DISTRIBUTION AND WAREHOUSE MANAGEMENT

Introduction to Inventory Management

- **Definition:** Inventory management refers to the process of overseeing and controlling the flow of goods into, within, and out of a warehouse or distribution center.
- **Importance:** Efficient inventory management ensures the right products are available at the right time, reduces excess inventory, and optimizes storage costs.
- **Key Goals:**
  - Maintain an optimal inventory level.
  - Minimize stockouts and excess inventory.
  - Improve cash flow and reduce costs.

ABC Analysis and Classification

Definition of ABC Analysis: A method of categorizing inventory items based on their importance to the business, usually using annual consumption values.

Categories:

- **A-items (High Priority):** 10-20% of items that contribute to 70-80% of total inventory value.
- **B-items (Medium Priority):** 20-30% of items that contribute to 10-20% of inventory value.
- **C-items (Low Priority):** 50-70% of items that contribute to 5-10% of inventory value.

Example:

A company sells 1,000 products. Out of these, 20 products account for 75% of the total sales value. These 20 products would be classified as A-items.

- Example Data:

Item	Annual Demand (Units)	Unit Cost ($)	Annual Consumption ($)
A	500	10	5,000
B	300	15	4,500
C	1000	2	2,000

- Classification:
  - A: Items with the highest consumption values (A-item could be product "A" here).
  - B: Medium consumption value.
  - C: Low consumption value.

- Explanation:
  - Based on annual consumption, items are categorized, helping businesses direct their resources where they are needed most. This classification helps to optimize purchasing, storage, and stock rotation efforts.

EOQ Example and Calculation

- **Scenario:** A retailer sells 12,000 units per year of a product, has an ordering cost of $75 per order, and a holding cost of $3 per unit per year.
- **EOQ Calculation:**

$$EOQ - \sqrt{\frac{2(12,000)(75)}{3}} - 600\,\text{units}$$

- **Implication:** Ordering 600 units at a time will minimize the total costs of ordering and holding inventory.

- **Explanation:**
  - The EOQ helps determine how much to order at a time to avoid both understocking and overstocking, optimizing inventory turnover and storage costs.

Reorder Point (ROP) Calculation

Definition: The Reorder Point is the inventory level at which a new order should be placed to replenish stock before it runs out.

ROP Formula: ROP=Lead Time Demand=D×LTROP = \text{Lead Time Demand} = D \times LTROP=Lead Time Demand=D×LT

Where:

D = Demand rate (units per period)

LT = Lead time (in periods)

Example:

If demand is 100 units per day, and lead time is 5 days, then the reorder point is:

ROP=100×5=500 unitsROP = 100 \times 5 = 500 \, \text{units}ROP=100×5=500units

Explanation:

The reorder point ensures businesses reorder stock before inventory runs out, taking into account the lead time for new stock to arrive.

ROP Example and Application

Scenario: A product has a daily demand of 120 units, and the lead time for delivery is 7 days.

ROP Calculation: ROP=120 units/day×7 days=840 unitsROP = 120 \, \text{units/day} \times 7 \, \text{days} = 840 \,

\text{units}ROP=120units/day×7days=840units

Implication: When inventory reaches 840 units, the business should place a new order to avoid stockouts.

Explanation:

ROP is a critical metric for inventory replenishment. It ensures there is enough time to receive new stock before the existing inventory runs out, preventing lost sales.

Safety Stock Management

- **Definition:** Safety stock is the extra inventory held to protect against uncertainties in demand or supply chain disruptions.
- **Safety Stock Formula:** Safety Stock=Z×σ×LT\text{Safety Stock} = Z \times \sigma \times \sqrt{LT}Safety Stock=Z×σ×LT

  Where:
  - Z = Z-score (service level factor, e.g., 1.96 for 95% service level)
  - σ = Standard deviation of demand
  - LT = Lead time
- **Example:**
  - For a product with a demand standard deviation of 50 units, lead time of 10 days, and a Z-score of 1.96:
- Safety Stock=1.96×50×10=310.88 units\text{Safety Stock} = 1.96 \times 50 \times \sqrt{10} = 310.88 \, \text{units}Safety Stock=1.96×50×10=310.88units

•**Explanation:**

- Safety stock acts as a buffer to prevent stock outs during unforeseen increases in demand or delays in supply, ensuring that customer orders are met.

Demand Forecasting in Inventory Management

Definition: Demand forecasting involves predicting future customer demand using historical data, trends, and statistical models.

Types of Forecasting Methods:

Qualitative Methods: Based on expert judgment (e.g., Delphi method).

Quantitative Methods: Based on historical data and mathematical models (e.g., moving averages, regression analysis).

Example:

A retailer uses historical sales data from the past 12 months to predict demand for the next 3 months using a moving average.

Questions and Answers

Group -discussion