

CH2404 Process Economics

Unit – I

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Inventory Control

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Inventory

- **Raw materials** - materials and components scheduled for use in making a product.
- **Work in process** - materials and components that have begun their transformation to finished goods.
- **Finished goods** - goods ready for sale to customers.
- **Goods for resale** - returned goods that are salable.

The Reasons for Keeping Stock

- **Lead Time** - The time lags present in the supply chain, from supplier to user at every stage
- **Uncertainty** - Inventories are maintained as buffers to meet uncertainties in demand, supply and movements of goods
- **Economies of scale** - Ideal condition of "one unit at a time at a place where a user needs it, when he needs it" principle tends to incur lots of costs in terms of logistics. So bulk buying, movement and storing brings in economies of scale, thus inventory.

$$\text{Inventory Turnover} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$$

$$\begin{aligned}\text{Inventory Period} &= \frac{\text{Average Inventory}}{\frac{\text{Annual Cost of Goods Sold}}{365}} \\ &= \frac{\text{Average Inventory} \times 365}{\text{Annual Cost of Goods Sold}} \\ &= \frac{365}{\text{Inventory Turnover}}\end{aligned}$$

Cost Associated with Inventory

- **Inventory capital**
- **Inventory storage cost** - costs for warehouse space, for utilities, and for insurance to cover staff to handle and protect it from fire and other disasters, obsolescence, shrinkage (theft and errors), and others.
- **Ordering cost**

Inventory Control

- Inventory control is a planned approach of determining what to order, **when to order** and **how much to order** and how much to stock so that costs associated with buying and storing are optimal without interrupting production and sales
- Scientific inventory control aims at maintaining optimum level of stock of goods required by the company at minimum cost to the company

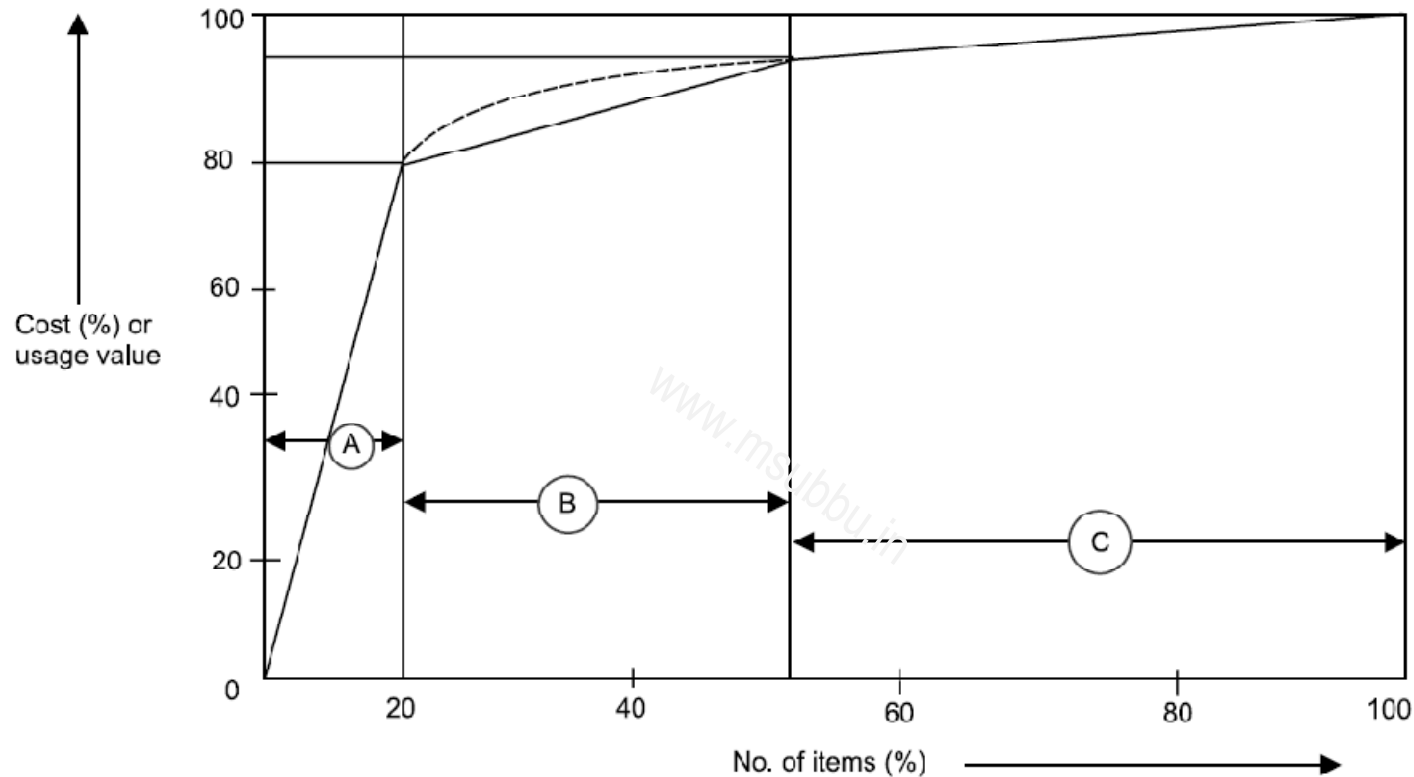
Techniques of Inventory Control

- The different techniques of inventory control are:
 - (1) ABC analysis,
 - (2) HML analysis,
 - (3) VED analysis,
 - (4) FSN analysis,
 - (5) GOLF analysis and
 - (6) SOS analysis.
- The most widely used method of inventory control is known as ABC analysis
- For effective inventory control, combination of the techniques of ABC with VED or ABC with HML or VED with HML analysis is practically used

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ABC Analysis

The classification of ABC analysis is shown by the graph given as follows :



A-Item: Very tight control, the items being of high value. The control need be exercised at higher level of authority.

B-Item: Moderate control, the items being of moderate value. The control need be exercised at middle level of authority.

C-Item: The items being of low value, the control can be exercised at gross root level of authority, *i.e.*, by respective user department managers.

A	Top 80% of total value
B	Next 15%
C	Next 5%

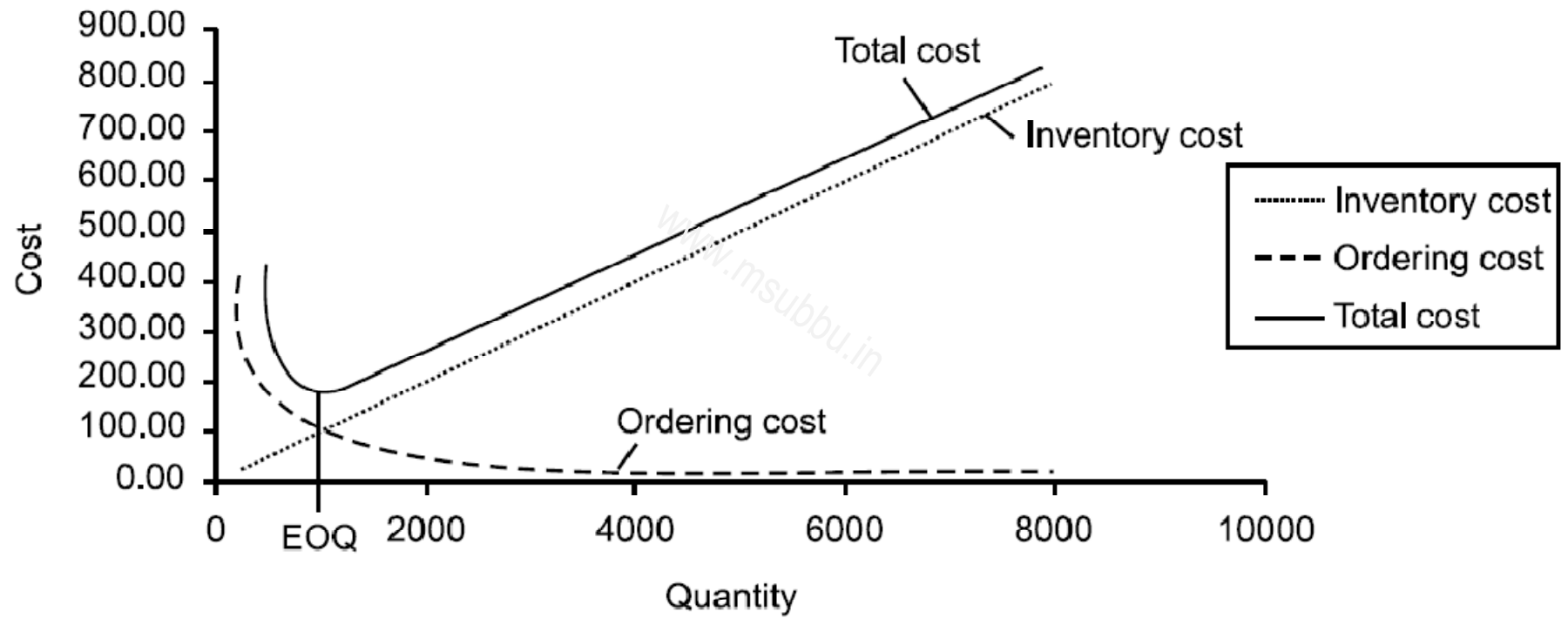
Item#	Annual Demand	Cost	Demand x Cost	% of total cost	Class
234	50	200	10000	10%	B
170	10	200	2000	2%	C
222	100	800	80000	80%	A
410	50	100	5000	5%	B
160	15	200	3000	3%	C
Total			100000		

Other Techniques of Inventory Control

- **HML analysis:** In this analysis, the classification of existing inventory is **based on unit price** of the items. They are classified as **high price, medium price** and **low cost** items.
- **VED analysis:** In this analysis, the classification of existing inventory is **based on criticality of the items**. They are classified as **vital, essential** and **desirable** items. It is mainly used in spare parts inventory.
- **FSN analysis:** In this analysis, the classification of existing inventory is **based on consumption of the items**. They are classified as **fast moving, slow moving** and **non-moving** items.
- **GOLF analysis:** In this analysis, the classification of existing inventory is **based on sources of the items**. They are classified as **Government supply, ordinarily available, local availability** and **foreign source** of supply items.
- **SOS analysis:** In this analysis, the classification of existing inventory is **based on nature of supply of items**. They are classified as **seasonal** and **off-seasonal** items.

Economic Order Quantity (EOQ)

- As the quantity ordered is increased, the **inventory carrying cost** increases while the **ordering cost** decreases. The 'order quantity' means the quantity procured during one production cycle. Economic order quantity is calculated by balancing the two costs.
- Economic Order Quantity (EOQ) is that size of order which minimizes total costs of carrying and cost of ordering.



$$\begin{aligned}\text{Average inventory} &= 1/2 (\text{maximum level} + \text{minimum level}) \\ &= (Q + 0)/2 = Q/2\end{aligned}$$

Total cost = Holding cost + Ordering cost

Holding cost = (order quantity/2) x holding cost per unit per year

Ordering cost = (annual demand/order quantity) x cost per order

Optimal order quantity (Q^*) is found when annual holding cost = ordering cost

$$Q^* = \sqrt{\frac{2 \times \text{Annual Demand} \times \text{cost per order}}{\text{holding cost per unit per year}}}$$