



# RAMA UNIVERSITY

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**FACULTY OF COMMERCE AND MANAGEMENT**

**COURSE: MBA III SEM..**

**SUBJECT: WORKING CAPITAL MANAGEMENT**

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**LECTURE: 22**

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## LECTURE-22



## **The Order Quality Problem:**

### **Economic Order Quantity (EOQ):**

How much inventory should be added when inventory is replenished is a major problem in inventory management, i.e., how much to buy or produce at a time is really a problem to the management. If bulk quantities are purchased, the cost of carrying will be high and on the contrary, if small quantities are purchased at frequent intervals, ordering cost will be high.

Therefore, the quantity to be ordered at a given time should be economic, taking mainly two factors into account, viz., ordering costs and carrying costs.

In short, it represents the most favourable quantity to be ordered at the reorder level EOQ is a problem of balancing the two conflicting kinds of costs — cost of carrying (arising out of balance purchases) and cost of not carrying (arising out of frequent purchases in small lots).

To sum up, EOQ is determined at the point where the carrying costs are approximately equal to the cost of not carrying (the ordering costs), where the total cost is minimum.

### **However, the natures of the above costs are discussed below:**

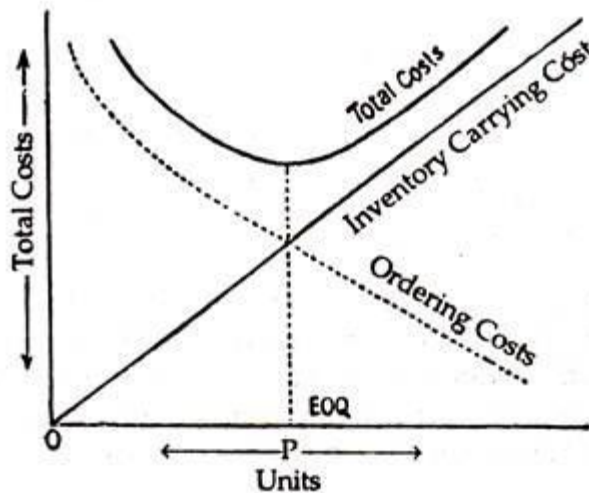
#### **Cost of Carrying:**

1. Handling and transportation
2. Clerical.
3. Rent, Insurance and other Costs of storage
4. Interest on capital blocked.
5. Pilferage and normal loss of holding.

#### **Cost of not Carrying:**

1. Extra cost of purchasing, handling and transportation
2. Frequent stock-outs resulting in disruption of production schedules and consequently extra costs of overtime setups, hiring and training.
3. Foregone quantity discounts and contribution margins on lost sales.
4. Additional cost of uneconomic production runs.
5. Loss of customer goodwill.
6. Risk of obsolescence.

The EOQ model is illustrated below with the help of the following diagram:



*Fig.8.11 No. of units per order.*

In the above diagram, the ordering costs, inventory carrying cost and the total costs are plotted. The diagram shows that the carrying costs vary directly with the size of the order whereas ordering costs vary inversely with the size of the order. The total cost (i.e., the sum of two costs) curves at first go downwards due to the fact that at this stage the fixed costs of ordering are spread over many units.

But at the next stage, this curve goes upward because of the fact that at this stage, decrease in average ordering costs is more than what is offset by the additional inventory carrying costs. The point P denotes the optimum order where the total cost is the minimum. Therefore, UP units are considered as the EOQ.

It should be remembered that the EOQ is not a stock level. It lies between the Maximum Stock Level and Minimum Stock Level. However, the EOQ will be determined in such a way as would help in earning the advantages of bulk purchases on the one side, and would keep the other costs (such as interest on capital) as minimum as possible on the other.

**The above principle can be illustrated with the help of the following formula:**

$$EOQ \text{ or } E = \sqrt{\frac{2AP}{S}}$$

where, I = the annual consumption, i.e., annual quantity used in units.

P = the ordering cost/cost per purchase order.

S = the annual cost of carrying one unit in stock for one year i.e., carrying cost percentage × cost of one unit

**The above model is based on the following assumptions:**

- (i) The supply position of the materials will be in such a way as will enable a firm to place as many order as it desires,
- (ii) Cost of materials or finished goods remains constant during the year;
- (iii) Quantity-discount is not allowed;
- (iv) Production and/or sales are evenly distributed over the period under consideration; and
- (v) Variable inventory carrying cost per unit and ordering cost per order remain constant throughout the year.

**Illustration:**

**Calculate the EOQ from the following particulars under:**

- (i) Equation Method, and
- (ii) Tabular Method:

**Solution:**

Under (ii) Tabular Method

Annual Demand	Orders per year	Units ordered (1) + (2)	Value per order (3) × Rs. 10	Average Inventory value (4) ÷ 2	Carrying Cost @ 15% on (5)	Ordering cost Rs. 25 per order	Total cost (6) + (7)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
300		Units	Rs.	Rs.	Rs.	Rs.	Rs.
	1	300	3,000	1,500	225	25	250
	2	150	1,500	750	112.5	50	162.5
	3	100	1,000	500	75	75	150
	4	75	750	375	56.25	100	156.25
	5	60	600	300	45	125	170
6	50	500	500	250	37.5	150	187.5

Hence, it is evident from the above table that 100 units per order are the most favourable one. Thus, the EOQ level is 100 units.

**Illustration:**

From the following particulars with respect to a particular item of materials of a manufacturing company, calculate the best quantity to order :

Ordering Quantities (tonnes)	Price per tonne (Rs.)	Foregone discount per tonne
less than 250	6.00	0.40
250 and less than 800	5.90	0.30
800 and less than 2,000	5.80	0.20
2,000 and less than 4,000	5.70	0.10
4,000 and above	5.60	—

The annual consumption for the materials is 4,000 tonnes. Stock holding costs are 20% of material cost per annum. The ordering cost per order is Rs. 6.00.

**Solution:**

- Annual Demand 4,000 tones.
- Holding Cost = 20% of materials cost.
- Ordering Cost = Rs. 6 per order.

Order Size (S)	200	250	800	2,000	4,000
Price per tonne	Rs. 6.00	Rs. 5.90	Rs. 5.80	Rs. 5.70	Rs. 5.60
No. of order (Annual Demand ÷ Order Size)	20	16	5	2	1
Value per Order (S × Price)	1,200	1,475	4,640	11,400	22,400
Average Inventory (Value per Order ÷ 2)	600	738	2,320	5,700	11,200
A. Ordering Cost (Rs. 6 per order)	120	96	30	12	6
B. Carrying Costs (20% of average inventory)	120	148	464	1,140	2,240
(A+B)	240	244	494	1,152	2,246

C. Annual Cost of Materials (Annual Demand × Price)	24,000	23,600	23,200	22,800	22,400
Total Cost (A + B + C)	24,240	23,844	23,694	23,952	24,646

Therefore, it is quite clear from the above table that at 800 order quantity the total cost is the lowest one. Hence, *EOQ* is 800 tonnes.

Alternatively, the same conclusion can be drawn up if discount foregone is taken into consideration in lieu of cost of annual consumption of the components at different prices. The same is shown as in the next page :

Order size (tonnes)	200	250	800	2,000	4,000
	Rs.	Rs.	Rs.	Rs.	Rs.
Cost of Ordering and carrying as per above statement	240	244	494	1,152	2,246
Discount foregone (Annual Demand × Rate)	1,600	1,200	800	400	—
	<u>1,840</u>	<u>1,444</u>	<u>1,294</u>	<u>1,552</u>	<u>2,246</u>

Hence, the *EOQ* is 800 units.