SNS COLLEGE OF TECHNOLOGY
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DEPARTMENT OF FOOD TECHNOLOGY

COURSE CODE & NAME: 19FTT202 & Food Plant Layout and Management

II YEAR / IV SEMESTER

UNIT : IV PRODUCTION PLANNING AND CONTROL

TOPIC 5 : Inventory Control, Cost & Deterministic models

Inventory Control

- Materials : raw, in process, finished packaging, spares, and others
  - Stocked in order to meet an unexpected demand or distribution in future
- Stock on hand at a particular time : raw materials, goods in process of manufacturing, finished products, merchandise purchased for resale and the like
- For financial statements and accounting records, the above in terms of amount assigned at the particular time

Inventory Management

- Development and administration of policies, systems & procedures
  - To minimise total costs relative to inventory decisions & related functions such as
    - **Customer service requirements, production scheduling, purchasing & traffic**
- Inventory control is primarily the administration of established policies, systems and procedures

Inventory Costs

- Ordering cost
- Carrying cost
- Out of stock or shortage cost
- Capacity cost

Carrying and Ordering costs can be 25-30% of the total inventory cost

Inventory costs

- Ordering costs include
  - Staff salaries of purchase department
  - Traveling & purchase follow-up expenses
  - Cost of bills of payment
  - Cost of inward inspection

- Inventory / carrying costs include
  - Expenses on warehouse personnel salaries
  - Cost of security for warehouses
  - Taxes & insurance
  - **Interest on the value of average inventory**
  - Cost of handling materials in stores
  - Obsolescence & pilferage
  - Cost of storage space for storing materials

Materials Management

- Material management begins with the determination of the quality and quantity of materials and ends with its issuance to production unit in time to meet customer demands on schedule and at the lowest cost.
- It generally includes determination and control of inventories, storage, shipping, material handling, traffic arrangement, inspection of materials.

Scope

- Determines quantity, kind and quality of raw materials.
- Arranging for purchase of raw materials and supplies through the purchasing department.
- Taking delivery of raw materials and supplies.
- Quality inspection.
- Arranging for storage of raw materials and supplies by the storage dept.
- Maintenance of the required level of stock of raw materials and supplies.
- Maintenance of store records.

Significance

- Adequate supply of raw materials will be ensured.
- Excessive investment in stock will be avoided.
- Effective utilization of materials and other facilities will be ensured.
- Productivity will improve as raw materials of right quantity are continuously made available.
- Inventory losses will be minimized.

Classification of Materials

- Raw Materials.
- Consumable Stores and Supplies.
- Fabricated Parts.
- Spares and Tools.
- Industrial Equipments.
- Office Stationery and supplies.
- Office Appliances.

Purchasing

- Purchasing maybe defined as that function of a business undertaking which is responsible for the procurement of materials, tools and implements, machinery and services required to produce certain goods and services.

Principles of Purchasing

- Right Quality.
- Right Quantity.
- Right Time.
- Right Source.
- Right Price.

Organization of Purchase Department

- ***Centralized Purchasing:*** when a separate department is set up for the performance of all purchase related activities in the organization.
- ***Decentralized Purchasing:*** the authority of purchase operations is delegated to various plants, divisions or departments.

Purchase Procedure

- Receiving purchase requisitions.
- Exploring the sources of supply and choosing the supplier.
- Placing of order.
- Follow up.
- Receipt of materials.
- Inspection of materials.
- Checking of invoices.

Inventory Control

- Inventory control is the process of deciding what and how much of various items are to be kept in stock.

Benefits

- No shortage of any item at any stage of production.
- It reduces the investment in inventories.
- Materials are made available at the most economic rates.
- Delays and interruptions in production does not occur.
- Forecast of exact and accurate delivery dates is possible and orders can be booked accordingly.
- Production schedule and delivery dates are maintained.
- The materials are protected from spoilage, deterioration and pilferage etc.

Fixation of Stock Level

The following levels and quantities are fixed for each class of item;

- The maximum level;
- The minimum level;
- The average level;
- The reorder level;
- The danger level.

Lead Time

Lead time means the time that lapses between the raising of the indent by the stores and the receipt of materials by them.

The level of inventory of an item will depend upon the length of lead time. The longer the time the higher will be the level of inventory holdings.

Lead Time

Lead time has two components:

- ***Administrative Lead Time*** is the time which it takes from initiating the procurement action until the placing of an order.
- ***Delivery Lead Time*** is the time it takes from placing the order until the delivery of the ordered material.

Safety-Stock

- It has been defined as the difference between the amount stocked to satisfy demand during a certain time interval and the average expected demand for the period.

Optimum Inventory

- The inventories must be kept at the optimum level because if the inventories are carried out at a higher level:
- It will involve cost of carrying.
- Ordering cost.
- Cost of the material.

Procurement/Ordering Costs

- **Def:** Expenses of processing an order, regardless of the order quantity.
  - Order processing
  - Shipping
  - Handling
- **Purchase cost:** the actual price of the items

Carrying/Holding Costs

- **Def:** Usually a percentage of the value of the item assessed for keeping an item in inventory; includes finance costs, insurance, security costs, taxes, warehouse overhead, and other related variable expenses)
- Capital (opportunity) costs
- Inventory risk costs
- Space costs
- Inventory service costs

Out-of-Stock/Backorder Costs

- **Def:** Costs associated with being out of stock when an item is demanded (including lost goodwill)
- Lost sales cost
- Back-order cost

Inventory Models: Deterministic Demand

- Economic Order Quantity (EOQ) Model

Economic Order Quantity (EOQ)

- The most basic of the deterministic inventory models is the economic order quantity (EOQ).
- The variable costs in this model are annual holding cost and annual ordering cost.
- EOQ minimizes the sum of holding and setup costs

Economic Order Quantity

- The Economic order quantity or the reorder quantity is the quantity of an item which is most economical to order when fresh supplies are required.
- At such level of reorder , the total of ordering cost and inventory carrying cost would be the minimun.

Economic Order Quantity

- Assumptions:
- The demand for the purchased or manufactured items is at a uniform rate.
- Carrying cost of inventory per unit per year is constant.
- Unit cost of the item is constant.

EOQ Assumptions

- Lead time or procurement is constant and the rate of delivery or rate of manufacturing can be predictable with fair degree of accuracy.
- Quantity discounts are ignored.
- Minimum inventory or safety stock is assumed to be zero.

Models for Inventory Management: EOQ

- EOQ minimizes the sum of holding and setup costs
- $Q = \sqrt{2DC_o / C_h}$

  D = annual demand

  C_o = ordering/setup costs

  C_h = cost of holding one unit of inventory

An Illustration

- $EOQ = \sqrt{2DC_o/C_h}$

  D = annual demand = 6,000

  C_o = ordering/setup costs = $60

  C_h = cost of holding one unit of inventory

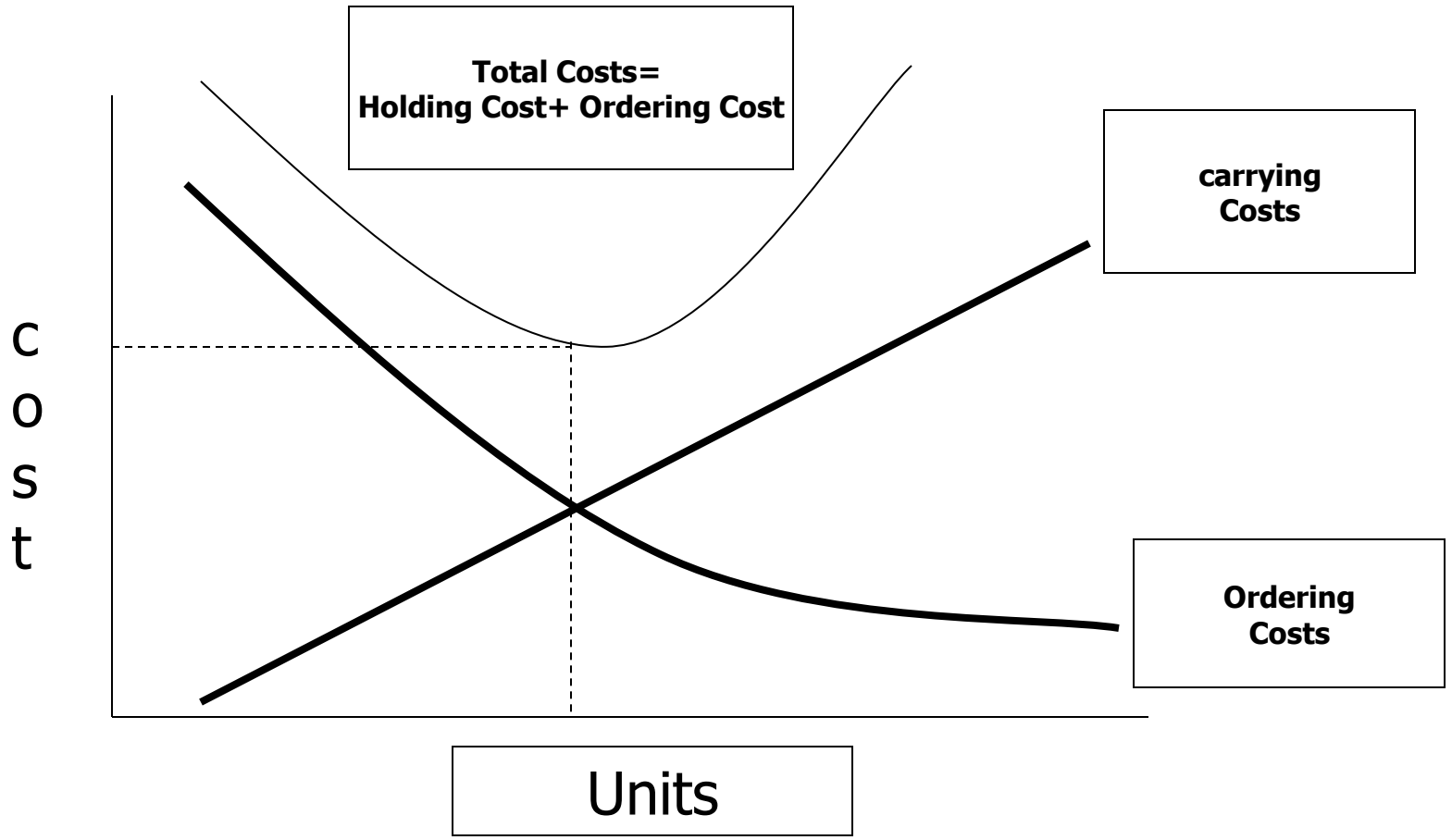
  $3.00 x 24% = .72

$$\sqrt{\frac{2 \times 6{,}000 \times 60}{.72}}$$

$$\sqrt{\frac{720{,}000}{.72}}$$

1,000

Marginal Analysis



Reorder Point

- Quantity to which inventory is allowed to drop before replenishment order is made

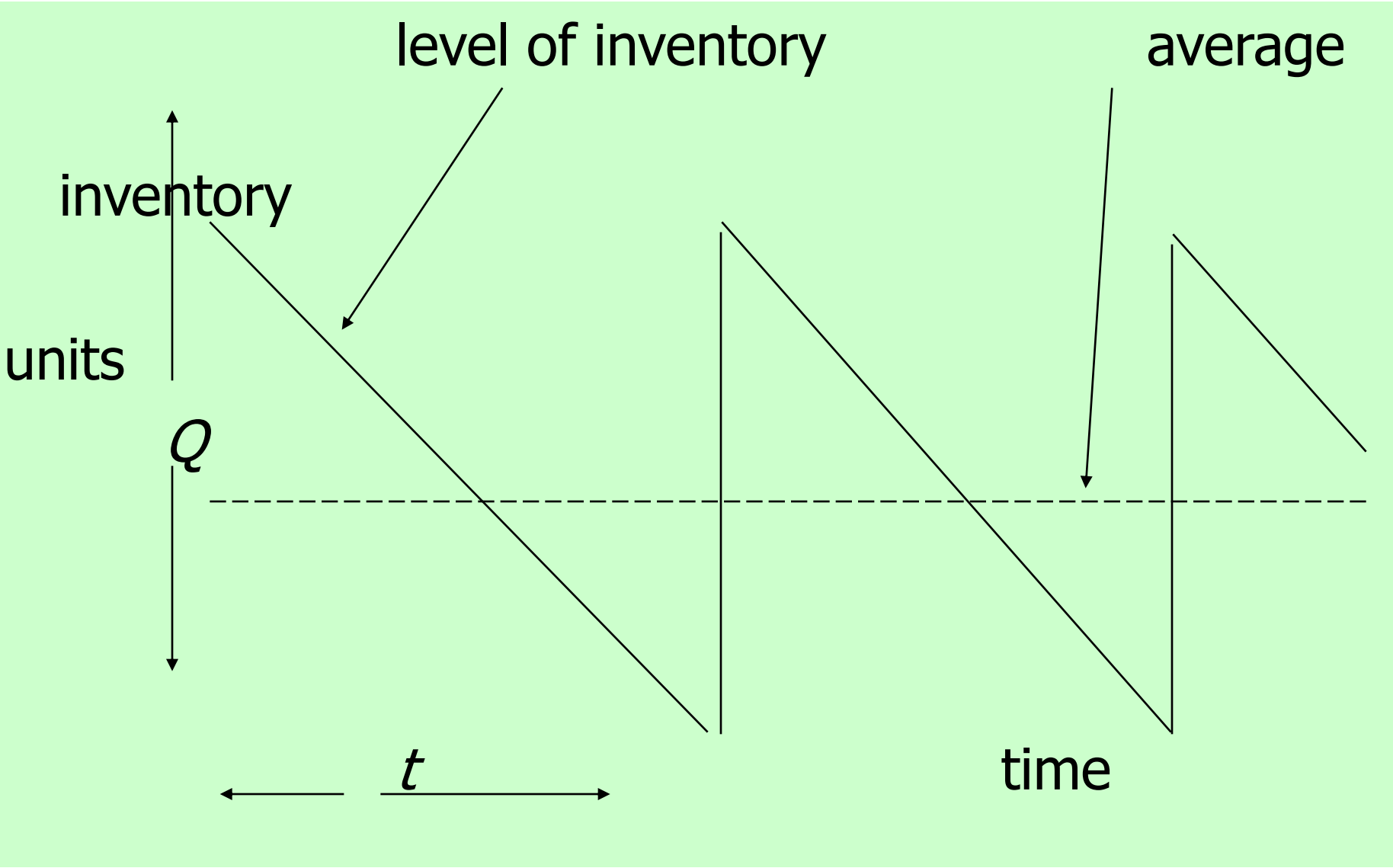
- Need to order EOQ at the Reorder Point:

ROP = D X LT

D = Demand rate per period

LT = lead time in periods

Sawtooth Model



Classifying Inventory Items

- **A Items:** very tight control, complete and accurate records, frequent review
- **B Items:** less tightly controlled, good records, regular review
- **C Items:** simplest controls possible, minimal records, large inventories, periodic review and reorder

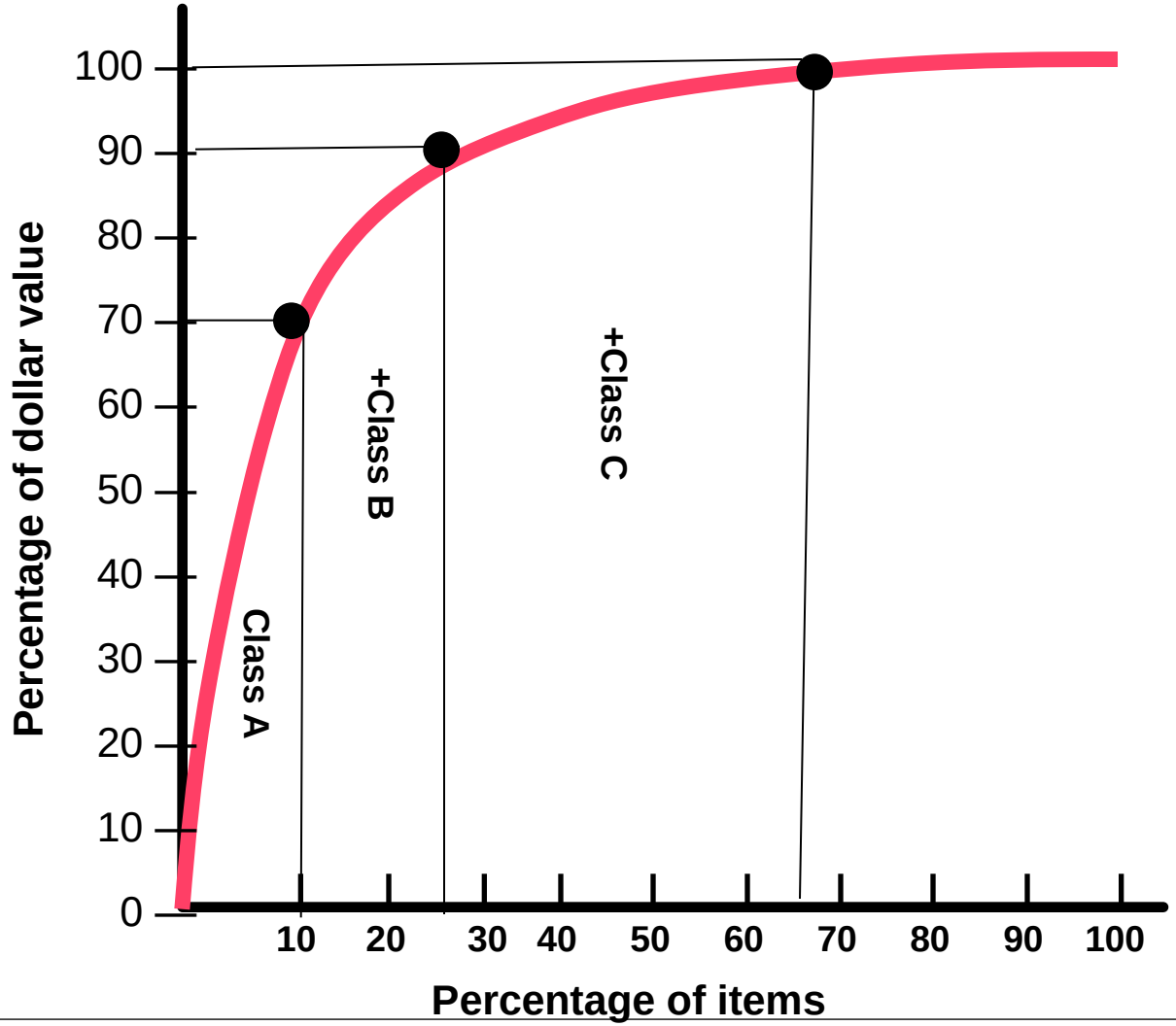
ABC Prioritization

- Based on "Pareto" concept (80/20 rule) and total usage in dollars of each item.
- Classification of items as A, B, or C often based on $ volume.
- Purpose: set priorities for management attention.

ABC Analysis Example(1/2)

Group	% of Items	% of Costs
A	10%	70%
B	25%	20%
C	65%	10%

ABC Analysis Example(2/2)



Thanks