7

INVENTORY MANAGEMENT TECHNIQUES

In the previous lesson, we learned the meaning of inventory and its management. Before we understand the inventory management techniques let's have a quick re-caption of our understanding. Right from raw materials to finished goods, all of which could be stored and is meant for sale is known as inventory. The objective of inventory management is to ensure a never out-of-stock or overstock situation. Out of stock often leads to failure of the business to meet customer demands, thereby losing potential sales opportunities. Too much stock on the other hand may lead to dead stock, which again results in a huge loss of investment. Both out of stock and overstock situations do not help firms achieve their profit-maximizing objective. We all know that every business strives to maximize its profits. Different methods are adopted to overcome the two profit disruptive situations. These methods are called inventory management techniques. Recognition of trends in customer behaviour and the cost of goods sold helps in identifying the right inventory management techniques. A technique is a way a thing is carried out. Hence inventory management technique refers to the method adopted in the process of effective inventory management.

Case Study

A&M has 3500 stores in 55 countries. It has a large supply network, warehousing, and logistics to handle. H&Ms operations are built around a team of 100 designers, who work closely with a baffling number of Companies on the production side and have no factories of their own. A&M cooperates with over 700 suppliers, 60 pattern makers, and 20 worldwide collection centers. Its inventory management strategy has played a key role in making this clothing retailer successful. A&M manufactures 80% of its retail inventory in advance and introduces the remaining 20% based on the present-day

market trend. It pairs with manufacturing units at affordable prices. A&M manages strong supplier relationships and reduces lead times. A&M has 30 International supply partners, and a central inventory management software system. Flexibility and short lead times, reduce the risk of buying the wrong items. Thus A&M stores are refilled quickly with the best-selling products at an economic price.

Inventory holding is associated with a number of costs including carrying and acquisition cost among others. Every business organization strives to strike a balance between the revenues earned and carrying and acquisition cost of inventory. These methods are discussed elaborately in the following sub-units of this lesson.

LEARNING OUTCOMES

After completing this lesson the Learner

- identifies the factors considered in fixing different levels of inventory;
- computes EOQ, Maximum level, minimum level, reorder level, and danger level;
- summarizes the significance of Economic Order Quantity;
- states the ABC technique of Inventory control.

7.1 ECONOMIC ORDER QUANTITY

An inventory manager is confronted with making decisions about

(a) How much of each item must be stocked?

(b) When an order should be placed and in what quantity?

The demand for the product may be certain or uncertain. If the demand is certain then the supply can be matched accordingly. On the other hand, if the demand is uncertain, the manager is left with two options.

1. They may place orders several times, which will consequently increase the order cost.
2. Theymay estimate the future demand and place few orders with large supplies resulting in large quantities of inventories and high inventory carrying costs.

We may observe that both the above situations are not desirable. Therefore, it is necessary to strike a balance between the two and order that quantity each time with optimum material quantities at a minimum cost.

The inventory manager identifies the right quantity of materials to be ordered such that the total cost remains at minimum level. This order quantity is known as Economic Order Quantity. Economic Order Quantity, also known as Economic Purchase Quantity or Re-order Quantity, is the order quantity that minimizes the total holding and ordering costs in inventory management. It represents the ideal order size to minimize costs for the business. It is a useful formula for all sizes and types that order and hold inventory.

EOQ is an extremely effective tool for managers because they can use it to figure out the optimal amount of inventory to hold on hand and calculate when to order more merchandise. After all, new sales should be generated.

The EOQ formula is calculated by using the demand rate, setup cost, production costs, and interest rate:

$$EOQ = \frac{\sqrt{2AO}}{C}$$

A = Annual consumption of materials in units

O = Ordering cost

C = Annual inventory Carrying cost per unit per year.

It is necessary to understand the two terms, ordering cost and carrying cost.

(a) **Ordering cost**: refers to all buying costs associated with the purchasing of material. Usual costs that are included here are:

1. Purchase order is processed with the help of staff services and then the order is placed with the suppliers. The cost of staff used forms a part of the ordering cost.
2. Transport cost incurred in bringing the materials from the place of the supplier to the organization.
3. Inspection cost of the material received.
4. Expenses incurred for stationery, typing, postage, telephone charges, etc.

(b) **Carrying cost**: The expense incurred to hold the inventories is known as carrying cost. Usual costs include:

1. The interest paid for capital invested in inventories.
2. The cost of inventory storage, like rent for warehouse, pests, and preservatives cost, etc.

3. Loss on account of obsolescence, damages, deterioration due to passage of time.

4. **Insurance cost.** Ordering and carrying costs are inversely related. Ordering cost increases with the increase in the number of orders placed while the carrying cost per unit reduces as the number of materials purchased increases.

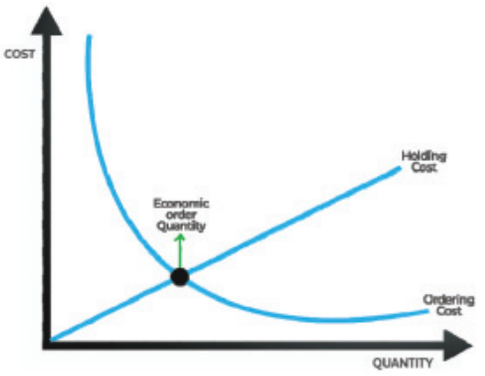

Fig. 7.1: EOQ graphical representation

Assumptions of EOQ

1. There is no shortage of goods. They can be purchased whenever necessary.
2. A definite quantity of materials will be purchased by the organization.
3. There is no change in the price of materials.

Illustration 1:

From the following information, find out the economic order quantity.

Annual usage 15,000 units

Cost of order Rs. 15 per order

Cost of materials Rs. 20 per unit.

The annual carrying cost per unit is 10% of the inventory value.

Solution:

Formula: $EOQ = \frac{\sqrt{2AO}}{C}$

A = Annual consumption of materials in units = 15,000 units

O = Ordering cost per order= Rs. 15/-

C = Annual inventory Carrying cost per unit per year = Rs. 2/-

Thus, $$EOQ = \frac{\sqrt{2 \times 15,000 \times 10}}{2}$$

$$= \sqrt{2,25000}$$

$$= 474 \text{ units}$$

Economic order quantity is a key factor for an organization's sustainability because ordering heavily can lead to high holding costs and take resources away which may be otherwise available for other business activities, like marketing or research and development, that could further boost sales or reduce costs. EOQ may not be extremely helpful when managing the office supply closet. It is important when the organization is looking at large, high volume, or expensive purchases. As orders and inventory grow and scale, EOQ has a greater impact on profits.

The benefits of using EOQ

- **Better Order Fulfilment:** EOQ ensures timely availability of products on hand, at minimum cost for operational activities that lead to increased sales.
- **Accurate Forecasting:** An accurate forecast of stocks of material avoids all disadvantages associated with over-ordering and making unnecessary investments of cash in stocks.
- **Reduces loss on Obsolescence:** Optimum order quantities avoid overstocking of material. Most significantly for perishable goods, fashion commodities, apparels, electronics goods where innovations are a regular phenomenon, it helps in reducing dead stock.
- **Reduces Storage Costs:** EOQ is the optimum stocks that are to be ordered and their storage requires less place and maintenance cost when they are stored in the stores. This can lower real estate, utility, security, insurance, and other related costs.
- **Gain Quantity Discounts:** EOQ help in determining the right quantity of material orders to be placed at the right time. Thus, the business enterprise can gain advantages from placing a bulk order or quantity discounts offered by vendors.

Notes

With all the advantages, computation of the order is not always an easy task. Lack of accurate data, incomplete data, business life cycle, shortage of inventory, and seasonality of availability of inventory pose challenges to adopting EOQ.

INTEXT QUESTIONS 7.1

I. Fill in the blanks

1. Both ..... and ..... do not help in profit maximization.
2. ..... techniques refer to the method adopted in the process of effective Inventory management.

II. Multiple Choice Questions.

1. EOQ refers to [ ]
   (a) Economic Order Quantity.
   (b) Equal Order Quantity.
   (c) Equity on Quality.
   (d) Electronic on Quantity.
2. Determinants of EOQ are [ ]
   (a) Annual Consumption rate.
   (b) Ordering Cost.
   (c) Annual Inventory Carrying Cost.
   (d) All of the above.
3. EOQ does not make this assumption [ ]
   (a) No shortage of goods.
   (b) Quantity purchased is definite.
   (c) No change in material price.
   (d) Sales of are constant.

7.2 SETTING LEVELS

Inventory control emphasizes setting different levels of stocks. These levels alarm the inventory manager for the initiation of necessary actions to avoid understocking or overstocking of materials. Inventory control involves both quantity control and value control. Production executives and storekeepers are more interested in quantity control because it is their responsibility to see that there should be no

stock-out problem or overstocking of materials. Similarly, the finance executive is responsible for efficient and effective utilization of money spent on materials.

Case Study

Zara Inventory Management Strategy

Jara is a large retail chain store. It has 6900 plus stores in 86 countries and 450 million items are sold in a year. Over the past five years has opened about 400 stores annually and included 8 brands. Jara is a renowned brand for its ability to deliver new clothes to its stores in small batches and at minimum time. The store's Manager orders clothes twice a week, and the new garments arrive on schedule. Jara keeps most of its production in-house. The supply chain is its competitive advantage. Jara designs, manufactures and distributes clothes within two weeks of its original design first appearing on catwalks.

6 months in advance, commits to only 15 to 25% of a seasons line. By the start of the season, 50% of its clothes are designed and manufactured rights during the season. If a particular style becomes highly popular all of a sudden, Jara reacts instantly by creating a new design style and getting them into the stores while the trend is still peaking.

Inventory management software let the store manager communicate with customers feedback on what they are looking for, and what they like and dislike. Zara's designers keep sketching based on the feedback data. This strategy allows, Jara, to sell more items at full price, fewer markdowns, and less inventory piling up in any part of the supply chain from raw materials to finished products. Optimization models are used, to determine the quantity to be delivered to a single retail store twice a week. The stock delivered is strictly limited, ensuring that each store receives just what it needs. Thus, the brand image looks exclusive, and building up unpopular stock is avoided. The batches delivered are small, so if a design does not sell well, it will cause little harm to inventory. However, when the demand is on the rise, the company can address it quickly as its factory usually operates only 4.5 on full capacity, leaving flexibility for extra shifts. The core of Jara's success is centralized enterprise resource planning. Inventory, products, and logistics are managed in central cloud-based software. The merchandise is already priced and labeled, ready for sales and the operations are monitored in real-time and change accordingly. At Jara, change does not disrupt the system, and it is part of the system.

7.3 FACTORS DETERMINING THE DIFFERENT LEVELS OF INVENTORY

1. The factors that are considered to determine the different levels of inventory of raw materials in a manufacturing organization are:

    1. Average rate of raw material consumption.

Notes

2. Lead time
3. Re-order level.
4. Available storage place.
5. Cost of storage.
6. Insurance
7. Security
8. Risk of obsolescence, damages, evaporation, depletion, etc.
9. Cost of no stocks.
10. Inventory carrying cost.
11. Ordering cost.
12 Maximum requirement of materials for production at any time.
13. Economic ordering quantity.

2. Setting levels encompass setting Maximum Level, Minimum Level, Average Stock Level, Reorder Level, and Danger Level for each category of material.

- **Maximum level**

  This is the maximum level of stock that the materials should be stored, any quantities beyond this level indicate overstocking. The factors influencing the determination of this level are the nature of the product, the size of the warehouse, consumers' preferences, etc.

  Maximum Stock Level = Reorder Level + Reorder Quantity – (Minimum Consumption × Minimum Reordering Period)

  (or)

  = Reorder level + reorder Quantity – minimum usage

- **Minimum level**

  The minimum level is fixed at that quantity of materials that can easily meet the market demand. Lead time is the time taken for the materials to reach the warehouse from the place of the supplier, which determines this level. The consumption rate and the rate at which goods are sold influence the minimum stock level.

Minimum Stock Level = Reorder Level – (Normal Consumption × Reordering Period)

(or)

Minimum Stock Level = Reorder Level – (Average Consumption × Average Re-order period or Average Lead time)

- **Average stock level**

  This level determines the average monthly inventory required by the firm. The sum of inventory levels at the month's beginning and end of the month is divided by 2.

  Average stock level = (Inventory at month beginning + Inventory at month ending)/2

  (or)

  Average stock level = Minimum Stock level + ½ Re-order Quantity

  (or)

  Average stock level = Maximum Stock level + Minimum Stock level/2

- **Reorder level**

  This level is set to alarm the manager to take initiation to place an order and refill the stock of materials. As and when the stocks reach the reorder level, a request for material is placed with the vendor so that the stocks are above the minimum stock level.

  Reorder Level = Daily Consumption × Lead Time

  (or)

  Re-order level = Maximum Re-order Period × Maximum usage

  (or)

  Re-order level = Average usage × (Minimum Stock level in weeks + Average Lead Time)

- **Danger level**

  The danger level is set in a manner to indicate that the stocks are reaching out of stock position that is insufficient stock supply for production activity to be performed. Therefore necessary steps are initiated immediately to replenish materials to avoid dangerous levels.

  Danger Level = Average Consumption × Maximum reorder period for emergency purchases.

Notes

Illustration 2:

From the following information calculate:

(a) Re-order level

(b) Minimum Level

(c) Maximum level

(d) Average stock level

Normal usage : 50 units per week each

Minimum usage : 25 units per week each

Maximum usage : 75 units per week each

Re-order Quantity : 300 units

Re-order Period : 4 to 6 weeks

Solution:

(a) Re-order level = Maximum Re-order period × Maximum usage

= 6 × 75 units = 450 units

(b) Minimum Level = Re-order Level – (Normal Consumption × Normal re-order period)

= 450 units – (50 units × 5) = 200 units

(c) Maximum Level = Re-order level + Re-order Quantity – (Minimum consumption × Minimum Re-order Period)

= 450 units + 300 units – (25 × 4) = 650 units.

(d) Average Stock Level = Minimum stock level + ½ Re-order Quantity

= 200 units + ½ (300 units) = 350 units

INTEXT QUESTIONS 7.2

1. List any five factors that influence the level of materials.

.....

.....

.....

7.4 ABC ANALYSIS

ABC Analysis - "Always Better Control" is an integral part of material management and is also referred to as ABC Classification**.** ABC is a vital part of Inventory Management. It allows business owners to distinguish the products in their stock and manage them based on their worth. The main objective of ABC analysis is to make maximum out of minimum investment without wasting any resources or inventory. It is popularly known as "Control by Importance and Exception."

It is an inventory categorization method, which classifies the inventory primarily into three distinct categories based on revenue generation. ABC inventory helps business entrepreneurs and stock owners identify the essential products in the stock and prioritize their management based on the value. The inventory analysis is based on the Pareto Principle.

The Pareto Principle is a popular economic theory discovered by renowned Italian economist Vilfredo Pareto. Pareto believed that optimum economic growth occurs only due to a small part of the economy. It means that the relation between the input and output is always unequal.

Pareto Principle states that 80% of the sales volume is generated from the top 20% of items. It says that there are significant few and insignificant many in any group. It is also known as the 80/20 rule.

Category of ABC Analysis

The market value of goods is different and, on this basis, the goods are categorized into A, B & C.

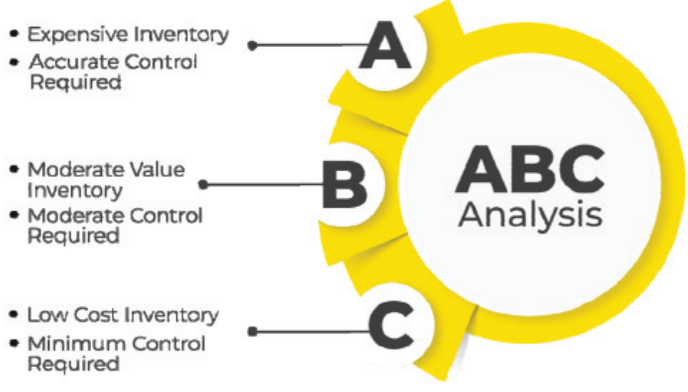

Fig. 7.2: ABC Analysis

- **A:** This is the inventory with the highest annual consumption value. It should be highly prioritized, in case of any stockout. The physical units are less but their value is high.

Notes

Features of A: category inventory Items:

1. A category items are frequently ordered.
2. Very strict control is exercised over these items.
3. Efforts are made to reduce the lead time.
4. Top-level management takes care of these items.
5. Every 15 days or every month the stocks in this category are reviewed, to identify waste, obsolete, and class items.
6. Many alternative sources of supply are identified.
7. Very low safety stock is maintained.
8. Centralized purchasing is made for these items.
9. Intense analysis is made for this item.
10. These items are very closely followed by management.

- **B**: The sale of this Inventory is regular but not as many as A items. The holding cost of inventory is more than those in the A category. The physical units and value of this inventory are almost the same.

Features of B-category inventory Items

1. B category items are ordered once in three months.
2. Moderate control is exercised over these items.
3. Moderate efforts are made to reduce the lead time.
4. Middle-level management takes care of these items.
5. Every 3 months the stocks in this category are reviewed, to identify waste, obsolete, and class items.
6. Three or more alternative sources of supply are identified.
7. Low safety stock is maintained.
8. Centralized purchasing is made for these items.
9. Moderate analysis is made for this item.
10. Periodic follow-up is made by management.

- **C**: The sale of this inventory is low and their value is less. The physical inventory makes up the bulk of the inventory cost.

Features of C-category Items:

1. C category items are ordered once in six months.

2. Loose control is exercised over these items.
3. Minimum efforts are made to reduce the lead time.
4. Lower-level management takes care of these items.
5. Every 6 months the stocks in this category are reviewed, to identify waste, obsolete, and class items.
6. Three reliable sources of supply are identified.
7. High safety stock is maintained.
8. Centralized purchasing is made for these items.
9. Minimum value analysis is made for this item.
10. Follow-up is made only in exceptional cases by the management.

This concept is explained with the help of a pyramid.

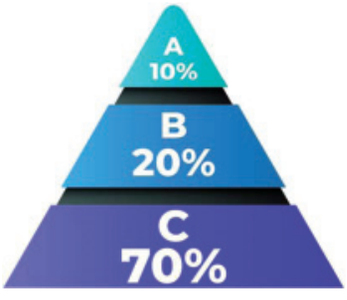

Fig. 7.3: This pyramid represents the percentage the Average of physical units

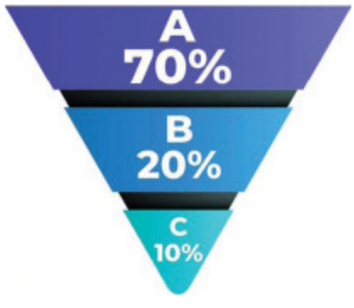

Fig. 7.4: This pyramid represents the Inventory Value

Calculate ABC Analysis

A stock manager can perform ABC calculations on individual product groups or a wide range of inventory. An ABC Calculation is usually carried out within five steps, which are as follows:

1. First, multiply the annual number of products by each item's cost and find the utility of that product.
2. Make every product category in descending order based on its usage value.
3. Add the usage value of the products, including the total number of items.

Notes

4. Find the cumulative percentages of items sold and annual consumption value.

5. Now, divide the data into three categories, finally, in an approximate ratio of 80:15:5.

Advantages of ABC Analysis

1. **Strict control**: Control on materials with high value is exercised. Management pays more attention to significant goods rather than to less significant materials.

2. **Minimum inventory investment**: It helps in reducing investment in inventory to the minimum possible extent. ABC analysis allows management to exercise close control on A-category items and less control on C category materials.

3. **Minimises storage cost**: Only those items whose annual consumption is high are planned for storage. Their comparative number is less, thus bringing down inventory storage costs.

4. **Saves time**: Value and quantity based categorization of material helps management to focus their attention on highly valued material and thus, save time.

INTEXT QUESTIONS 7.3

1. Explain the ABC percentage classification with the help of a pyramid diagram.

.....

.....

.....

7.5 JUST IN TIME

Just-in-time, or JIT, is an inventory management method in which goods are received from suppliers only when they are needed. This method aims to reduce inventory holding costs and increase inventory turnover. In this method, measures to improve vendor management and forecasting are made to assess the need to hold any safety stock or not. This is a pull system, which is responsive to demand.

1 Origin of JIT

The JIT management technique originated in Japan and is often attributed to Toyota. Japan's shipyards were the first to develop and adopt this approach successfully. JIT originated from a three-fold crisis that sprout from Japan's post-war situation - lack of cash, lack of space for big factories and inventory, and lack of natural resources. By 1980, developing countries began implementing JIT which was adopted in Japan successfully.

Just in time requires careful planning of the entire supply chain and using superior software to carry out the entire process till delivery, increases efficiency and eliminates the scope for error as each process is closely supervised.

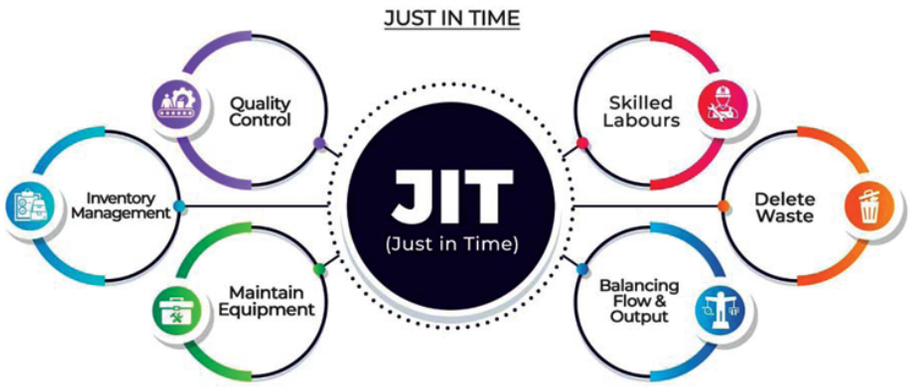

Fig. 7.5: Just in Time

2. Features of JIT

1. JIT does not stock inventories.
2. It operates as a pull system, where production activities are made on demand for the products.
3. Minimizes set-up time and lead time.
4. Serving the customers' needs in time is prioritized.
5. Every receipt of inventories from suppliers is well planned and controlled.
6. Kanban system is used to control the flow of materials. The concept of Kanban is borrowed from the Japanese word for 'card' used to ensure timely delivery of materials from the suppliers.
7. It avoids defective material.

Notes

3. Requisite conditions for JIT

1. The demand for the products must be stable.
2. Sources of supply must be reliable.
3. Supplies of inventory should be free from defects.
4. The management should adopt Total Quality Management processes.
5. An effective Management Information system MIS must be in vogue.
6. Set-up time and delivery time must be minimized to the possible extent.
7. Production processes must be simple.
8. Tools, Plant, and Machinery must be effectively maintained.

4. Advantages of JIT

1. Minimizes investment in inventories.
2. Helps in reducing carrying costs.
3. Establishes relationships with a limited number of reliable suppliers.
4. Negotiation time with suppliers and paperwork is reduced.
5. Inspection cost of incoming materials is reduced.
6. Ensures quick and frequent delivery of quality materials in small quantities.
7. Suitable for perishable goods.

INTEXT QUESTIONS 7.4

1. Will you suggest JIT method to your mother for her daily cooking requirements. Justify.

   .....

   .....

   .....

7.6 BATCH TRACKING

Batch Tracking is a system used to trace products. It is also known as lot tracking. Each batch is assigned a number called batch number. Batches comprise identical products. Identity may be with respect to parts or ingredients, association with a group of products in the entire distribution chain, manufacturer or supplier,

fulfilment scenter, or customers. Goods from raw material to finished goods are grouped and monitored right from the place where the products were dispatched to their destination, the quantity of inventory shipped, and their expiry date if any. It helps in strategic decision-making.

1. Application of Batch Tracking

Batch tracking applies to all types of products. It is more recommendable for identical products as they can be stored together and do not require separate storage space. Products requiring batch tracking are

- Foods and beverages (F&B).
- Cosmetics.
- Vitamins and Supplements.
- Medical Supplies.
- Household cleaners.
- Certain electronic devices.

2. Importance of Batch tracking

- Traces expiry date: Batch tracking traces the expiry date of the products and arranges for their shipment. Those products whose expiry date is nearer or shorter are forwards at the first instance.
- Increases efficiency: Tracking the products helps in giving the present status of the transaction and the location of the product in transit. This saves unnecessary wandering and tensions. With batch tracking, specific materials can be identified easily and gain greater control over the entire process.
- Minimizes wastage: Batch tracking helps in organizing required inventory. Thus, minimizes losses arising from wastages and damages.
- Enhances quality control: Traceability helps in identifying quality issues based on the source of the issue. Backtracking helps in identifying the manufacturer of the damaged inventory, batches with similar quality issues, or the specific mode of transportation where damages occur. Problems are identified at their source and are resolved before they reach the customer.
- Promotes health and safety: Rotten, damaged, and expired products are restricted from entering the customers' market. Customers are offered only fresh products. The risk of expired products reaching consumers is reduced to zero. Thus, batch tracking helps in promoting the health and safety of the consumers.

- Compliance with regulatory norms: Backtracking helps in rules and norms compliance of the regulatory bodies. For example, industries like Food and beverages, and pharmaceuticals, have stringent guidelines for the production, distribution, storage, sales, and supply to be followed.
- Avoid common human errors: Manual inventory tracking is eliminated in batch tracking. Thus, common picking mistakes are avoided. For example, shipping incorrect products to consumers can be avoided. Batch tracking helps in dispatching customers' orders accurately.
- Manages warranties efficiently: Most of the commodities necessitate manufacturers' warranty. Warranty management includes updation and availability for ready reference. Batch tracking helps to keep track of warranties according to time frame, serial numbers, manufacturing dates, and the condition of the commodities.
- Analyse rate of return for batches: Batch tracking helps in providing real-time and accurate data. It helps in identifying which batch of inventory is paying more returns and meeting customers' needs. Batch-specific reports can be prepared. It also helps in the conduct of inventory audits and warehouse audits.
- Demonstrate to customers the difference between products: Batches are created by grouping identical products and are labeled, with the date of manufacture, Serial number in the batch, ingredients, etc. It helps in demonstrating the unique characteristics of the product to the customers.
- Make more accurate reports on revenue, and profit margin reports, and prepare a Simple Moving Average (SMA).

Fig. 7.6: Batch Costing

3. Batch Tracking practices

- Smart inventory management is crucial for a product-oriented business. Inventory batches allow setting up specific strategies, such as LIFO, FIFO, and FEFO. These strategies FIFO, LIFO, and FEFO are common inventory methods and have reflective effects on logistics and profitability.

  FIFO: A "First in First Out" strategy implies that products that came in first will move out first. FIFO is widely used by companies that sell fast-moving products.

  LIFO: "Last in First Out" means that products that came in the last move out first. LIFO is widely used for products that do not have a shelf life.

  FEFO: The "First Expired First Out" method is used for products with an expiry date. The product with the closest expiry date is sent out first.

- Barcode Scanning System: every batch is provided with a barcode using an inventory scanner system. This method reduces manual work and promotes optimum utilization of time. It also reduces human error and saves laborcosts.

- Distribution network leverage: Backtracking helps in splitting inventory across multiple fulfilment centers and fulfilling the orders fast. Food and beverage like juices, milk, and muffins which expire fast, time is crucial.

INTEXT QUESTIONS 7.5

Match the following columns

	A	B	
1.	Batch Tracking	(a) Re-order level	[ ]
2.	EOQ	(b) Control by Importance and Exception	[ ]
3.	ABC	(c) Lot Tracking	[ ]
4.	Pareto Principle	(d) Toyato	[ ]
5.	JIT	(e) 80/20 rule	[ ]

7.7 PERPETUAL INVENTORY MANAGEMENT

The process of recording the movement of stocks- receipt and sale, on a real-time basis is known as perpetual inventory management. The Chartered Institute of Management Accountants London, define the perpetual inventory system as," a system of records maintained by the controlling department, which reflects the

physical movement of stocks and their current balances". The physical movement of the stocks on the receipt and issue of materials to the departments are recorded in the Bin cards and stores ledgers. Material balances are ascertained after every receipt and issue of material through stock records. Inventory changes are provided in detail and current balances of inventory are maintained in the stores' records. Regular check is facilitated and the stock verification process is simplified without stopping work for the physical verification of stocks. Perpetual Inventory System is extensively used in warehouses and retail industries. Overstatement (also known as phantom inventory) and understatement of inventories are controlled by adopting this system. A Perpetual Inventory Management system is suggested for use in companies that use material requirement planning (MRP) for production. The company need not make any additional effort to keep track of its inventory details. Every time a purchase is made, it is debited to the inventory database. Closing inventory is computed using the formula

Closing Inventory = Opening Inventory + Purchases (Receipts) – Shipments (issues)

The Perpetual Inventory Management system is a robust inventory control mechanism. The bin card and stores record information verified by a system of continuous stocktaking (Physical perpetual inventory). There is every chance for a mismatch of stock levels that is on records and actual stocks in the stores. This may arise due to human error or fraud or the very nature of the materials. All discrepancies are addressed through stores accounts and control strategies are executed for all applicable causes.

1. Process of Perpetual Inventory Management System

Fig. 7.7: Perpetual Inventory System Process

- Stock records are maintained and posting is made after every receipt and issue so that the current balance is known.

- All sections of the stores are physically verified on a rotation basis every day so that all items of stock are verified.
- Stores received but inspection pending, are not mixed with stores during the physical verification process.
- The physically verified stocks are recorded in the bin cards also known as inventory tags or stock verification sheets.

2. Advantages of Perpetual Inventory System

- It avoids physical verification of all items in the stores at the end of the year, thereby avoiding production disruption.
- It provides up-to-date inventory information.
- It helps in accurate inventory reporting without any delay.
- It reduces manual counting and verification.
- It ensures a detailed and reliable check on the stores.
- It easily locates errors and frauds.

3. Disadvantages of Perpetual Inventory System

- Setup cost of Perpetual Inventory System is high.
- It requires software and training for employees to use this system.
- It is not error-free and takes time to fix the error.
- It requires consistent record keeping and monitoring.
- Continuous Inventory check is required to ensure the accuracy of records and physical units.

INTEXT QUESTIONS 7.6

1. Perpetual Inventory system is the best suitable method for Reliance mart. Comment.

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7.8 DROPSHIPPING

Dropshipping is a supply chain management method of doing business. Here, the vendor facilitates customers and suppliers like a middleman. They does not hold stocks of materials that they intends to sell. The vendor rather sends the customers' purchase order directly to the supplier of the order. The supplier sends the order to the customer. Dropshipping is the wise choice of most budding businesses. Amazon too used dropshipping model during its initial years.

Fig. 7.8: Dropshipping Model

Advantages

- **No Carrying Cost: There** is no stocking of goods and so no carrying cost in this inventory method. It saves businesses time and money which allows business to focus on scaling up their operations, attracting new customers, and retaining existing customers.
- **No Setup Cost: The** setup costs of a dropshipping business are extremely low. No investment is required for inventory, and there aren't any costs associated with warehousing.
- **Low Risk: Dropshipping** method does not require any investment in stocks. Thus capital locked in stores is avoided and consequently risk is reduced.
- **No stocking: As** vendor does the stocking, there is no need for actual storage space.
- **Maximum Customer satisfaction:** Customers' orders are directed to suppliers to fulfilling the needs of the customers. Supply of goods at right time and good quality ensure maximum satisfaction for customers.
- **Effective internal operations:** Dropshipping provides ample scope for management to focus on internal operations effectiveness.

Disadvantages

- No access to wholesale pricing.
- Drop shipping distributors include their cost in determining the price of the product under dropshipping.
- Suppliers are directly connected to customers and the role of the vendor is reduced to middlemen. If things do not work appropriately, the reputation of the business will be ruined.
- A business in drop shipping has little control of the customer's experience.
- Vendor does not have any control over the time of delivery of products to customers and the amount they pay.

WHAT YOU HAVE LEARNT

- The inventory management technique refers to the method adopted in the process of effective inventory management.
- EOQ - Economic Order Quantity, also known as Economic Purchase Quantity or Re-order quantity, is the order quantity that minimizes the total holding costs and ordering costs in inventory management. It represents the ideal order size to minimize costs for the business.

$$EOQ = \frac{\sqrt{2AO}}{C}$$

A = Annual consumption of materials in units

O = Ordering cost

C = Annual inventory Carrying cost per unit per year.

- Ordering cost increases with the increase in the number of orders placed while the carrying cost per unit reduces as the number of materials purchased increases.
- Setting levels encompass setting Maximum Level, Minimum Level, Average Stock Level, Reorder Level, and Danger Level for each category of material.
- ABC Analysis - "Always Better Control" is an integral part of material management. The main objective of ABC analysis is to make maximum

out of minimum investment without wasting any resources or inventory. ABC inventory helps business entrepreneurs and stock owners identify the essential products in the stock and prioritize their management based on the value.

- Just-in-time, or JIT, is an inventory management method in which goods are received from suppliers only when they are needed. This method aims to reduce inventory holding costs and increase inventory turnover. This is a pull system, which is responsive to demand.
- Batch Tracking is a system used to trace products. It is also known as lot tracking. Each batch is assigned a number called batch number. Batches comprise identical products. Goods from raw material to finished goods are grouped and monitored right from the place where the products were dispatched to their destination, the quantity of inventory shipped, and their expiry date if any.
- The process of recording the movement of stocks- receipt and sale, on a real-time basis is known as perpetual inventory management. The physical movement of the stocks on the receipt and issue of materials to the departments are recorded in the Bin cards and stores ledgers. Material balances are ascertained after every receipt and issue of material through stock records.
- Dropshipping is a supply chain management method of doing business. Here, the vendor facilitates customers and suppliers like a middleman. They Don't hold stocks of materials that they intend to sell. The vendor rather sends the customers' purchase order directly to the supplier of the order.

TERMINAL EXERCISE

1. What is overstocking of material?
2. What do you mean by Inventory Management Technique?
3. Ordering Cost
4. Carrying cost
5. JIT
6. Explain Economic Order Quantity.

7. What are factors to be considered while setting levels of material?
8. What are the advantages of ABC analysis?
9. Mention the products for which Batch tracking is applicable.
10. What are the advantages of JIT?
11. Calculate EOQ
    (a) Q = 600 units
    (b) Ordering Cost Rs. 12 per unit.
    (c) Carrying /cost Rs. 20.
    (d) Price per unit Rs. 20 **(Ans: 60 units)**
12. From the following information calculate (1) Re-order Level. (2) Maximum Stock Level. (3) Minimum Stock Level:

Re-order quantity	4000 units
Minimum stock level to allow for emergencies	5 weeks
Average delivery time from suppliers	4 weeks
Maximum stock level allowed by management	20 weeks
Average rate of consumption per week	250 units
Minimum consumption in 4 weeks	800 units

(Ans: 1. 2,250 units, 2. 5,450 units, 3. 1,250 units)

13. Discuss the advantages and disadvantages of the Perpetual Inventory System.
14. What do you mean by Dropshipping? Explain.
15. Explain the factors determining the different levels of Inventory.

ANSWER TO INTEXT QUESTIONS

7.1

I. 1. Out of Stock and Overstocking.
   2. Inventory management

II. 1. (a) 2. (d) 3. (d)

7.2

Any five factors.

7.5

1. (c) 2. (a) 3. (b)
4. (e) 5. (d)

GLOSSARY

- **ABC analysis**: A method of categorizing stocks of items on the basis of cost and demand for them in quantities.
- **Under stocking**: Stocks of materials that fall short of the actual demand for them by the customers. It is the inability to meet the demand.This leads to losing demand to competitors.
- **Overstocking**: Stocks of materials in excess of the actual demand for them by the customers. This results in holding unsaleable stocks.
- **Lead time**: It is the time period between the initiation of an order to the receipt of the order. It is expressed in weeks and considered while fixing the reorder levels.
- **FEFO**: First Expiry First Out. Helps retailers to manage products that have a limited shelf life.
- **Re-Order point**: It refers to the minimum stock quantity when an order has to be placed.
- **EOQ**: Economic Order Quantity. It refers to than quantity of materials for which the order is most economical. The Purchases manager places an order for this quantity of materials to reap maximum advantage on buying.

  Formula EOQ = $\frac{\sqrt{2AO}}{C}$
- **Order Cost**: It refers to the buying cost associated with the purchase of material. It includes buying staff remuneration, Transport costs, inspection cost, etc.
- **Carrying cost**: It refers to the holding cost of materials in the warehouse. It includes interest payable on the amounts invested in materials, storage costs, loss on account obsolescence, damages, insurance, etc.

Suggested Reading

1. Inventory Best Practices by Steven M. Bragg, Publisher Willey; April 5, 2011

2. Inventory Management Explained: A focus on Forecasting, Lot Sizing, Safety Stock, and Ordering Systems by David J. Piasecki, Ops Publishing, March 1, 2009

3. Warehouse Management: A Complete Guide to Improving Efficiency and Minimizing Costs in the Modern Warehouse (2nd Edition) by Gwynne Richards, Publisher: Kogan Page; Second edition (June 28, 2014)

ACTIVITY

A hot chips manufacturer wants you to help him determine how much of potatoes they should have at any time so that they can meet the customer's demand efficiently. List the criteria you will consider to help him.

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