

# CHAPTER – 3

## TECHNIQUES OF INVENTORY

### MANAGEMENT

#### 3.1 Introduction

The term 'inventory' originates from the French word 'Inventaire' and Latin word 'Inventariom", which implies ***a list of things found.***

The term 'inventory' can be defined as,

***"The term inventory includes materials like – raw, in process, finished packaging, spares and others; stocked in order to meet an unexpected demand or distribution in the future."***

Inventory includes the following categories of items:

- a. **Production Inventories:** Raw materials, parts and components which enter the firm's product in the production process. These may consist of two types – special items manufactured to company specifications and standard industrial items purchased '*off the shell*'.
- b. **MRO Inventories:** Maintenance, Repair, and Operating supplies which are consumed in the production process but which do not become the part

of the product. (e.g. lubricating oil, soap, machine repair parts)

- c. **In-process Inventories:** Semi-finished products found at various stages in the production operation.
- d. **Finished goods Inventories:** Completed products ready for shipment.

### 3.2 Process of Inventory Management and Control

*Inventory management and control* refers to the planning for optimum quantities of materials at all stages in the production cycle and evolving techniques which would ensure the availability of planned inventories. Following **four** steps are involved in the process:

- a. **Determination of optimum inventory levels and procedures of their review and adjustment:** It is a significant step but a difficult one. Too much inventory results in locking up of working capital accompanied by increased carrying costs (but reduced ordering costs). Excess inventories, however, guarantee uninterrupted supply of materials and components, to meet production schedules and finished goods to meet customers demand. Too less of inventory releases working capital for alternative uses and reduces carrying

costs and increases ordering costs. But there is the risk of stock out costs.

- b. **Determination of the degree of control that is required for the best results:** The second aspect of inventory management is to decide just how much control is needed to realize the objectives of inventory management. The difficulty is best overcome by categorization of inventory on the basis of value. Popularly called the **ABC** categorization, this approach is useful in deciding the degree of control. '**A**' class items are 'high' in value but 'low' in quantity, '**C**' class inventories are the opposite of '**A**' group i.e. 'high' in quantity and 'low' in value. In between are the '**B**' group stocks which are more or less equal in quantity and value proportion to the total inventory. Tight control is exercised on '**A**' category items through accurate records of receipts and issues and by co-ordination of incoming shipments with production managements.
- c. **Planning and design of the Inventory control system:** An inventory system provides the organizational structure and the operating policies for maintaining and controlling goods to be inventoried. The system is responsible for ordering and receipt of goods, timing the order placement,

and keeping track of what has been ordered, how much, and from whom.

- d. **Planning of the Inventory control organization:** It is yet another important aspect of inventory management because choosing the panel to control is very difficult.

### 3.3 Inventory Control Techniques

Inventory control techniques are employed by the inventory control organization within the framework of one of the basic inventory models, viz., fixed order quantity system or fixed order period system. Inventory control techniques represent the operational aspect of inventory management and help realize the objectives of inventory management and control.

Several techniques of inventory control are in use and it depends on the convenience of the firm to adopt any of the techniques. What should be stressed, however, is the need to cover all items of inventory and all stages, i.e. from the stage of receipt from suppliers to the stage of their use. The techniques most commonly used are the following:

- a. **ABC Analysis:** ABC analysis is a business term used to define an inventory categorization technique often used in materials management. It is also known as '*Selective Inventory Control.*'

ABC analysis provides a mechanism for identifying items which will have a significant impact on overall inventory cost<sup>21</sup> whilst also providing a mechanism for identifying different categories of stock that will require different management and controls.<sup>22</sup> When carrying out an ABC analysis, inventory items are valued (item cost multiplied by quantity issued/consumed in period) with the results then ranked. The results are then grouped typically into three bands.<sup>23</sup> These bands are called ABC codes.

### **ABC CODES**

"**A class**" inventory will typically contain items that account for 80% of total value, or 20% of total items.

"**B class**" inventory will have around 15% of total value, or 30% of total items.

"**C class**" inventory will account for the remaining 5%, or 50% of total items.

ABC Analysis is similar to the Pareto principle in that the "A class" group will typically account for a large

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<sup>21</sup> Manufacturing planning and control systems for supply chain management By Thomas E. Vollmann

<sup>22</sup> <http://www.supplychainmechanic.com/?p=46> How to carry out an ABC analysis of inventory

<sup>23</sup> Oracle E-Business Suite Manufacturing & Supply Chain Management By Bastin Gerald, Nigel King, Dan Natchek

proportion of the overall value but a small percentage of the overall volume of inventory.<sup>24</sup>

## **USAGE OF ABC ANALYSIS**

1. In day to day warehouse operations, materials are some time under issued, over issued, issued and not accounted into the system, misplaced, stolen etc. This results into inaccuracy in the inventory. *Cycle counting* is the process to count and reconcile the materials. Ideally, every material in the warehouse should be counted during a fixed interval (every year) for maintaining 100% accuracy, but counting & reconciling every material is not cost effective and very expensive. To count the accuracy of the inventory in a cost effective manner, it is recommended to count the materials based on inventory classification. If A class materials are counted within a fixed interval (could be six months or a year) then the firm needs to count only 5% to 10% of the total materials and it will cover 60% to 80% of the inventory value. It means that firm only counts 5 % to 10% of the materials and remove the inaccuracy from the inventory value from 60% to 80%. Similarly B class materials can also be counted on a less frequency ( from once in 18 months to 24 Months) as the number of materials become higher and C class

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<sup>24</sup> Purchasing and Supply Chain Management By Kenneth Lyons, Brian Farrington

materials at even lesser frequency (once in 27 months to 36 months) as number of material becomes more (60% to 85% of the total materials).

2. An inventory controller shall be concentrating more on the A class items for reducing the inventory as he/she shall be concentrating only 5% to 10% of the total items and shall be getting the opportunity to reduce inventory on 60% to 80% of the value.
  3. Any reduction in lead time of A class items shall result in reduction in inventory, so procurement manager will work out with suppliers to reduce the lead time.
  4. On issue of materials, tight control on A class, Moderate control on B class, Loose Control on C class. So 'A' class items may be issued after getting the approvals from Senior Executives of the company. B may be moderately controlled. Very little control can be exercised while issuing C class item
- b. **High, Medium and Low Classification:** The High, medium and Low (HML) classification follows the same procedure as is adopted in ABC classification. Only difference is that in HML, the classification *unit value* is the criterion and not the annual consumption value. The items of inventory should be listed in the descending order of unit value and it is up to the management to fix limits for three categories.

The HML analysis is useful for keeping control over consumption at departmental levels, for deciding the frequency of physical verification, and for controlling purchases.

Procurement department is more concerned with prices of materials so this analysis helps them to take them the decisions such as, who will procure what based on the hierarchy and price of material.

Some of the other objective can be as under

Helps in taking the decision such as whether to procure in exact requirement or opt for EOQ or purchase only when needed

When it is desired to evolve purchasing policies then also HML analysis is carried out i.e. whether to purchase in exact quantities as required or to purchase in EOQ or purchase only when absolutely necessary

When the objective is to keep control over consumption at the department level then authorization to draw materials from the stores will be given to senior staff for **H** item, next lower level in seniority for **M** class item and junior level staff for **L** class items.

Cycle counting can also be planned based on HML analysis. **H** class items shall be counted very frequently, **M** class shall be counted at lesser frequency and **L** class shall be counted at least frequency as compared to H & M class.

- c. **VED Classification:** While in ABC, classification inventories are classified on the basis of their consumption value and in HML analysis the unit value is the basis, criticality of inventories is the basis for vital, essential and desirable categorization.

The VED analysis is done to determine the criticality of an item and its effect on production and other services. It is specially used for classification of spare parts.

- d. **SDE Classification:** The SDE analysis is based upon the availability of items and is very useful in the context of scarcity of supply. In this analysis, items, generally imported, and those which are in short supply. It refers to difficult items which are available indigenously but are difficult items to procure. Items which have to come from distant places or for which reliable suppliers are difficult to come by fall into category. It also refers to items which are easy to acquire and which are available in the local markets.

The SDE classification, based on problems faced in procurement, is vital to the lead time analysis and in deciding on purchasing strategies.

SDE analysis is done based on purchasing problems associated with items on day-to-day basis. Some of the purchasing problems are as under: -

Long Lead Times.

➤ Scarcity and hardly available

Sourcing the same material from many geographically scattered sources

➤ Uncertain and unreliable sources of supply

Purchasing department classifies these materials and formulates the strategy and policy of procurement of these items accordingly. So classification of materials is done based on level of difficulty in sourcing

e. **FSN Classification:** FSN stands for fast moving, slow moving and non-moving. Here, classification is based on the *pattern of issues* from stores and is useful in controlling obsolescence.

To carry out an FSN analysis, the date of receipt or the last date of issue, whichever is later, is taken to determine the number of months, which have lapsed since the last transaction. The items are usually grouped in periods of 12 months.

FSN analysis is helpful in identifying active items which need to be reviewed regularly and surplus items which have to be examined further. Non-moving items may be examined further and their disposal can be considered.

- f. **SOS Analysis:** 'S' stands for Seasonal items and 'OS' stands for off-seasonal items. It may be advantageous to buy seasonal items at low prices and keep inventory or buy at high price during off seasons. Based on the fluctuation in prices and availability, suitable decision has to be taken regarding how much to purchase and at what prices.
- g. **XYZ Analysis:** XYZ analysis is calculated by dividing an item's current stock value by the total stock value of the stores. The items are first sorted on descending order of their current stock value. The values are then accumulated till values reach say 60% of the total stock value. These items are grouped as 'X'. Similarly, other items are grouped as 'Y' and 'Z' items based on their accumulated value reaching another 30% & 10% respectively. The XYZ analysis gives an immediate view of which items are expensive to hold. Through this analysis, firm can reduce its money locked up by keeping as little as possible of these expensive items.
- h. **GOLF Analysis:** This stands for Government, Open market, Local or Foreign source of supply. For many

items imports are canalized through government agencies such as State Trading Corporations, Mineral and Metals Trading Corporations, Indian Drugs and Pharmaceuticals etc.

For such items, the buying firms cannot apply any inventory control techniques and have to accept the quota allotted by the Government. 'Open market' categories are those who form bulk of suppliers and procurement is rather easy. 'L' category includes those local suppliers from whom items can be purchased off-the-shelf on cash purchase basis. 'F' category indicates foreign suppliers. Since an elaborate import procedure is involved, it is better to buy imported items in bigger lots usually covering the annual requirements.

- i. **Economic Order Quantity:** Economic order quantity is the level of inventory that minimizes the total inventory holding costs and ordering costs. It is one of the oldest classical production scheduling models. The framework used to determine this order quantity is also known as ***Wilson EOQ Model*** or ***Wilson Formula***. The model was developed by F. W. Harris in 1913. But still R. H. Wilson, a consultant who applied it extensively, is given credit for his early in-depth analysis of the model.

Assume that the demand for a product is constant over the year and that each new order is delivered in full when the inventory reaches zero. There is a fixed cost

charged for each order placed, regardless of the number of units ordered. There is also a holding or storage cost for each unit held in storage (*sometimes expressed as a percentage of the purchase cost of the item*).

An organization wants to determine the optimal number of units of the product to order so that it minimize the total cost associated with the purchase, delivery and storage of the product

The required parameters to the solution are the total demand for the year, the purchase cost for each item, the fixed cost to place the order and the storage cost for each item per year. It is worth noteable that the number of times an order is placed will also affect the total cost; however, this number can be determined from the other parameters-

The ordering cost is constant.

➤ The rate of demand is constant

The lead time is fixed

➤ The purchase price of the item is constant i.e. no discount is available

The replenishment is made instantaneously; the whole batch is delivered at once.

EOQ is the quantity to order, so that ordering cost + carrying cost finds its minimum. (*A common*

*misunderstanding is that formula tries to find when these are equal.)*

Inventory models for calculating optimal order quantities and reorder points have been in existence long before the arrival of the computer. When the first Model T Fords were rolling off the assembly line, manufacturers were already reaping the financial benefits of inventory management by determining the most cost effective answers to the questions of when? and how much? Yes long before JIT, TQM, TOC, and MRP, companies were using these same (then unnamed) concepts in managing their production and inventory.

Corporate goals and strategies may sometimes conflict with EOQ. Measuring performance solely by inventory turns is one of the most prolific mistakes made in the name of inventory management. Many companies have achieved aggressive goals in increasing inventory turns only to find their bottom line has shrunk due to increased operational costs.

EOQ is essentially an accounting formula that determines the point at which the combination of order costs and inventory carrying costs are the least. The result is the most cost effective quantity to order. In purchasing this is known as the *order quantity*, in manufacturing it is known as the *production lot size*.

While EOQ may not apply to every inventory situation, most organizations will find it beneficial in at least some aspect of their operation. Anytime firm has repetitive purchasing or planning of an item, EOQ should be considered. Obvious applications for EOQ are purchase-to-stock distributors and make-to-stock manufacturers, however, make-to-order manufacturers should also consider EOQ when they have multiple orders or release dates for the same items and when planning components and sub-assemblies. Repetitive buy maintenance, repair, and operating (MRO) inventory is also a good application for EOQ. Though EOQ is generally recommended in operations where demand is relatively steady, items with demand variability such as seasonality can still use the model by going to shorter time periods for the EOQ calculation. Just make sure their usage and carrying costs are based on the same time period.

The basic Economic Order Quantity (EOQ) formula is as follows:

$$EOQ = \sqrt{\frac{2(\text{Annual usage in units})(\text{Order cost})}{(\text{Annual carrying cost per unit})}}$$

## THE INPUTS

While the calculation itself is fairly simple the task of determining the correct data inputs to accurately represent your inventory and operation is a bit of a project. Exaggerated order costs and carrying costs are common mistakes made in EOQ calculations. Using all costs associated with your purchasing and receiving departments to calculate order cost or using all costs associated with storage and material handling to calculate carrying cost will give firm highly inflated costs resulting in inaccurate results from its EOQ calculation. Often these references trace back to studies performed by advocacy agencies working for business that directly benefit from these exaggerated (my opinion) costs used in ROI calculations for their products or services.

It is relevant to keep in mind that even though accuracy is crucial, small variances in the data inputs generally have very little effect on the outputs. The following breaks down the data inputs in more detail and gives insight into the aspects of each.

### **ANNUAL USAGE**

Expressed in units, this is generally the easiest part of the equation. Firm can simply use its forecasted annual usage data for computational purposes.

## **ORDER COST**

Also known as purchase cost or set up cost, this is the sum of the fixed costs that are incurred each time an item is ordered. These costs are not associated with the quantity ordered but primarily with physical activities required to process the order.

For purchased items, these would include the cost to enter the purchase order and/or requisition, any approval steps, the cost to process the receipt, incoming inspection, invoice processing and vendor payment, and in some cases a portion of the inbound freight may also be included in order cost. It is important to understand that these are costs associated with the frequency of the orders and not the quantities ordered. For example, in firm's receiving department the time spent checking in the receipt, entering the receipt, and doing any other related paperwork would be included, while the time spent repacking materials, unloading trucks, and delivery to other departments would likely not be included. If firm has inbound quality inspection where it inspects a percentage of the quantity received it would include the time to get the specs and process the paperwork and not include time spent actually inspecting, however if it inspects a fixed quantity per receipt it would then include the entire time including inspecting, repacking, etc. In the purchasing department it would include all time associated with creating the purchase order, approval steps, contacting the vendor, expediting, and

reviewing order reports, it would not include time spent reviewing forecasts, sourcing, getting quotes (unless it gets quotes each time it order), and setting up new items. All time spent dealing with vendor invoices would be included in order cost.

Associating actual costs to the activities associated with order cost is where many an EOQ formula runs afoul. Do not make a list of all of the activities and then ask the people performing the activities "how long does it take you to do this?" The results of this type of measurement are rarely even close to accurate. It has been found it to be more effective to determine the percentage of time within the department consumed performing the specific activities and multiplying this by the total labor costs for a certain time period (usually a month) and then dividing by the line items processed during that same period.

It is extremely difficult to associate inbound freight costs with order costs in an automated EOQ program and it is suggested it only if the inbound freight cost has a significant effect on unit cost and its effect on unit cost varies significantly based upon the order quantity.

In manufacturing, the order cost would include the time to initiate the work order, time associated with picking and issuing components excluding time associated with counting and handling specific quantities, all production scheduling time, machine set up time, and inspection time.

Production scrap directly associated with the machine setup should also be included in order cost as would be any tooling that is discarded after each production run. There may be times when firm wants to artificially inflate or deflate set-up costs. If it lacks the capacity to meet the production schedule using the EOQ, it may want to artificially increase set-up costs to increase lot sizes and reduce overall set up time. If firm has excess capacity it may want to artificially decrease set up costs, this will increase overall set up time and reduce inventory investment. The idea being that if it is paying for the labor and machine overhead, anyway it would make sense to take advantage of the savings in the reduced inventories.

For the most part, order cost is primarily the labor associated with processing the order; however, it can include the other costs such as the costs of phone calls, faxes, postage, envelopes, etc.

### **CARRYING COST**

Also called *Holding Cost*, carrying cost is the cost associated with having inventory on hand. It is primarily made up of the costs associated with the inventory investment and storage cost. For the purpose of the EOQ calculation, if the cost does not change based upon the quantity of inventory on hand it should not be included in carrying cost. In the EOQ formula, carrying cost is represented as the annual cost per average on hand

inventory unit. Below are the primary components of carrying cost.

**Interest:** If firm had to borrow money to pay for its inventory, the interest rate would be part of the carrying cost. If it did not borrow on the inventory, but have loans on other capital items, it can use the interest rate on those loans since a reduction in inventory would free up money that could be used to pay these loans. If by some miracle firms are debt free, they would need to determine how much they could make if the money was invested.

**Insurance:** Since insurance costs are directly related to the total value of the inventory, firm would include this as part of carrying cost.

**Taxes:** If firms are required to pay any taxes on the value of their inventory they would also be included.

**Storage Costs:** Mistakes in calculating storage costs are common in EOQ implementations. Generally companies take all costs associated with the warehouse and divide it by the average inventory to determine a storage cost percentage for the EOQ calculation. This tends to include costs that are not directly affected by the inventory levels and does not compensate for storage characteristics. Carrying costs for the purpose of the EOQ calculation should only include costs that are variable based upon inventory levels.

If firms are running a pick/pack operation where they have fixed picking locations assigned to each item where the locations are sized for picking efficiency and are not designed to hold the entire inventory, this portion of the warehouse should not be included in carrying cost since changes to inventory levels do not effect costs here. Their overflow storage areas would be included in carrying cost. Operations that use purely random storage for their product would include the entire storage area in the calculation. Areas such as shipping/receiving and staging areas are usually not included in the storage calculations. However, if they have to add an additional warehouse just for overflow inventory then they would include all areas of the second warehouse as well as freight and labor costs associated with moving the material between the warehouses.

Since storage costs are generally applied as a percentage of the inventory value you may need to classify your inventory based upon a ratio of storage space requirements to value in order to assess storage costs accurately.

There are situations where firm may not want to include any storage costs in its EOQ calculation. If firm's operation has excess storage space of which it has no other uses it may decide not to include storage costs since reducing your inventory does not provide any actual savings in storage costs. As firm's operation grows near a point at

which it would need to expand its physical operations it may then start including storage in the calculation.

A portion of the time spent on cycle counting should also be included in carrying cost, remember to apply costs which change based upon changes to the average inventory level. So with cycle counting, it would include the time spent physically counting and not the time spent filling out paperwork, data entry, and travel time between locations.

Other costs that can be included in carrying cost are risk factors associated with obsolescence, damage and theft.

### **IMPLEMENTING EOQ**

There are primarily *two* ways to implement EOQ. Both methods obviously require that firm has already determined the associated costs. The simplest method is to set up its calculation in a spreadsheet program, manually calculate EOQ one item at a time, and then manually enter the order quantity into its inventory system. If its inventory has fairly steady demand and costs and it has less than one or two thousand SKUs it can probably get by using this method once per year. If it has more than a couple thousand SKUs and/or higher variability in demand and costs it will need to program the EOQ formula into its existing inventory system. This allows it to quickly re-calculate EOQ automatically as often as needed. It can also use a hybrid of the two systems by downloading its data to a spreadsheet or database program, perform the calculations and then update its

inventory system either manually or through a batch program. Whichever method it uses, it should make sure to follow the following steps:

**Test the formula:** Prior to final implementation it must test the programming and setup. Run the EOQ program and then manually check the results using sample items that are representative of the variations of its inventory base.

➤ **Project results:** Firm will need to run a simulation or use a representative sampling of items to determine the overall short-term and long-term effects, the EOQ calculation will have on warehouse space, cash flow, and operations. Dramatic increases in inventory levels may not be immediately feasible, if this is the case, it may temporarily adjust the formula until arrangements can be made to handle the additional storage requirements and compensate for the effects on cash flow. If the projection shows inventory levels dropping and order frequency increasing, it may need to evaluate staffing, equipment, and process changes to handle the increased activity.

**Maintain EOQ:** The values for Order cost and Carrying cost should be evaluated at least once per year taking into account any changes in interest rates, storage costs, and operational costs.

**j. Minimum-Maximum Technique:** The minimum-maximum system is often used in connection with manual inventory control systems. The minimum quantity plus the optimum lot size. In practice, a requisition is initiated when a withdrawal reduces the inventory below the minimum level; the order quantity is the maximum minus the inventory status after the withdrawal. If the final withdrawal reduces the stock level substantially below the minimum level, the order quantity will be longer than the calculated EOQ.

The effectiveness of a minimum-maximum system is determined by the method and precision with which the minimum and maximum parameters are established. If these parameters are based upon arbitrary judgments with a limited basis, the system will be limited in its effectiveness. If the minimum are based on an objective rational basis, the system can be very effective.

**k. Two-bin Technique:** One of the oldest systems of inventory control is the two bin system which is adopted to control 'C' group inventories. In the two – bin system, stock of each item is separated into two bins. One bin contains stock, just enough to last from the date a new order is placed until it is received in inventory. The other bin contains a quantity of stock enough to satisfy probable demand during the period of replenishment.

### **3.4 Application of Inventory Management**

## Techniques

Small businesses, both manufacturers and retailers, now have the opportunity to reduce inventory-related costs significantly through the use of various inventory techniques implemented on a micro- or mini-computer. Inventory techniques are divided into two categories--those for independent demand items (finished goods) and those for dependent demand items (manufacturing-in-process items and raw material). The use of micro-computers is growing rapidly, with material requirements planning (MRP) systems currently available for use on micro-and mini-computers. These MRP systems assist the small manufacturer in planning and controlling inventory levels of dependent demand items and in scheduling work centers.<sup>25</sup> Several techniques offer potential for savings with independent demand items. Independent demand item techniques are subdivided into continuous review models, periodic review models, and mixed models.

The model most frequently presented is the continuous review model (reorder point/economic order quantity model). However, an assumption implicit in continuous review models is that a perpetual inventory is maintained so that it is practical to release a replenishment order on the

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<sup>25</sup> James F. Cox and Steven J. Clark, "Material Requirements Planning System Development," *Computers and Industrial Engineering*, vol. 2 (1978), pp. 123-139.

day the reorder point is reached. Thus, continuous review models assume that point-of-sale information is being collected.

The continuous review technique, while very practical for a computerized inventory system collecting point-of-sale data, is not practical for manual systems handling numerous different items.

### **CONTINUOUS REVIEW MODEL**

There are dozens of variations of the continuous review inventory model.<sup>26</sup> The version discussed here is derived from the following assumptions:

The item under consideration is independent of all other items (no joint replenishment).

- Demand for the item varies (is random), but the average demand is constant over time.

Lead time is known and constant.

- Holding costs and replenishment costs are known and constant.
- The inventory position is maintained at all times.

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<sup>26</sup> This article discusses only the simplest model. More complete discussions can be found in Rein Peterson and Edward A. Silver, *Decision Systems for Inventory Management and Production Planning* (New York: John Wiley & Sons, 1979), and E. Naddor, *Inventory Systems* (New York: John Wiley & Sons, 1966).

## **SUCCESSFUL INVENTORY MANAGEMENT**

Successful inventory management involves balancing the costs of inventory with the benefits of inventory. Many small business owners fail to appreciate fully the true costs of carrying inventory, which include not only direct costs of storage, insurance and taxes, but also the cost of money tied up in inventory. This fine line between keeping too much inventory and not enough is not the manager's only concern. Others include:

Maintaining a wide assortment of stock -- but not spreading the rapidly moving ones too thin;

- Increasing inventory turnover -- but not sacrificing the service level;

Keeping stock low -- but not sacrificing service or performance.

- Obtaining lower prices by making volume purchases -- but not ending up with slow-moving inventory; and

Having an adequate inventory on hand -- but not getting caught with obsolete items.

The degree of success in addressing these concerns is easier to gauge for some than for others. For example, computing the inventory turnover ratio is a simple measure of managerial performance. This value gives a rough guideline by which managers can set goals and evaluate

performance, but it must be realized that the turnover rate varies with the function of inventory, the type of business and how the ratio is calculated (whether on sales or cost of goods sold). Average inventory turnover ratios for individual industries can be obtained from trade associations.

## **THE PURCHASING PLAN**

One of the most important aspects of inventory control is to have the items in stock at the moment they are needed. This includes going into the market to buy the goods early enough to ensure delivery at the proper time. Thus, buying requires advance planning to determine inventory needs for each time period and then making the commitments without procrastination.

For retailers, planning ahead is very crucial. Since they offer new items for sale months before the actual calendar date for the beginning of the new season, it is imperative that buying plans be formulated early enough to allow for intelligent buying without any last minute panic purchases. The main reason for this early offering for sale of new items is that the retailer regards the calendar date for the beginning of the new season as the merchandise date for the end of the old season. For example, many retailers view March 21 as the end of the spring season, June 21 as the end of summer and December 21 as the end of winter.

Part of your purchasing plan must include accounting for the depletion of the inventory. Before a decision can be

made as to the level of inventory to order, you must determine how long the inventory you have in stock will last. For instance, a retail firm must formulate a plan to ensure the sale of the greatest number of units. Likewise, a manufacturing business must formulate a plan to ensure enough inventories are on hand for production of a finished product.

In summary, the purchasing plans details:

When commitments should be placed;

➤ When the first delivery should be received;

When the inventory should be peaked;

➤ When reorders should no longer be placed; and

➤ When the item should no longer be in stock.

Well planned purchases affect the price, delivery and availability of products for sale.

## **CONTROLLING THE INVENTORY**

To maintain an in-stock position of wanted items and to dispose of unwanted items, it is necessary to establish adequate controls over inventory on order and inventory in stock. There are several proven methods for inventory

control. They are listed below, from simplest to most complex.

Visual control enables the manager to examine the inventory visually to determine if additional inventory is required. In very small businesses where this method is used, records may not be needed at all or only for slow moving or expensive items.

- Tickler control enables the manager to physically count a small portion of the inventory each day so that each segment of the inventory is counted every so many days on a regular basis.

Click sheet control enables the manager to record the item as it is used on a sheet of paper. Such information is then used for reorder purposes.

- Stub control (used by retailers) enables the manager to retain a portion of the price ticket when the item is sold. The manager can then use the stub to record the item that was sold.

As a business grows, it may find a need for a more sophisticated and technical form of inventory control.

Today, the use of computer systems to control inventory is far more feasible for small business than ever before, both through the widespread existence of computer service organizations and the decreasing cost of small-sized computers. Often the justification for such a computer-

based system is enhanced by the fact that company accounting and billing procedures can also be handled on the computer.

Point-of-sale terminals relay information on each item used or sold. The manager receives information printouts at regular intervals for review and action.

- Off-line point-of-sale terminals relay information directly to the supplier's computer who uses the information to ship additional items automatically to the buyer/inventory manager.

The final method for inventory control is done by an outside agency. A manufacturer's representative visits the large retailer on a scheduled basis, takes the stock count and writes the reorder. Unwanted merchandise is removed from stock and returned to the manufacturer through a predetermined, authorized procedure. A principal goal for many of the methods described above is to determine the minimum possible annual cost of ordering and stocking each item. Two major control values are used:

1) The order quantity, that is, the size and frequency of orders; and

2) The reorder point, that is, the minimum stock level at which additional quantities is ordered. The Economic Order Quantity (EOQ) formula is one widely used method of computing the minimum annual cost for ordering and

stocking each item. The EOQ computation takes into account the cost of placing an order, the annual sales rate, the unit cost, and the cost of carrying inventory. Many books on management practices describe the EOQ model in detail.

### **3.5 Developments in Inventory Management**

In recent years, two approaches have had a major impact on inventory management: Material Requirements Planning (MRP) and Just-In-Time (JIT). Their application is primarily within manufacturing but suppliers might find new requirements placed on them and sometimes buyers of manufactured items will experience a difference in delivery.

Material requirements planning are basically an information system in which sales are converted directly into loads on the facility by sub-unit and time period. Materials are scheduled more closely, thereby reducing inventories, and delivery times become shorter and more predictable. Its primary use is with products composed of many components. MRP systems are practical for smaller firms. The computer system is only one part of the total project which is usually long-term, taking one to three years to develop.

Just-in-time inventory management is an approach which works to eliminate inventories rather than optimize them. The inventory of raw materials and work-in-process

falls to that needed in a single day. This is accomplished by reducing set-up times and lead times so that small lots may be ordered. Suppliers may have to make several deliveries a day or move close to the user plants to support this plan.

## **TIPS FOR BETTER INVENTORY MANAGEMENT**

### ***At the time of delivery***

Verify count -- Make sure you are receiving as many cartons as are listed on the delivery receipt.

- Carefully examine each carton for visible damage -- If damage is visible, note it on the delivery receipt and have the driver sign your copy.

After delivery, immediately open all cartons and inspect for merchandise damage.

### ***When damage is discovered***

- Retain damaged items -- All damaged materials must be held at the point received.

Call carrier to report damage and request inspection.

- Confirm call in writing--This is not mandatory but it is one way to protect oneself.

### ***Carrier inspection of damaged items***

Have all damaged items in the receiving area -- Make certain the damaged items have not moved from the receiving area prior to inspection by carrier.

- After carrier/inspector prepares damage report, carefully read before signing.

### ***After inspection***

Keep damaged materials -- Damaged materials should not be used or disposed of without permission by the carrier.

- Do not return damaged items without written authorization from shipper/supplier.

## **SPECIAL TIPS FOR MANUFACTURERS**

If firm is in the business of bidding, specifications play a very important role. In writing specifications, the following elements should be considered.

Do not request features or quality that is not necessary for the items' intended use.

Include full descriptions of any testing to be performed.

- Include procedures for adding optional items.

Describe the quality of the items in clear terms.

The following actions can help save money when firms are stocking inventory:

Substitution of less costly materials without impairing required quality;

- Improvement in quality or changes in specifications that would lead to savings in process time or other operating savings;

Developing new sources of supply;

- Greater use of bulk shipments;

Quantity savings due to large volume, through consideration of economic order quantity;

- A reduction in unit prices due to negotiations;

Initiating make-or-buy studies;

- Application of new purchasing techniques;

- Using competition along with price, service and delivery when making the purchase selection decision.

When firm chooses to implement specific inventory techniques into the workplace, it'll find that its job is much easier and that its entire department runs more smoothly. Here are a few simple but essential inventory management techniques that will assist firms in keeping track of their inventory without a hassle.

## **STOCK ROTATION**

Every good department head understands the importance of stock rotation. When new stock arrives, it is filed into the inventory kept in the warehouse behind any current stock of the item. This allows for older product to move out to the sales floor or to the ordering customer first. When firm rotates stock, it keeps any of its inventories from becoming outdated and useless. If anything expires or becomes outdated, it is no longer usable merchandise and must be written off as a loss. Therefore, stock rotation is one of the most important inventory techniques one can employ to achieve success.

### **CREATING A SYSTEM**

When new inventory arrives, it cannot be placed in any open area of firm's warehouse. Firms must employ some sort of systematic stocking agenda so that all replenishment of stock is regulated. If a new item is to be shelved in the warehouse, room must be made for it in an area of similar items. This system must be made clear to all employees who handle the inventory in your department or supply house so that there are no errors resulting in lost or misplaced inventory. This sort of organization is obviously one of the more important inventory management techniques involved in keeping track of current stock.

### **LABELING**

Of all the inventory management techniques firm could employ in its workplace, labeling is probably the most

important. Especially if firm has a large warehouse of merchandise, it is absolutely essential that everything is clearly labeled so that all replenishment stock can be placed in the proper area with no hesitation or uncertainty, and also so that any outgoing merchandise can easily be located for shipping. On top of that, when an inventory check is completed, it will make the process of reconciliation that much simpler to handle.

## **INVENTORY MANAGEMENT SOFTWARE**

Using any kind of software that assists firm in tracking its inventory can be helpful as well, making it simple to just scan in and out any moving merchandise on a daily basis. Using a database or other software can make the other inventory management techniques that much easier for it by cataloguing all the information for it, including quantity on hand, cost of the item, and location within your warehouse. It also gives a clearer picture of how quickly items are sold and allows inventory checks to be processed more quickly and efficiently.

As one can see, some of the inventory management techniques, that are best suited to help firm maintain its responsibility without any hassle, are not all that difficult to employ. Especially if it has a good management software package, all the other techniques can easily fall into place. With a robust training program for employees and a drive to

follow these pointers, managing your inventory will be a breeze.

Inventory control has been a must in running a business or an organization. This involves small business software (for small and medium businesses), lean manufacturing, business accounting software, and inventory systems.

There are techniques involved in managing your inventory, such as the following (with their definitions):

1. **Stock rotation:** As new stock arrives, it is recorded into the inventory (usually stored in a warehouse) and placed behind any existing stock of such items, to allow older products to move out to the sales floor and pass on to the ordering customer. Stock rotation keeps your inventory updated, as if anything expires; it would no longer be usable and must be declared as a loss.

2. **System creation:** Creating a system must be specific to the type of business. Firm could apply a system where a new item would be shelved and should create room for similar items. This must be cleared with those handling its inventory to minimize errors, like misplaced inventory. System creation is a must in keeping track of its current stock.

3. **Labeling:** When firm has a huge warehouse of merchandise, it is a must that everything is appropriately

and clearly labeled so that all stock designated as replenishment stock would be stored in its assigned area. Labeling would also help it identify outgoing stock and such make it easily tracked when delivered or shipped. Properly labeled stock would make reconciliation of items simpler to manage.

4. **Inventory Management Software:** Use technology to one's advantage by employing inventory management software that would track one's item. Create a database or use other software when cataloguing its items, including information such as firm item's quantity, item's cost, and item's location in your storehouse. Inventory management software would also help to know which items are sold faster. Such would allow the inventory checks to be efficiently processed.

The inventory management techniques cited here are easy to apply. Complement that with a reliable inventory management software package and such techniques could be easier, even seamlessly implemented. Couple its inventory management techniques with a training program for its employees, so they would diligently and accurately perform their inventory jobs.

Attending inventory management seminars; checking and applying inventory management resources from Web sites, papers, books, and publications; joining management forums, and availing of management training are some of

the means where firm could enhance the inventory management techniques for its business success.

Additional lessons that could be covered in attending such inventory management seminars include (but are not limited to) the strategic role of inventory management; front-end optimization of inventory levels; systems for inventory planning and replenishment; automating order processes; distribution and service inventories, and inventory accuracy and audits.

In addition, when efficient inventory management techniques are employed, one would be able to enjoy the benefits of reducing one's costs; becoming responsive to one's clients' needs; making one's scheduling and shop loading efficient; narrowing the gap between sales and stock replenishment, and fine-tuning the record-keeping accuracy.

## **CONCLUSIONS**

"Inventory" to many small business owners is one of the more visible and tangible aspects of doing business. Raw materials, goods in process and finished goods all represent various forms of inventory. Each type represents money tied up until the inventory leaves the company as purchased products. Likewise, merchandise stocks in a retail store contribute to profits only when their sale puts money into the cash register.

In a literal sense, inventory refers to stocks of anything necessary to do business. These stocks represent a large portion of the business investment and must be well managed in order to maximize profits. In fact, many small businesses cannot absorb the types of losses arising from poor inventory management. Unless inventories are controlled, they are unreliable, inefficient and costly.

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