
UNIT 5 INVENTORY MANAGEMENT AND ORDER HANDLING

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5.0 OBJECTIVES

After studying this unit, you should be able to:

- state the purpose for which inventories are held
- describe the factors that influence the various levels of inventory for raw materials and finished goods
- explain the concept and objectives of inventory control
- explain the concepts of reorder level and reorder quantity
- explain the concept of selective inventory control and technique of ABC classification used for the purpose
- describe the new trends in inventory management
- explain the nature of order processing and the sub-activities involved therein
- describe the different stages involved in handling an export order.

5.1 INTRODUCTION

You know the key activities that are of primary importance in achieving the cost and service objectives of logistics, domestic or international, are: (1) transportation, (2) warehousing, (3) inventory maintenance, and (4) order processing. These activities are considered primary to the effective management of logistics because they either contribute most to the total cost logistics or they are essential to the effective coordination and completion of the logistics task. While transportation adds 'place' value to a product, inventories add 'time' value, and in order to create this time value, inventories are placed close to customers or close to manufacturing points. The large number of such stocking points (warehouses) and the high costs of carrying

the products in storage require close management of inventories keeping stock levels as low as possible while providing desired level of stock availability for customer. Similarly, though order processing costs tend to be minor as compared to transportation or inventory maintenance cost, it is also treated as a primary logistics activity that triggers product movement and service delivery. This is specially true of an export order that involves detailed procedures to suit specific requirements for ensuring production or procurement of goods, packing, marking, etc. and a number of formalities at the preshipment, shipment and post shipment stages. In this unit, you will learn about the need, objectives and techniques of inventory control, and the various steps involved in the processing of in an export order and its despatch.

5.2 NEED FOR INVENTORIES

The dictionary meaning of the term 'inventory' is 'stock of goods' which usually includes stock of (1) raw materials, (2) stores and spares, (3) work in progress (semi-finished goods), and (4) finished goods. Inventories of these items are needed because it is either impractical or impossible to know future demand with certainty and because the availability of supplies cannot be guaranteed at any given moment. Inventories actually serve a number of purposes i.e., they (i) improve customer service, (ii) effect production economics, (iii) permit purchase and transportation economics, (iv) act as a hedge against price fluctuations, (v) protect against uncertainties of demand and lead time, and (vi) meet contingencies.

The inventory problem is not equally distributed throughout firms or industries. Manufacturer's inventories, for example, are much larger in total than retail and wholesale inventories. Similarly, the durable goods represent quite a large proportion of business goods inventories and show more fluctuations than non-durable goods. In fact, business inventories have been increasing over the years. Some of the factors responsible for such an increase are:

- 1 Inefficient purchase organization : unplanned purchases might have been made with the result that materials in order, when received, increase the level of inventory.
- 2 Ineffective production planning : lack of proper coordination between material procurement and production requirement may result in overstocking of materials, components, and work-in-progress.
- 3 Economic batch quantity and the various stock levels might not have been established or followed.
- 4 Long production cycle
- 5 Lack of proper system of classification and coding
- 6 Product diversification
- 7 Lower or depressed sales to which the procurement could not be adjusted in time
- 8 Discontinuance of product / products for which materials are in stock

5.3 FACTORS INFLUENCING INVENTORIES

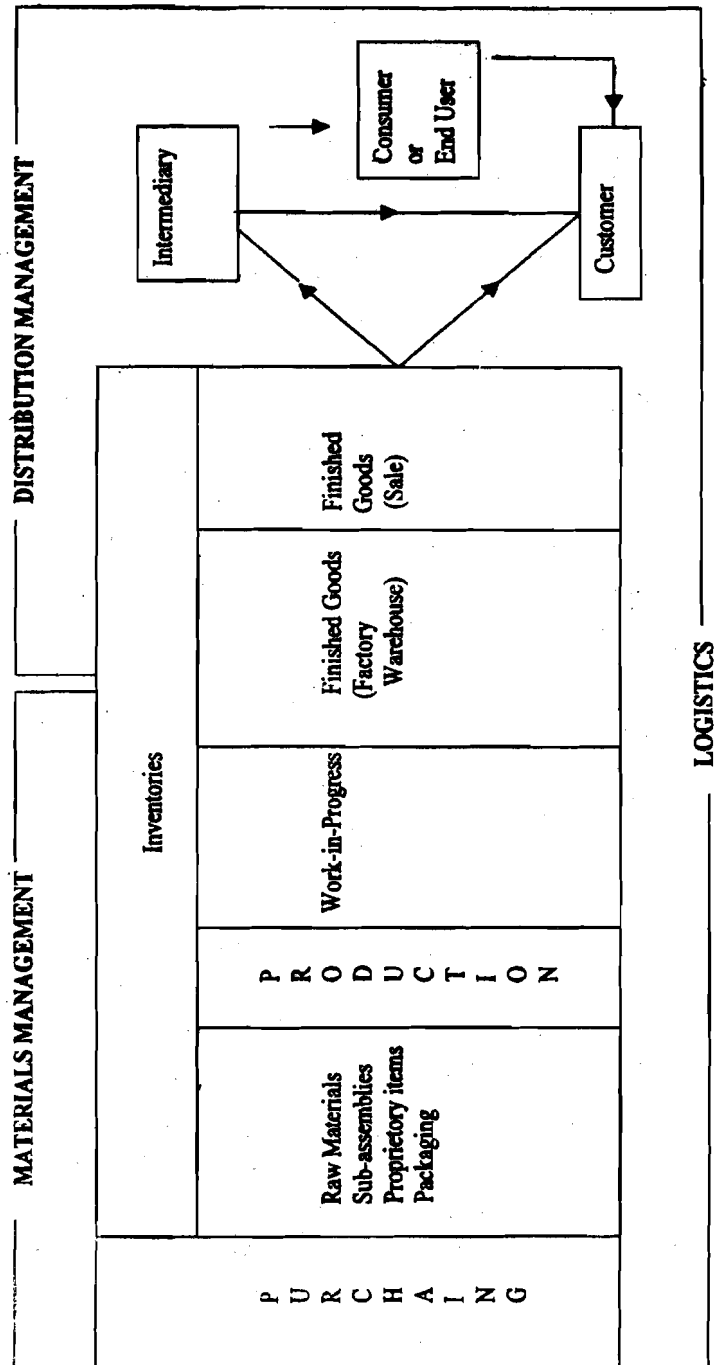
The role of inventories in logistics can be assessed from Figure 5.1. However, logistics management is concerned primarily with two types of inventories, viz., (1) production inventory consisting of raw material and components, and (2) finished goods inventory consisting of manufactured goods kept in warehouse and retail outlets. The accuracy with which production schedules and sales can be forecast shall go a long way in determining the level of inventories. But, relevant factors that influence these inventories are as follows:

Raw materials and Components: The size of this inventory will be determined by

- a) Lead time or the time taken between the decision to purchase and the actual delivery of the goods. Lead time has two parts :
 - (i) Administrative or internal lead time which is the time taken within the company to place the order. This will include time taken for calling of quotations, comparing quotations, making enquiries, negotiations where necessary, obtaining sections of competent authority, etc.

- (ii) The supplier's lead time or the time taken by the supplier to deliver the goods from the time the purchase order is placed on him.
- b) Annual consumption of the material and the fluctuations in demand, seasonal or otherwise
 - c) Reliability of suppliers
 - d) Availability of storage space
 - e) Amount of capital available
 - f) Government policy, especially in regard to imports and more so in the case of canalized imports
 - g) Cost of procurement
 - h) Cost of Storage
 - i) Minimum order quantity imposed by suppliers

Figure 5.1 Role of Inventories in the Logistics system



Finished Goods : The factors influencing this inventory are :

- a) Accuracy of sales forecast,
- b) Production in economic lot sizes which may be higher than sales requirements, and
- c) Available storage space.

As stated earlier, inventories must be sufficient to (1) to take care of demands till the next supply arrives; (2) to take care of probable delays in supplies, and (3) to take care of probable variations in demand. For this purpose, the problems that need to be tackled are:

- a) determination of the level of inventory for placing a replenishment order (Reorder Level),
- b) the quantity to be ordered (Reorder Quantity), and
- c) the extent of delay in supplies (Lead Time) and the extent of variations in demand which inventory should be able to withstand.

Check Your Progress A

1 State the purpose for holding inventories?

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2 State any three factors that have led to increase in inventory these days.

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3 State whether the following statements are True or False.

- i) Inventory problem is not equally distributed throughout the firms and industries.
- ii) Lead time means the time taken by suppliers to deliver the goods.
- iii) Annual consumption of materials or fluctuation in demand have no effect on the size of inventories.
- iv) Inventory management is concerned primarily with inventories of raw materials and finished goods.
- v) Determination of level of inventory has no relevance to placing a fresh order.
- vi) Inventories must be sufficient to take care of probable variations in demand.

5.4 CONCEPT OF INVENTORY CONTROL

Controlling inventories is vital in the logistics activity mix because inventories can absorb 25-30 per cent of logistics cost and represent a significant proportion of the total assets of an organization leading to a substantial amount of working capital locked up in an idle resource. This has a direct impact on the profitability of an organization. Conversely, if it is not

maintained at an adequate level it may lead to loss of sales resulting in decreased profits. In other words, while distribution has to be maintained at desired levels of customer service, it has to be matched with the minimum inventory holdings. Therefore, we have to devise systems and procedures to reach the optimum levels without stock out situations and minimize the funds locked up in inventory. This precisely is what signifies inventory control. Thus, the term 'inventory control' may be defined as systematic control and regulation of purchase, storage, usage of materials in such a way so as to maintain an even flow of production and avoiding, at the same time, excessive investment in inventories."

5.5 OBJECTIVES OF INVENTORY CONTROL

Internally almost everyone in the organization is interested in the inventory. But external agencies like bankers, carriers, insurers, customers are equally interested in the organization's inventory. The primary objective of inventory control, therefore, is to satisfy the 'customer' whether he is inside the organization or is outside the organization who is a real customer.

Customer satisfaction results from several things. For example, a production manager is concerned about the service he gets from the stocks i.e., how often can he get what he wants without delay of waiting for a delivery or without resorting to a "special order". Such a level of service can be quantified and be set as a target to achieve, and the service efficiency can be measured in terms of the percentage of total demand which is actually met from stock. This objective of the inventory control can, of course, be achieved by piling up bigger stocks of everything which would conceivably be required to improve the service level. But, in the process, there is a distinct possibility that this might bring the company to the brink of bankruptcy as it is expensive to carry inventory. It is also not possible to aim at very low stocks as this might jeopardize the quality and level of service rendered. In fact, balancing service with the cost of providing the service so as to achieve the best return on the money tied up in inventories is what scientific inventory control really aims at. Thus, the broad objectives of inventory control can be listed as follows:

- 1 Avoid understocking
- 2 Avoid overstocking
- 3 Achieve economy in purchasing
- 4 Minimize losses in stores
- 5 Ensure timely dissemination of inventory information

5.6 TECHNIQUES OF INVENTORY CONTROL

There are two fundamental questions that arise in inventory control. These are:

- 1 When to buy (or order for)?
- 2 How much to buy (order) at one time?

Hence, inventory control starts by fixing the Reorder Level (ROL) and Reorder Quantity (ROQ) for each item of inventory.

5.6.1 Reorder Level

The basic approach of all inventory control methods is to establish a proper reorder level which, when reached, would indicate that the stock needs replenishment. This level usually represents the maximum possible consumption during the lead time plus a safety margin. The formula normally used to arrive at this level is:

The method of determining this level should be appropriate for each item and ensure that at the re-order level there will be sufficient stock to maintain production or sale until the replenishment arrives. It is the adjustment of this important level to suit demand that will determine whether the inventory control system is effective or not. However, there are fluctuations in consumption/demand and, in most cases, such fluctuations cannot be predicted accurately. In practice, therefore, the replenishment procedure usually takes the following two approaches:

- a) When the stock level reaches the pre-determined re-order level, a review is made of the requirement and a fixed quantity is ordered. However, the date on which the re-order level is reached will vary from month to month. It may be say 1st January, 10th February, 9th March, 17th April and so on. This system is called the Perpetual Review System (P System).
- b) In the second method the review is made on particular dates, say, first of every month. At that point one calculates the consumption rate, demand and stock level and orders the quantity that is required to make the stocks reach in maximum level on the date of replenishment. This is called the Periodic Review System (Q system).

The difference in the two systems is that in the first the time interval between the orders will vary and the order quantity is constant, while in the latter the interval between the orders will be constant and the quantity will vary.

Let us now examine the details of the two systems.

Perpetual review system (P system): This system is also known as Fixed Order Size System, Reorder Level System, Two Bin System, or Constant Cycle System. Under this system, when the stock level reaches the Reorder point (ROL) a fresh order for a pre-fixed quantity is placed which is determined as follows:

$$(\text{Max. Level} - \text{ROL}) + \text{Lead Time Consumption.}$$

This system suffers from the following limitations:

- 1 In many cases purchases are made for a group of items and it is usual to stipulate a minimum order size. Under this system, it will not be possible to meet the minimum order restrictions for a group of items as the re-order quantity for individual items is constant.
- 2 The system will be insensitive to changes in demand and may result in an increase in the frequency of reordering.
- 3 A constant review of inventory levels of all items will be necessitated and, therefore, it is absolutely necessary that stores records are always upto date.

Periodic Review System (Q System) : This system is also known as Fixed Interval Order System, Fixed Time System, etc. Under this system, the interval between two orders is fixed but the size of the orders will vary as per actual requirements. The operating procedure consists of reviewing the inventory position regularly at fixed intervals of time. If at any particular review the stock level is, say S, then the order quantity R is based on the following formula:

$$\text{Average Consumption during Review Period} + \text{Lead Time Consumption}$$

The limitations of this system are:

- 1 Inventory costs are not explicitly considered in this system.
- 2 It is often not possible to meet the minimum or package-quantity restriction.

- 3 The system will react quickly to the most recent consumption which may be of random occurrence and may not be representative at all.
- 4 Frequent re-ordering for small quantities cannot be avoided when operating this system.

The Perpetual Review System is more suitable for C and low value B items. (As you will see later, the A-B-C classification is based on the consumption value). The Periodic Review System with its frequent and careful reviews is suitable for A and high value B items. For a given risk of stockouts, the Periodic Review System requires more safety stock as compared to the Perpetual Review System.

The time for replenishment is chosen purely from the point of view of administrative convenience. It may be once a week, fortnight, one month or three months, as the case may be. It depends on the number of orders to be placed per annum as given by the Economy Order Quantity formula if the consumption is fairly steady throughout the year. In most cases, consumption rate will vary. In such a case, the quantity to be ordered on each occasion will be adequate to replenish to the predetermined maximum level or meet the production requirement during the next time-interval or both.

5.6.2 Reorder Quantity

One of the most effective techniques for determining the reorder quantity is called Economic Order Quantity or E.O.Q. The basic objective is to economise on the total cost of purchasing and maintaining the inventories. The details of these costs are :

- 1 **Purchasing Cost or Procurement Cost** : This is the cost incurred by the Purchase Department in making purchases. For example, each time a Purchase Order is issued, clerical costs are involved in calling for quotations, scrutinizing the quotations, deciding the supplier on whom the order should be placed, issuing the Purchase Order, follow-up, etc. Then there are costs of inspection and costs of receiving the materials, clerical costs incurred by the Accounts Department like making payment to the supplier, etc. The sum total of all these costs is called the purchasing cost. The purchasing cost incurred during a year divided by the number of orders issued will give the cost per order.
- 2 **Inventory Carrying Cost** : The various costs are incurred to maintain inventories are:
 - i) Interest on the money locked up in inventories
 - ii) Taxes payable
 - iii) Insurance
 - iv) Obsolescence
 - v) Shrinkage
 - vi) Evaporation
 - vii) Deterioration or spoilage
 - viii) Rentals
 - ix) Labour costs
 - x) Overheads

All these constitute inventory carrying costs and are usually expressed as a percentage of the total value of inventory held. This can be as high as 25 to 30% under today's conditions.

The Economic Order Quantity is that quantity at which the cost of procuring the annual requirement of an item and the cost of carrying the inventory are equal. That is the quantity where the total of the two cost will be lowest.

Let us take an example where the annual consumption of an item is 12,000 units costing Rs. 1.25 per unit, and the ordering cost is Rs. 15 per order and the inventory carrying cost is 20% of the average inventory. Based on this data we can prepare the following table :

No. of orders Per year	Units per order	Value per order Rs.	Ordering cost Rs.	Carrying cost Rs.	Total cost Rs.
1	12,000	15,000	15	1,500	1,515
2	6,000	7,500	30	750	780
3	4,000	5,000	45	500	545
4	3,000	3,750	60	375	435
5	2,400	3,000	75	300	375
6	2,000	2,500	90	250	340
7	1,714	2,142	105	214	319
8	1,500	1,875	120	188	308
9	1,333	1,667	135	167	302
10	1,200	1,500	150	150	300
11	1,091	1,364	165	136	301
12	1,000	1,250	180	125	305
13	923	1,154	195	115	310
14	857	1,071	210	107	317
15	800	1,000	225	100	325

Note : Inventory carrying cost is based on average inventory.

The above table shows that 1,200 units is the ideal size of the order where ordering cost is equal to the carrying cost (Rs. 150) and total cost is minimum (Rs. 300). Thus, 1,200 units is the economic order quantity. Economic order quantity can also be worked out by the following formula.

$$EOQ = \sqrt{\frac{2AP}{UC}}$$

Where

A = Annual consumption in units

P = Procurement cost per order

U = Unit price

C = Inventory carrying cost expressed as a percentage (of value)

Applying this formula to the above data, the EOQ will be

$$\begin{aligned}
 & \sqrt{\frac{2 \times 12,000 \times 15}{1.25 \times 0.20}} \\
 &= \sqrt{\frac{3,60,000}{0.25}} = 1,200 \text{ units or Rs. 1,500.}
 \end{aligned}$$

The mathematical calculations should be used only as guidelines, and it would be necessary to alter the figures for certain practical considerations. Some of these considerations are as follows:

- 1 **Simplification of routine:** If the E.O.Q. formula indicates that 13 orders have to be placed in a year, we may place 12 orders, i.e., once a month.

- 2 **Ordering in package sizes:** Many goods are packed in units of one gross. If our figure shows a quantity of $11\frac{1}{2}$ dozens, it should be changed to 12 dozens.
- 3 **Economical freight rates:** If the mathematical figures give $\frac{9}{10}$ th of a lorry load or $\frac{9}{10}$ th of a rail wagon load, it is better to increase the quantity to have one full lorry load or one full wagon load. This would be cheaper, because the full wagon load rates would be lower than taking the material as smalls.
- 4 **For perishable articles** whose shelf-life is very low, E.O.Q. should be much less than the theoretical figure and should be based on practical considerations.
- 5 **For articles of a seasonal nature** such as cotton or groundnuts or sugarcane, bulk purchases during the season will be cheaper than purchases based on E.O.Q.
- 6 In certain cases, considerable discounts would be available for bulk purchases. This should be compared to the savings as a result of the application of E.O.Q. formula and a decision should be taken based on which is cheaper.
- 7 E.O.Q. cannot be successfully applied in the case of imports with its attendant problems of obtaining import licences, uncertain lead times, etc.

5.6.3 Other Techniques

Having fixed the reorder level and the reorder quantity, it is also considered prudent to fix the maximum and minimum stock levels for each item of inventory and also work out the inventory turnover rate based on the average inventory. This helps the organization to exercise better control over inventories and assess the degree of efficiency with which the inventories have been managed.

Maximum Level : It represents the maximum quantity of each item that should be held in stock at any one point of time. It is greatly influenced by the reorder quantity of the item. If the quantity ordered at a time is high, this level will also be high, and, if the quantity ordered is small, this level will also be low. The formula for fixing the maximum level is

$$\text{ROQ} + \text{ROL} - (\text{Minimum Consumption} \times \text{Minimum Lead Time})$$

Minimum Level : This may be zero or it may be the quantity of buffer stock that we will require. The following formula is normally used for fixing this level:

$$\text{ROL} - (\text{Normal Consumption} \times \text{Normal Lead Time})$$

Inventory Turnover Rate: The inventory turnover rate (material/sales volume to average inventory) is a measure frequently used for assessing the efficiency with which the inventories have been managed and to check how far it is within limits. It is a relationship between the annual consumption of materials (or annual sales) and the average inventory held and is calculated as follows.

For Materials

$$\text{Inventory Turnover Rate} = \frac{\text{Cost of Materials Consumed}}{\text{Cost of Average Stock of Materials}}$$

For Finished Goods

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

Normally, higher the rate better it is because any increase in the inventory turnover rate saves the firm from the cost of carrying the inventory. But, one should be aware that inventory turnover rate differs from industry to industry. It is usually high in case of fast moving items and low in case of slow moving items. Hence, it is better to compare it with the industry norms so as to assess the efficiency level correctly.

Check Your Progress B

1 Define Inventory Control.

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2 State three basic factors that are taken into account for determining various levels of stock.

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3 How does Reorder Level (ROL) differ from Reorder Quantity (ROQ)?

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4 What do you mean by selective inventory control? List the major techniques used for this purpose.

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5 Select the most appropriate answer.

i) Primary objective of inventory control is

- a) to avoid understocking
- b) to minimize losses in stores
- c) to satisfy the customer

ii) To achieve best return on the money tied up in inventories is

- a) to balance quality of service with cost of providing the service
- b) to maintain inventories at the minimum level
- c) to disseminate inventory information regularly

- iii) Reorder Level is determined by taking into consideration
 - a) minimum requirement during average lead time
 - b) maximum requirement during average lead time
 - c) maximum requirement during maximum lead time

- iv) Effective technique for determining Reorder Quantity is called
 - a) Reorder Level
 - b) Economic Order Quantity
 - c) Both of the above

- v) Inventory Turnover rate is usually high
 - a) in case of slow moving items
 - b) in case of fast moving items
 - c) in case of all items

- vi) The ideal economic order quantity is the quantity
 - a) for which the procurement cost of annual requirement is minimum.
 - b) which does not allow inventory level to exceed the predetermined maximum level of inventory.
 - c) at which procurement cost of annual requirement is equal to the inventory carrying cost.

5.7 SELECTIVE INVENTORY CONTROL

One must have heard of the phrase "the vital few and trivial many". For example, one will find that the number of tax payers in the country are not more than 10%. If we take a T.V. set, about 5% of the total number of parts contribute to 80% of the costs. This is true of a car or a refrigerator or any machine. One would find, for example, in a multi-product company, that perhaps 10% of the products contribute to 90% of the sales or 75% of the total profits. The discovery of this interesting phenomenon was made by a person called Pareto and the phenomenon is popularly called the Pareto's Law. Pareto was a German economist who worked out the distribution of incomes in East Prussia and found that 20% of the people got 80% of the money. Pareto's law has been used in many contexts outside welfare economics. Briefly stated: "In any series of elements to be controlled, only a small fraction in terms of elements will usually account for a large fraction in terms of results". It is also usually called the 80/20 rule. Pareto's law is noticeable in inventories. One would find for example that of the total number of materials in stock, 20% of the items contribute to 80% of the value, or that 20% are the most difficult to obtain, or that 20% are the most critical in so far as the company's production is concerned, and so on.

Let us appreciate the facts that the primary objective of inventory control is to minimize costs and that almost the same effort is required to control an item of inventory whether its annual consumption is Rs. 5,000 per annum or Rs. 50,000 per annum. A pertinent way of looking at the problem, therefore, would be to control items of high value consumption because they give us the greatest returns and not to care much for the low consumption value items because the returns are low. Thus, selective control means that we have variations in the method and degree

of inventory control from item to item and this differentiation should be on a selective basis. Broadly, selective control can be divided into eight types. These are:

	Classification	Criteria
1	A-B-C (sometimes nicknamed as Always Better Control)	Annual value of consumption of the items concerned
2	H-M-L (High, Medium, Low)	Unit price of material (This is the opposite of A-B-C and does not take total consumption into account)
3	V-E-D (Vital, Essential and Desirable)	By the critical nature of the component or material with respect to production
4	S-D-E (Scarce, Difficult to obtain, Easy to obtain)	Purchasing problems in regard to availability
5	G-O-L-F (Government, Ordinary Local, Foreign)	Source from which the material is obtained
6	F-S-N (Fast moving, Slow moving and Non-moving)	Issues from stores
7	S-O-S (Seasonal, Off-Seasonal)	Seasonality (This applies especially to commodities)
8	X-Y-Z	The inventory value of items stored

Of these, we shall discuss in detail the ABC classification as this happens to be the most commonly adopted technique of selective inventory control in practice.

A-B-C Classification

The technique of A-B-C analysis is a basic technique of inventory control and is often said to be its starting point. A-B-C analysis can be applied to almost all aspects of materials management such as purchasing, receiving and inspection, store-keeping and issue of stores, verification of bills, inventory control, value analysis, etc.

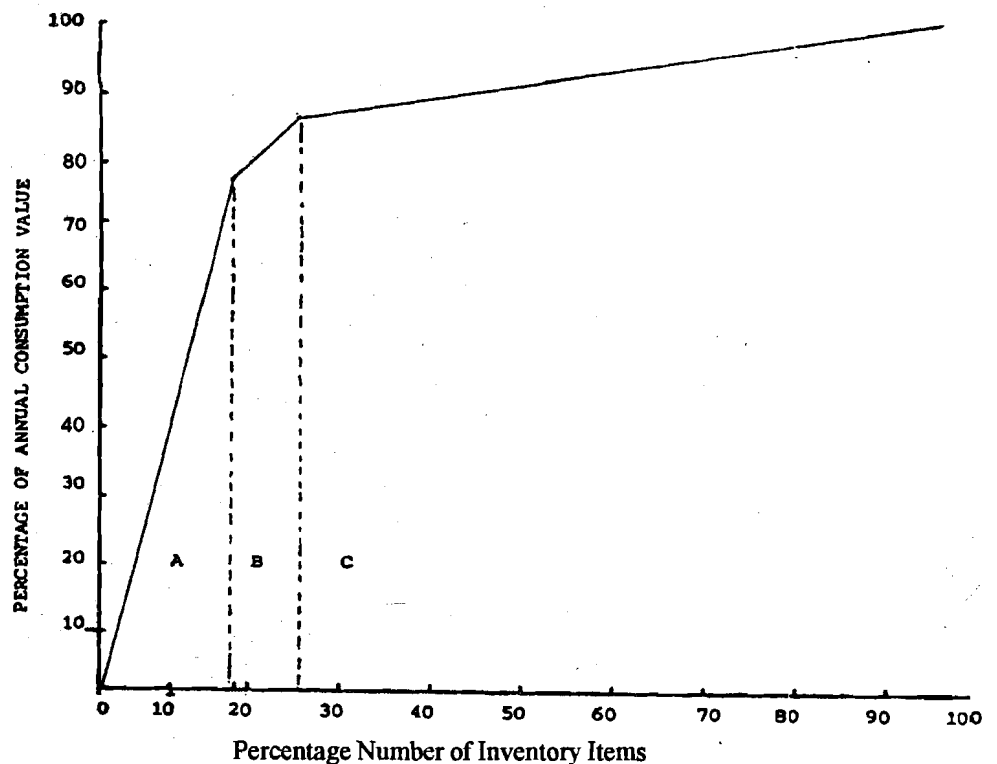
If we make an analysis of all stores items representing the entire inventory in rupees, it will be found that not more than 10 per cent of the items will be responsible for about 80 per cent of the total annual consumption cost, about 20 per cent of the items will account for about 15 per cent of the annual consumption cost, while the remaining 75 per cent of the items will cover only 5 per cent of the cost. The small number of high-consumption-value items are called A items, the medium-consumption-value items are B items, while the large number of items whose annual consumption value is very low are C items. It must be clearly understood that A-B-C analysis does not depend on the unit cost of the item, but only on its total annual consumption or turnover. Again, it does not depend on the importance of the item. Figure 5.2 that follows gives an A-B-C analysis of the materials consumed in three types of firms.

Figure 5.2 : A-B-C Analysis of Materials Consumed in Three Typical Companies

Class	Items	Per cent	Value	
			Rs. Millions	Per cent
A large chemical plant				
A	513	5.95	52.17	81.20
B	1362	15.80	7.37	11.47
C	6747	78.25	4.71	7.33
Total	8622	100.00	64.25	100.00
A large textile mill				
A	576	8.30	26.05	78.98
B	1271	18.10	4.09	12.42
C	5149	73.60	2.84	8.60
Total	6996	100.00	32.98	100.00
A medium size engineering plant				
A	281	8.00	4.38	83.59
B	534	15.30	0.64	12.21
C	2679	76.70	0.22	4.20
Total	3494	100.00	5.24	100.00

We can graphically present this data if we plot the percentage of items used along one axis and the value of annual consumption (as percentage of the total) in the other axis. A typical graph is given Figure 5.3.

Figure 5.3 : A-B-C Analysis of Material Consumption



The substance of what has been stated above is that the time, effort and expense involved in controlling 'A' items will give returns which are much higher than those available from controlling 'C' items.

The purpose of A-B-C analysis must be now quite clear. It is to separate the predominant few (from the point of view of annual consumption value) from the vast majority of items whose annual consumption value is very low. The reason why this is done is simple to explain. Without a systematic A-B-C analysis, perhaps more or less equal attention will be paid to all items, with the result that the control will be unnecessarily too costly and be too diffused to remain efficient. A-B-C analysis gives rise to selective inventory control in which maximum attention can be given to A items, a fair amount to B items, while the attention necessary for C items can be reduced to routine procedures. It is in A items that the bulk of the work lies but which give the best returns if we reduce inventory levels.

5.8 NEW TRENDS IN INVENTORY MANAGEMENT

The main thrust in competitive strategy today is to reduce costs of both manufacturing and distribution. The most vital area is inventory and, as such, the focus of cost reduction has been on the reduction of inventory. This has resulted in company managements to reappraise conventional wisdom in regard to inventory control. On the one hand, there is a financial pressure to reduce inventory levels and, on the other, there are market pressure for competitive service level. An ideal management strategy is to reconcile these two contradictory pressures. The new techniques involved have brought about a revolution which very broadly can be referred to as Requirements Planning.

The traditional approach to inventory management is based upon the re-order point and the re-order quantity concepts for determining when to order and in what quantity. This represents conventional thinking. Under this approach a re-order point or re-order level is predetermined, based upon the expected length of the replenishment lead time. The amount to be ordered may be based on EOQ concept which balances procurement costs and inventory carrying costs. However, this has proved to be inadequate and a new technique of Requirements Planning has been introduced.

Requirements Planning

Considerable attention has now been paid to the concept of Materials Requirements Planning (MRP). The essence of MRP is a system for forecasting or projecting component parts and materials requirements from a company's Master Production Schedule and the Bill of Materials for each item under production. The time-phased requirement for components and materials are then calculated, taking into account the stock in hand as well as the scheduled receipt of materials for which orders have been placed. The system establishes, maintains and devises priorities based on regular reviews and updates. One of the key principles of MRP is that it works on a time-phased basis. In other words, the requirements for components are established in the light of when they will be required for production against planned replenishment lead times. The correct practice of MRP has led to considerable reduction of inventory of components and materials, a greater ability to reschedule production to meet changed market needs and a higher level of service in terms of meeting final demand.

The success of the MRP concept has led to the Distribution Requirements Planning concept (DRP). It is a mirror image of MRP since it seeks to identify requirements for finished products at the point of demand then produces aggregate time-phased requirement schedules for each echelon in the distribution system. The emphasis is by identifying and anticipating customer requirements at the point of demand and then working backwards down the distribution pipeline. Instead of manufacturing a product and pushing it in the market which is the traditional system the demand is identified accurately and fully and this "pulls" the product from the distribution pipeline. This concept requires a lot of flexibility to meet the changes in demand requirements. While customer based service level objectives are fulfilled, inventory is kept to the lowest level possible.

The DRP concept relies upon forecast of end demand being generated at the lowest point in the distribution echelon (the regional depots) and the requirements at each preceding point in the

network (the central warehouse) and then the plant, are calculated on the basis of aggregation from the levels below on a time-phased basis.

Another method with similar objectives as MRP/DRP originally developed by the Japanese is called KANBAN or Just-in-time manufacturing. This has also come to be recognized as a valuable technique for reducing the inventory while maintaining service levels at desirable standards. It may be noted that Just-in-time approach to supply does not always lead to zero inventory. If requirements and/or lead times are not known for sure, then larger quantities and longer lead times are used, which forces inventory into the system. Also, over-stocking to take advantage of quantity discounts leads to carrying an inventory. To the extent that these conditions hold, the Just-in-time approach leads to results that are similar to other inventory control procedures. Therefore, Just-in-time is a method of choice when (1) products are high valued and require close control, (2) requirements are known with high certainty, (3) lead times are short and are known, and (4) there are no economic benefits to supplying in quantities larger than the requirements.

5.9 ORDER PROCESSING

Order processing is considered as one of the primary logistics activities along with transportation and inventory management. It acts as a trigger for the goods to fulfill the demand requirement of customers on time, as fast and accurate order processing minimizes order response time and smoothens the flow of goods throughout the logistics system. Thus, it is the key to the level of service the customer ultimately receives.

Order processing refers to all those activities that are involved in collecting, checking and transmitting sale/order information. It is the handling of all the paper work associated with the sale of firm's products and services. This involves a number of sub-activities such as order entry, order handling, order status reporting, invoicing and communicating compliance of the order.

Order entry : It refers to those activities at the interface between the customer and the supplying organization. It involves the form and mode in which the order information is transmitted. The objective is to maximize the speed at the lowest cost. Traditionally it has been accomplished by means of sale-order forms or contracts transmitted from customer by means of the mail or telephone or hand carried by the sales people. But, now a days, the modern electronic methods have revolutionised order entry for many organizations. It has become quite popular to tie points where orders originate with central order processing points. Some customers have created computer to computer hook-ups to gain the maximum speed and accuracy.

Order Handling : When order entry has been accomplished, there are a number of activities that take place before the order can be filled and delivered. Orders may be received at the order-processing point in a form that is not compatible with production, warehousing, or transportation procedures. They may require typing if the original is handwritten, or transcribed from one form to another, such as from written forms to paper tape.

In addition, credit checking, price checking, verifying item availability, and estimating delivery dates often become part of this activity. This is followed by packing, marking and arranging the despatch of goods. These routine tasks can usually be automated if the volume of orders handled is sufficient to justify the cost of the equipment needed.

Order Status Reporting : Some firms consider it good business to keep customers informed of the status of their orders when orders require some time to be filled. This may just be a routine business practice involving verification that the order was received, and possibly periodic updating as to when the order can be expected. Order-status reporting generally does not affect the length of the order cycle. However, it can be an important element in the customer-service mix.

Invoicing : At times, order-processing personnel become involved in billing customers as an administrative convenience to the company. This activity generally does not affect the length of the order cycle.

Communicating Compliance : After all the formalities have been completed and goods have been dispatched, the organization has to communicate compliance of the order and forward the necessary documents along with the invoice to enable the customer to take delivery of goods and arrange payment.

5.10 HANDLING AN EXPORT ORDER

As stated right at the beginning, handling an export order involves highly complex procedure and a number of legal formalities at the pre-shipment, shipment and post shipment stages, it also requires special care in packing and marking, containerization and transportation. All these aspects have been discussed in detail in Unit 4 (Block 1) of your course on Export Import Procedures and Documentation (IBO-04). You are advised to go through the same and refresh your knowledge in relation there to.

Check Your Progress C

1 What do you mean by order processing?

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2 State whether the following statement are True or False.

- i) Order entry refers to form in which the order information is transmitted.
- ii) Orders are received in a form that is always compatible with production.
- iii) All orders can be successfully filled within the normal order cycle time.
- iv) Processing of an export order starts with the receipt of an order.
- v) An export exercise is concluded successfully after the exporter has been able to deliver the consignment in accordance with the export contract and receive the payment.

5.11 LET US SUM UP

Inventory refers to the stock of materials and goods that a firm has to maintain in order to ensure their ready availability for production/sale. The size of inventory is normally determined by a host of factors such as annual requirement, normal lead time, reliability suppliers/production schedules, amount of capital available, availability of storage space, etc.

Inventories constitute 25-30 per cent of logistics cost and involve substantial amount of capital which has direct impact on the profitability of an organization. Not only that, while overstocking leads to higher logistics cost, understocking may adversely affect the production and sale. Hence, inventories have to be maintained at judicious level and a systematic control and regulation of purchase, storage and usage of materials. This involves fixation of maximum, minimum and reorder stock levels for each item and determination of economic order quantity. However, as almost the same effort is required to control an item of inventory; it is advisable to exercise selective control. For this purpose, ABC analysis is made and the items of high, moderate and low consumption are identified and the method and degree of control are adjusted accordingly. Now a days, in order to further reduce cost of inventories, new techniques like Material Requirement Planning and Distribution Requirement Planning, for reducing inventories while maintaining service levels at desirable standard, are being used by many organizations.

Order processing is another primary logistics activity and needs efficient handling. The sub-activities involved in order processing are (1) order entry, (2) order handling (3) order status reporting (4) invoicing and (5) communicating compliance. Handling export-order is rather more complex and involves detailed procedures, special care in packing and marking, and complying with a number of legal formalities at the pre-shipment, shipment and post-shipment stages.

5.12 KEY WORDS

ABC Analysis : A technique of selective inventory control according to which the goods are divided into A, B and C categories based on their share in total value of consumption/sale and the volume

Economic Order Quantity : The quantity of goods to order at which total of procurement cost and inventory carrying cost is lowest.

Inventory Turnover Rate : Ratio of cost of materials/goods consumed/sold to the average inventory of materials/goods held.

Margin of Safety: Additional stock carried to protect against unexpected demand or delay in lead time.

Order entry : It refers to those activities that are involved in collecting, checking and transmitting sales order information.

Periodical Review System : A system under which the time interval between two orders is fixed and the size of order is determined as per actual requirement.

Perpetual Review System: A system under which, when stock reaches the reorder level, a fresh order for a pre-fixed quantity is placed.

Reorder Level : It is the level of stock at which a fresh order is initiated.

Reorder Quantity : The quantity of goods for which an order is actually placed at a time.

Selective Inventory Control : A system under which the method and degree of inventory control vary from item to item.

5.13 ANSWERS TO CHECK YOUR PROGRESS

- A 3 (i) True (ii) True (iii) False (iv) True (v) False (vi) True
B 5 (i) c (ii) a (iii) c (iv) b (v) b (vi) c
C 2 (i) True (ii) False (iii) False (iv) True (v) True

5.14 TERMINAL QUESTIONS

- 1 What is the purpose of holding inventories? Discuss the various factors that influence the size of inventory in an organization.
- 2 What do you mean by inventory control? State its objectives.
- 3 Explain the terms (a) Maximum Level, Minimum Level and Reorder Level of inventories. What are the main factors that are taken into account while fixing these levels.
- 4 Explain why?

- a) inventory cost increases as a higher level of customer service is provided.
 - b) inventory costs increases while larger orders are placed.
 - c) more accurate forecasting reduces inventory costs.
 - d) order processing costs and inventory carrying costs tend to be in conflict with each other.
 - e) ordering fewer times per year can lower annual out-of stock costs.
- 5 Describe the concept of Economic Order Quantity and state how is it a cost optimization technique.
- 6 Describe the Perpetual Review System and Periodical Review System used for replenishment of inventories.
- 7 What is 'Selective Inventory Control?' Discuss the ABC technique analysis in this context.
- 8 Why is order processing regarded as a primary logistics activity? Describe the sub-activities involved that every logistician should be aware of if he is to efficiently manage the customer service.
- 9 Describe briefly the steps involved in handling an export order.

SOME USEFUL BOOKS

- 1 Ronald H. Ballou : Basic Business Logistics, Prentice Hall, Inc., Englewood Cliffs, N.J.
- 2 Roy Chaudhary, E K : Logistics Management
- 3 Sharma S C : Warehousing and Distribution
- 4 Martin Christopher : Logistics - The Strategic Issues
- 5 Gopalakrishna, P. and Shandilya M.S. : Stores Management and Logistics
- 6 Ackerman, K.B. : Practical Handbook of Warehousing
- 7 Economic Survey by Ministry of Finance
- 8 Annual Reports of Ministry of Surface Transport, Ministry of Railways, Ministry of Civil Aviation, and Ministry of Commerce
- 9 Indian shipping and Transport News, Bombay
- 10 Indian Railways : A journal published by Ministry of Railways
- 11 Chibber : "Warehousing Corporation of India - a Study" 1982