$\begin{aligned} \text{EOQ} &= \sqrt{\frac{2 \times \text{Annual demand} \times \text{Ordering cost}}{\text{Carrying cost per unit per annum}}} \\ &= \sqrt{\frac{2 \times 96,000 \times 1000}{20 \times 15\%}} \\ &= 8,000 \text{ kg.} \end{aligned}$$

(ii) Analysis of Cost under different options of 'order quantity'.

Particulars	When EOQ is ordered	When discount of 2% is accepted and supply is in equal installments
Order size	8000 kgs.	$\frac{96,000}{4} = 24,000 \text{ kgs}$
No. of order	$\frac{96,000 \text{ Kgs}}{8,000 \text{ Kgs}} = 12$	$\frac{96,000 \text{ Kgs}}{24,000 \text{ Kgs}} = 4$
Purchase Cost per Kg.	=Rs. 20	(20 – 2% Rs. 20) = Rs. 19.60
Total Purchase Cost (A)	(96,000 kgs. × Rs.20) = Rs. 19,20,000	(96,000 Kgs. × 19.6) = Rs. 18,81,600
Ordering Cost (B)	12 orders × Rs. 1,000 = Rs. 12,000	4 orders × Rs. 1000 = Rs. 4,000
Carrying Cost (c)	$\frac{8,000 \text{ Kgs}}{2} \times 15\% \times 20$ = Rs. 12,000	$\frac{24,000 \text{ Kgs}}{2} \times 15\% \times 19.6$ = Rs. 35,280
Total Cost (A+B+C)	= Rs. 19,44,000	Rs. 19,20,880

Advice: The total Cost is lower if Company accept an offer of 2% discount by the supplier , when supply of the annual requirement of material 'X' is made in 4 equal instalments . Hence, the company should accept the offer of 2% discount.

Q. 4 Ans:

(i) Economic Order Quantity:

$$\begin{aligned} \text{EOQ} &= \sqrt{\frac{2Aca}{Ci}} \\ &= \sqrt{\frac{2 \times 40,000 \times 750}{15}} \\ &= 2,000 \text{ Kg} \end{aligned}$$

*A = Annual Units required

$$= \frac{1,00,000}{2.5}$$

$$= 40,000 \text{ Kg.}$$

$$**\text{Ordering Cost} = C_a = 370 + 380 = \text{Rs. } 750$$

$$***\text{Carrying Cost} = C_i = 12 + 3 = 15$$

$$(\text{incremental carrying cost} = 0.25 \text{ p.m. / per Kg.})$$

(ii) **Computation of days of placing Next Order**

For 40,000 units → 360 days

For 2,000 units → ? days

$$\text{Days required} = \frac{2,000 \times 360}{40,000}$$

$$= 18 \text{ days.}$$

Alternative Solution

Frequency of placing orders for procurement:

Annual consumption (A) = 40,000 Kg.

Quantity per order (E.O.Q) = 2,000 Kg.

$$\text{No. of orders per annum} \left(\frac{A}{\text{E.O.Q}} \right) = \frac{40,000 \text{ Kg.}}{2,000 \text{ Kg.}} = 20 \text{ orders}$$

$$\text{Frequency of placing orders (in days)} = \frac{360 \text{ days}}{20 \text{ orders}} = 18 \text{ days}$$

Particulars	On Quarterly Basis	On E.O.Q Basis
1. Annual Usage (in Kg.)	40,000 Kg.	40,000 kg.
2. Size of the order	10,000 Kg.	2,000 Kg.
3. No.of orders (1 ÷ 2)	4	20
4. Cost of placing orders or ordering cost (No. of orders × Cost per order)	Rs. 3,000 (4 orders × Rs. 750)	Rs. 15,000 (20 orders × Rs. 750)
5. Inventory carrying cost (Average inventory × Carrying cost per unit)	Rs. 75,000 (10,000 Kg. × ½ × Rs. 15)	Rs. 15,000 (2,000 Kg. × ½ × Rs. 15)
6. Total Cost (4 + 5)	Rs. 78,000	Rs. 30,000

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When order is placed on quarterly basis the ordering cost and carrying cost increased by Rs. 48,000 (Rs. 78,000 – Rs. 30,000)

So, discount required = Rs. 48,000

Total annual purchase = 40,000 Kg. × Rs. 80 = Rs. 32, 00,000

Therefore, Percentage of discount to be negotiated

$$= \frac{\text{Rs.48,000}}{\text{Rs.32,00,000}} \times 100 = 1.5 \%$$

Q.5 Ans:

(i) Calculation of Re-order quantity:

$$\begin{aligned} \text{EOQ} &= \sqrt{\frac{2ACa}{Ci}} \\ &= \sqrt{\frac{2 \times 72,000 \times 2,250}{300 \times 12\%}} \\ &= \sqrt{\frac{32,40,00,000}{36}} \\ &= \sqrt{90,00,000} \\ &= 3,000 \text{ units.} \end{aligned}$$

(ii) Calculation of Re- ordering level :

$$\begin{aligned} \text{ROL} &= \text{Maximum Re-order period} \times \text{Maximum usage} \\ &= 20 \text{ days} \times 400 \text{ units per day} \\ &= 8,000 \text{ units.} \end{aligned}$$

(iii) Calculation of Minimum stock level:

$$\begin{aligned} \text{Minimum stock level} &= \text{ROL} - \left[\frac{\text{Average Consumption}}{\times \text{leas time}} \right] \\ &= 8,000 - (300 \times 14) \\ &= 8,000 - 4,200 \end{aligned}$$

= 3,800 units.

(iv) Calculation of Maximum stock level:

$$\begin{aligned}\text{Maximum stock level} &= \text{ROL} - \left[\frac{\text{Minimum Consumption}}{\text{Minimum Consumption}} \times \frac{\text{Minimum Consumption}}{\text{Minimum Consumption}} \right] + \text{ROQ} \\ &= 8,000 - (200 \times 8) + 3,000 \\ &= 8,000 - 1,600 + 3,000 \\ &= 9,400 \text{ units}\end{aligned}$$

(v) Calculation of Danger level:

$$\begin{aligned}\text{Danger level} &= \text{Minimum consumption} \times \text{Emergency delivery time} \\ &= 200 \text{ units} \times 5 \text{ days} \\ &= 1,000 \text{ units}\end{aligned}$$

Q.6 Ans:

Difference between Minimum lead time and Maximum lead time = 4 days

Max. lead time – Min. lead time = 4 days

Or, Max. lead time = Min. lead time + 4 days(i)

Average lead time is given as 6 days i.e.

$$\frac{\text{Max.lead time} + \text{Min.lead time}}{2} = 6 \text{ days} \dots\dots\dots(ii)$$

Putting the value of (i) in (ii)

$$\frac{\text{Min.lead time} + 4 \text{ days} + \text{Min.lead time}}{2} = 6 \text{ days}$$

Or, Min.lead time + 4 days + Min. lead time = 12 days

Or, 2 Min. lead time = 8 days

$$\text{Or, Minimum lead time} = \frac{8 \text{ days}}{2} = 4 \text{ days}$$

Putting this Minimum lead time in (i), we get

Maximum lead time = 4 days + 4 days = 8 days

(i) Maximum consumption per day:

Re-order level = Max. Re-order period × Maximum Consumption per day
1,60,000 units = 8 days × Maximum Consumption per day

$$\text{Or, maximum Consumption per day} = \frac{1,60,000 \text{ units}}{8 \text{ days}} = 20,000 \text{ units}$$

(ii) Minimum Consumption per day:

Maximum Stock level = Re-order level + Re- order Quantity – (Min. lead time × Min. Consumption per day)

Or, 1, 90,000 units = 1, 60,000 units + 90,000 units – (4 days × Min. Consumption per day)

Or, 4 days × min. Consumption per day = 2, 50,000 units – 1, 90, 000 units

Or, Minimum Consumption per day = $\frac{60,000 \text{ units}}{4 \text{ days}} = 15,000 \text{ units.}$

Q. 7 Ans:

Re- order Level = Maximum Level – [Re- order quantity – (Minimum usage per day × Minimum Re-order period)

= 8000 kg. - [5000 kg. – (400 kg,* × 4)

= 8000 kg. – 3400 kg. = 4600 kg.

Hence, Re-order level is 4600 K.

*Minimum usage per day = 50 kg. × 8 = 400 kg.