CHAPTER - V

Techniques of
Inventory Management
Brief accounts of inventory Management techniques are presented in this chapter. Inventory accounts for a substantial portion of the capital employed in any organisation. It constitutes stocks of resources held for future production activity or sale. Inventory holdings are often considered as the graveyard of business, as surplus stocks have been a principal cause of business failure. This kind of attitude in the outlook of business towards inventory may be attributed to the increasing size, wide variety and complexity of business enterprises, urgency of modern requirements to cope up with the business world and high idle cost of machines and men. At the same time "the efficient management and control of inventory not only solves the acute problem of liquidity but also enhances annual profits and causes substantial reduction in the working capital of a firm". The increasing importance of inventories as a core ingredient in gross working capital obviously calls for maximum efficiency in managing them for the careful efficient management of working capital.

Concept

The literary meaning of the word inventory is stock of goods. The term inventory' in its broader sense is referred to as idle resources provided that such resources have economic value. As per accounting terminology, inventory means, "the aggregate of those items of tangible property which -

a. Are held for sale in the ordinary course of business.
b. Are in the process of production for such sale and
c. Are to be currently consumed in the production of goods or services to be available for sale.
From the definition it is clear that inventories consist of the following types.

1. Raw materials and bought in components are the stock of material held prior to their utilisation in the production process.

ii. Work-in-Progress includes products, which are only part way through manufacturing process. Raw material, labour, sub contracting and other manufacturing costs all together constitute work-in-progress.

iii. Finished goods are products, which the company sells to its customers.

iv. Spares are the items required keeping plant and machinery in working condition.

In a typical manufacturing concern, in addition to the above, there are other inventories, which include supplies. These are the materials used in running the plant or employed in producing products. These include miscellaneous consumable stores such as cotton waste, oil and greases and other general office supplies, printed forms, electric supplies and tools like needles and spanners.

The term inventory has been defined in many ways. Some of them are as follows. According to Kholar, the term inventory may be defined as "any class or group of materials or supplies or construction materials". Starr and Miller defined the term inventory as "a stock of some kind of physical commodity". Greene defined inventory as "the movable articles of the business, which are eventually expected to go into the flow of trade". Inventory from the viewpoint of financial manager in the aggregate value of raw materials, stores and spares, consumables, work-in-process, finished goods in which the company's funds have been invested.
The operational definition of inventory would be the amount of raw materials, fuels and lubricants, spare parts and semi-processed material to be stocked for the smooth running of the plant. Inventory in management parlance is an idle resource of any kind having an economic value\(^1\) so long as the resource is kept in the warehouse, it is idle. But the material has the economic value, in the sense that is capable of being converted into semi-finished and finished goods and sold to the customers to buy more items.

Inventory in a wider sense is defined as any idle resources of an enterprise. It is commonly used to indicate materials—raw, in process, finished, packing, and spares and other—stocked in order to meet the demand or distribution in the future. Even through inventory of materials is an idle resource in the sense it is not meant for immediate use, it is almost a necessity to maintain some inventories for the smooth functioning of an organisation. Inventory is made of all those items ready for sale or of items, which keep the process running\(^1\).

Inventory as current asset differs from other current assets, because only financial managers are not involved, rather managers of all functional areas, i.e. finance, marketing, production and purchasing are involved. The views concerning the appropriate level of inventory would differ among the different functional areas\(^1\). More over in the words of Fred Hansman an inventory is idle resource of any kind, provided that such resource has economic value\(^1\).

The Need

Inventories generally occupy the key position in the structure of working capital. Not only large investments involved in inventories, but the cost of inventory also forms a major portion of the cost of production in many manufacturing enterprises. Therefore, it is absolutely imperative to study the need of inventories in any enterprise.
The finished products after packaging are first stored and sent to the market as the need arises or orders are received. Also the raw materials needed for the finished product cannot be directly fed to the production department from the market. These have to be stored first after procurement. These things put together give an idea of storing these items. This process of storing is called inventory.

Every business must have some inventory of some kind. In fact no business can exist without inventory. The manufacturing enterprises must have inventory of raw materials, purchased components, in-house fabricated sub-assemblies etc., needed to operate and produce a finished product. It also has to maintain an inventory of finished products in anticipation of demand for them. Thus inventories act as a protective cushion for the continuous operations in any manufacturing enterprise. 

In practice, almost every manufacturer carries an inventory that is substantially greater than minimum amount, because of the following reasons.

1. Primarily inventory is held for transaction purpose. Today's inventory is tomorrow's consumption. Normally there is a time lag between the recognition of the need and its fulfillment. This period is called lead-time, consequently, greater the lead-time, greater will be the inventory.

2. Inventory is held as a precaution or as a contingency for increase in lead-time or consumption rate.

3. There is a speculative element in the reasons for holding inventory. Price may rise or materials may become scarce during certain period of time.
4. The marketing, sales production departments, all find it more convenient to have supply on hand that is more than ample.

5. Adequate inventories protect a firm against the shortages that would result in production stoppages and considerable losses.

6. Customers desire a prompt fulfillment of orders A firm should have the goods available for sale, other wise the customers are likely to get their orders executed by competitors.

7. Finally the maintenance of inventories facilitate smooth production and sales operations.\textsuperscript{15}

Inventory Management

The concept of inventory control first came to light when Harris F.W. Published his work on classical order size model. This work is extended by Raymond F.E (1931) and Wilson R.M. (1934). But only after the Second world war, with the development of operational research and computer technology that the theoretical concepts got a practical application. In India inventory control techniques were developed in 1960. The increased pace of industrialisation in India has highlighted a number of management problems. Among them the most important problem is inventory management. As a professional are a of development, the areas of production, marketing and financial management were given greater importance in the first flush of 'managerial revolution'.

The term Inventory Management has been defined in many ways and most of the definition stress the importance of achieving cost control and cost reduction. Inventory management is concerned with the determination of optimum level of investment for each component of inventory and also the efficient use of such
components of inventory\(^6\). It involves the process of planning and control of assets being produced with a view to selling in the normal course of operations of the enterprise\(^7\).

It may also be defined as the sum total of those activities, which are necessary for acquisition, storage, sale and disposal, or use of materials. It is a subject, which merits the attention of top-level management and influences the decisions of the planning and executive personnel. It is a matter of deep concern to those dealing with, production, sales forecasting, inventory planning, marketing, materials handling, finance, product designing and engineering\(^8\).

The Committee On Public Undertaking (COPU) defines inventory management as "acquisition, storage, sales disposal or use of materials, explains the function of planning and programming of materials, purchasing, ware housing, disposal of scrap and surplus material and utilization of by products by the management\(^9\). Inventory management in thus, a vital area of management covering the sum total activities necessary for acquisition, storage and use of materials. Its objective is to a) meet a high percentage of demand without creating excess stocks. b) Provide re-order points and order quantities for items scientific basis. c) Decide what to stock and what to procure on demand; and 4) Utilise storage space economically\(^20\).

Objectives of Inventory Management

Scientific inventory management is considered to be an important factor influencing the industrial prosperity of a nation. It has been rightly pointed out that the great scope for cost control and cost reduction lies in efficiency of material
management for the reason that the outlay on materials accounts for a major share in the total cost of production. Thus, scientific inventory management is not only a sine qua non for cost control and cost reduction, but also a key to industrial prosperity.²¹

In any organisation inventory management must try to spell out its objectives. Some of the common objectives of inventory management are as follows.

1. To have stocks available as and when they are required.
2. To utilise available storage space, but prevent stock levels from exceeding space availability.
3. To meet a higher percentage of demand without creating excess stock levels, in other words; neither to overstock nor to run out is the policy.
4. To decide which items to stock and which items to procure on demand.
5. To ensure adequate supply of materials, stores, Spares etc., and minimise stock out and shortages and also to avoid costly interruption in production and sales operation.
6. To keep down investment in inventories, inventory carrying costs and obsolescence losses to the minimum.
7. To facilitate purchasing economics in purchasing.
8. To provide a check against losses of materials through carelessness or pilferage.
9. To serve as a means for the location and disposition of inactive and obsolete items of stores.
10. To provide a perpetual inventory values and a consistent and reliable basis for preparation of financial statements.

11. To contribute to profitability finally.

12. To enable the management to make costs and consumption compressions between operations and periods.22

Functions

Inventory management is an area of material management, which is an all-embracing concept, covering the entire spectrum of business activity. Inventory management covers the entire range from materials planning to the final delivery of the product to the customers. The basic functions of inventory management are:

a. Inventory planning and programming;
b. Purchasing;
c. Store-keeping and ware housing;
d. Inventory control, handling and transportation;
e. Codification and standardisation;
f. Value analysis, disposal of obsolete and scrap material

Inventory management has two broad functions.23 Inventory accounting and inventory control;

Inventory accounting is concerned with book keeping aspect of inventory management. This function deals with the entry, processing and distribution of inventory stock, which in turn provides a history for all inventory transactions. This accounting will also provide information for the comparison of book inventory to the actual physical count of inventory stocked.

Inventory control may be defined as "a system of internal check and control to ensure that inventories of stores, raw-materials, finished good, work-in-process
are protected against irregularities and that the information related to inventories which is required in the preparation of operating and financial statements is authentic and reliable. Inventory control consists of planning, ordering and scheduling the release of materials used in manufacturing process. The efficient management and effective control of inventories help in achieving better operational results and reduce investment in total current assets. The principal objective of inventory control is to reduce investment in inventories and simultaneously to improve the profitability of firms. The other objectives of inventory control are:

a. to minimise idle time caused by raw-material shortages and breakdown caused by non-availability of critical spare-parts.

b. To keep down the capital investment and the cost of carrying inventory. Although, the broader concept of inventory management includes inventory control as a whole it is usual for the material department to be, primarily concerned with stock control of stores, inventory control of regular stock items. Inventory control is the most important function of the inventory management and it forms the nerve centre in any material management organisation. It also determines the time and quality of items to be procured.

Thus, the objectives of inventory control are as follows:

i. Economy or provisioning at minimum investment and cost without jeopardizing essential production; and

ii. Insurance against due to stock outs of materials.
Importance

The importance of inventory management has been substantially realised of late, all over the world in view of the significant influence on the profitability of an organisation. In majority of the manufacturing enterprises, inventories represent a significant part of the total investment. As such investment in inventories should be subjected to rigorous control to ensure that every rupee of investment in materials has productively been utilised. Good inventory management is good financial management. An efficient management of inventory will ultimately result in the maximization of owner's wealth.

Recent studies have shown that in many manufacturing companies the inventory investment can range from 20 to 35 percent of its total capital. On an average, inventories are approximately 60 to 70 percent of current assets of public limited companies in India. Because of large size inventories maintained by the firms, a considerable amount of funds is required to be committed in them; it is therefore absolutely imperative to manage inventories efficiently and effectively in order to avoid unnecessary investments in them. An undertaking neglecting the management of inventories will be jeopardising its long run profitability and may fail ultimately. That is why inventories are regarded as graveyard of business and the uncontrolled inventories as the cancer of industries. It is possible for a company to reduce its levels of inventories to a considerable degree, eg., 10 to 20 percent without any adverse effect on production and sales by using simple inventory planning and control techniques. The reduction in excessive inventories carries a favourable impact on a firm's profitability.
Inventory management is hence, an important area and it plays a vital role in any country, particularly in a developing economy like India. The importance of an inventory management of an organisation depends upon the extent of inventory investment. Heavy inventory holding lead to unnecessary blocking of scarce capital and high holding costs. On the other hand, in adequate inventory leads to stock out costs. Therefore, it is necessary to decide judiciously about the size of inventory in an enterprise. To achieve higher operational efficiency and profitability of an enterprise, it is very essential to reduce the amount of capital locked up in inventories. This will help in achieving high return on investment by minimising tied-up working capital.

The application of scientific techniques of inventory management has received hardly any attention in India. Hence, the Government of India constituted a Parliamentary committee to study and recommend on various aspects of inventory management. The committee has urged for greater attention of the administrative ministries to the problem of inventory management in the undertakings under their control, such as integration of stores and purchase departments, adoption of modern techniques of classification, codification and standardisation, variety reduction, value analysis, preparation of manuals of materials management and training of personnel in modern methods.

It is quite observed that inventories in India whether in the private sector or public sector are much higher than those in America and other European Countries. Japan has the lowest ratio of material cost with a moderate incidence of labour costs, which explains its competitiveness in the international market. In India, particularly in most of the manufacturing concerns, the inventory management systems were neglected till recently. Consequently the working capital of several
concerns had gone up by leaps and bounds neglecting all accepted norms. Many
times the objections raised by the controller and Auditor General of India\textsuperscript{31} in
respect of Andhra Pradesh State Enterprises were relating to the management of
inventories. Inventory, which constitutes a sizeable portion of the working capital,
is not being managed efficiently and it is the main reason for the persistent losses in
state level public enterprises of Andhra Pradesh. With the introduction of new
economic policy and liberalisation recently, the industries are facing increased
competition and this necessitates efforts to cut the costs to the bare minimum.
Naturally inventory area offers better scope unmatched by any other for the purpose
of reducing costs.

Several research studies that have been conducted on inventory problems of
public enterprises have revealed that maintenance of huge inventories has been a
bane of Government companies and still remains a liability\textsuperscript{32}.

Inventories in public enterprises of Andhra Pradesh Constitute as high as 70
percent of current assets. It was also noted that large blocking of funds in financing
heavy inventories was one of the main reasons of low productivity in public sector
units\textsuperscript{33}. It was also noted that there was not much appreciation of need for effective
inventory management in the Indian context, possibly due to sheltered market, a
shortage situation and hence a fear of stock-outs which would go against
production at any cost\textsuperscript{34}. In addition considering the fact that inventories account
for a major share of investment in working capital management, the key factor
must be the control of inventories.

The studies also revealed that the area of inventory control is being
neglected in power sector thermal stations leading to piling up of inventories and
consequently mishandling, wastage and locking up of invisible funds. It implies
that concentrated efforts on inventory items with scientific and innovative methods of inventory control helps in releasing the tied up funds for other productive purposes. Further, studies made in India have revealed that the scientific techniques of inventory management can reduce inventory investment, some time as much as 50 percent or even more. It is the area that offers a greater scope for improvement and needs greater attention and research on thermal stations. Therefore, investment in inventories should be subjected to rigorous control to ensure that every rupee of investment in inventory has contributed to increased profitability.

**Techniques of Inventory control**

An effective management of inventories will ensure adequate supply of materials and avoid the interruption of production process and at the same time minimise the investment on inventories. If the inventory management techniques are used effectively, they will enable to keep inventory levels and unit costs low with a minimum of stock-outs. For this purpose, the techniques of inventory control such as ABC analysis, Economic Order quantity, Re-order point, codification, vital, essential and desirable (VEP) Analysis, fast, slow and non-moving (FSN) analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM) etc., are popularly used by the power stations. The techniques of inventory management are also used to control the inventories. Hence, there is no clear-cut distinction between techniques of inventory management and inventory control. The need for using these techniques in India has been stressed by various committees. For example, the Report of the committee on public undertakings mentions, for proper inventory control, it is essential to adopt the scientific practices and techniques that have been developed in this regard.
Control of inventory is exercised by introducing the following measures:

1. Selective inventory control techniques.
2. Fixation of norms of inventory holdings.
3. Review of inventory levels.
4. Inventory report; and
5. Ordering system of inventories.

Selective Inventory control Techniques

Selective control is very simple approach. For the purpose of selective control, a different system of classification is attempted. The chart 5.1 indicates the different classification on methods available for the purpose of inventory control. Selective Inventory control can be broadly divided into eight types.

**Chart 5.1**

*Different Classification Methods for Inventory Control*

<table>
<thead>
<tr>
<th>Classification</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABC</td>
<td>Value of items consumed</td>
</tr>
<tr>
<td>(Always Better Control)</td>
<td></td>
</tr>
<tr>
<td>VED</td>
<td>The importance of critically</td>
</tr>
<tr>
<td>(Vital, Essential and Desirable)</td>
<td></td>
</tr>
<tr>
<td>FSN</td>
<td>The pace at which material moves</td>
</tr>
<tr>
<td>(Fast moving, slow moving, non moving)</td>
<td></td>
</tr>
<tr>
<td>HML</td>
<td>Unit price of in material</td>
</tr>
<tr>
<td>(High, Medium, how)</td>
<td></td>
</tr>
<tr>
<td>SDE</td>
<td>Procurement Difficulties</td>
</tr>
<tr>
<td>(Scare, Difficult, Easy to Obtain)</td>
<td></td>
</tr>
<tr>
<td>GOLF</td>
<td>Source from which material is obtained</td>
</tr>
<tr>
<td>(Government, Ordinary, Local foreign)</td>
<td></td>
</tr>
<tr>
<td>SOS</td>
<td>Seasonality, This applies essentially to commodities</td>
</tr>
<tr>
<td>(Seasonal, Off Seasonal)</td>
<td></td>
</tr>
<tr>
<td>XYZ</td>
<td>Value of items in stores</td>
</tr>
</tbody>
</table>
1. ABC Analysis

ABC analysis is relatively a very simple technique but at the same time a very useful and powerful technique of management and has multifarious applications. Originally developed for control of inventories, the technique is so versatile that it is applicable not only to inventory control, but in almost every field, where a large number of items or a large number of characteristics are to be watched and controlled by an executive.

ABC analysis is an important technique of inventory management. It will serve as a very useful weapon of controlling inventories and if properly utilised it contributes significantly to industrial merchandise and other organisations.

The first step in the inventory control process is classification of different types of inventories to determine the type and degree of control required for each. The ABC system is a widely used classification technique to identify various items of inventory for the purpose of inventory control. These techniques based on the consumption that a firm should not exercise the same degree of control on all items of inventory. It should rather keep a rigorous control on items that are (a) most costly and/or b) slowest turning while items that are less expensive should be given less control effort.

The ABC analysis is an analytical management tool for focussing attention and applying effort the area of inventory management ensuring control over inventories. According to this system, inventories are categorised in to three classes Viz., A, B and C on the basis of magnitude of value of components of inventories to the total inventory. The items included in group 'A' involve the largest
investment. Therefore, inventory control should be most rigorous and intensive and the most sophisticated inventory control techniques should be applied to these items. 'C' group consists of items of inventory, which involve relatively small investments although the number of items is fairly large. These items deserve minimum attention. 'B' group stands mid-way. It deserves less attention than 'A' but more than 'C'. Employing less sophisticated techniques can control it. The tasks of inventory management are to properly classify all the inventory items into one of these three categories.

The value of items in Class 'A' may be significant as a result of:

* The usage being sustained, though per unit cost of items may be small.
* Per unit cost of items being substantial, though the usage may be small.
* Both per unit cost of items and usage being substantial

**VED Classification**

VED stands for vital, essential and desirable. It applies largely to spare parts. The demand for spare parts depends on the performance of equipment. The vital spares should be stocked adequately. Essential parts may be stocked rather sparingly, for some risk can be taken stocking such spares. Desirable spares may be dispensed with if the lead-time for their procurement is low. It may be remembered that this classification is done by the technical department of an organisation and that will have to be combined with an earlier classification.
FSN Classification

The letters stand for fast moving, slow moving, non-moving. The FSN classification is mainly attempted on the basis of consumption pattern. It is made on the basis of how the materials have moved during the earlier periods, and is often, combined with XYZ classification, which is based on value of items in storage. The FSN classification helps in timely prevention of obsolescence. When FSN classification is made, all such information stands out prominently enabling the managers to act on the information in the best interests of the organisation.

HML Classification

HML stands for high cost, medium cost, low cost, this classification is made on the basis of the unit value of an item. Some items may be of low value while others may be of high value. The items should be listed out in descending order of unit value and management may fix limits for deciding the three categories. For example, it may decide that all items of the unit value above Rs.5000 will be H items, between Rs 1000 to 5000 will be M items, and below Rs 1000 will be L items. On this basis, the management may delegate the authority to various subordinate officers to purchase petty cash items.

SDE Classification

SDE stands for scarce, difficult and easy. It is made on the basis of scarcity of materials. The materials are classified on the basis of the nature of suppliers, the quality and continuity of supply, the lead-time involved and such other considerations. A scarce item might be an item, which is not easily available in the
market, or else it might be an item. Which is very difficult to manufacture for there are only one or two manufactures that have to be given orders several months in advance and soon.

**GOLF Classification**

This word stands for Government, ordinary local, and foreign. There are many items of import, which are channelised through the State Trading corporation Indian drugs and pharmaceutical limited, and minerals, & metals trading corporation. There are special procedures to be followed for procuring such items. As such ordinary procedures of inventory control may not work in respect of these materials they would require special treatment. Similarly, items, which are available with in the country, could be treated differently, if they were available locally. Imported items would be a special class by themselves and have to be accorded a treatment, which is quite unique.

**SOS classification**

It stands for seasonal and off-seasonal. Some of the items required are seasonal in nature and require special purchasing and stocking strategies. Many commodities especially of agricultural origin and seasonal in character have to be purchased at the best time; one cannot apply EOQ (Economic Order Quantity) here for example. Inventories at the point of procurement will be extremely high which cannot be helped. A buying and stocking strategy for seasonal items would depend on a large number of factors and a high degree of sophistication will take place in this matter. Operational research techniques have to be used to obtain optimum results.
XYZ Classification

This is attempted on the basis of the value of items in storage. The purpose is to classify inventories and their uses at scheduled interval. X items are whose inventory values are high, while Z items are those inventory values is low. This type of classification helps to identify those items, which are extensively stocked.

Fixation of Norms of Inventory Holdings

The norms for inventory could be set either by the top management or the materials department. The top management usually sets monetary limits for investment on inventories. The material department then has to allocate this investment to various, items and ensure the smooth operation of the company. It should be worthwhile, if the inventory norms are set by the "Management By Objectives" (MBO) concept. This concept expects the top management to set the inventory norms (limits) in consultation with the materials department. The norms thus evolved should be specific and quantified. The achievement of the targets set is the responsibility of materials department. In setting up of the norms, the involvement of persons, who are directly responsible for maintaining the inventory, is very desirable. Other departments, involved in setting the norms are finance, production, marketing, and materials control. The norms of inventory should be converted to specifically spell out parameters like the number of stock-outs permitted, the sales to inventory ratio and inventory to consumption ratio.

Carrying too much or too little of the inventories is detrimental to the firms. If too little inventories are maintained, the firm has to encounter frequent stock outs and incur heavy ordering costs. Very large inventories subject the firms to heavy
inventory carrying costs in addition to the unnecessary tie up of capital. In an efficient inventory control, costs are minimum and at the same time there is no stock-out, which may result in loss of sale or stoppage of production. This necessitates the determination of minimum and maximum levels of inventories.

1. **Determination of minimum level of inventory.**

The minimum level of inventories may be determined on the following basis.

a) Consumption during lead time or

b) Consumption during lead-time plus safety stock.

A firm would not be required to maintain any stock if the goods were available instantaneously on demand. Experience has shown that it is not so. The indenting firm requires some time to process the order. The supplying also requires time firm to execute this order. This period is called lead-time. Lead-time is defined as the period, which elapses between the recognition of the need and its fulfillment.

The safety stock refers to extra inventory against the possibility of stock-out. It is very rare to maintain constant lead time and usage rate since variations in usage and lead time cause both shortages and an item, therefore, depends upon its lead time, carrying cost and its importance, which can be measured in terms of its stock out cost\(^4\). If the lead time is constant, usage rate is variable and maximum usage rate is specified, it is necessary to no distribution of actual usage about the average usage during lead time order to determine the safety stock which will provide a specific for an item is consultation with the purchasing personnel and
from the past records. The safety stock sufficient to last the periodic difference level of safety stock is determined by the trade-off between the stock and carrying costs. The simple method of determining safety stock is to protect against stock outs.

Safety stock can be determined on the basis of past experience of delays in receiving supplies, fluctuations in the consumption rate plus other relevant factors such as transport bottlenecks, strikes or shutdowns. In the case of uncertainty, probabilistic approach may be applied to determine the safety margin.

2. Determination of maximum level of inventory

The study group\textsuperscript{42} on bank credit observed that it is not the function of industry to carry stock in excess of what is required for current operations. As otherwise industry will be taking over the function of traders. In practice one finds that all firms try to carry inventory exceeding their current needs. According to van Horne\textsuperscript{43}, Inventories should be allowed to increase till the resulting savings exceed the total cost of holding the added inventory. The balance finally reached depends upon the estimates of actual savings, the cost of carrying additional inventory and the efficiency of inventory control. Other things remaining the same, the firm will go on increasing its inventory, till the opportunity cost \textsuperscript{44} of funds is less than the estimated return from investing funds on inventory.

Generally, any one or more of the following factors may be the primary or secondary consideration for the firm while accumulating more and more of the inventories.
a) Future production plans  
b) Supply condition of goods  
c) Price changes  
d) Carrying cost of inventories, such as insurance, interest and rent etc.,  
e) Storage space available: and  
f) Opportunity cost of the funds employed.

The majority of firms in India give primary consideration to future production plans, supply condition of goods and changes in prices in determining the maximum level of inventories.

Review of Inventory Levels

Nothing is static in the business world, so also with inventory policies. For an efficient and effective management of inventories, it is essential to review periodically the level of inventories and to effect changes in the light of the review. According to a study conducted it was observed that 50 percent of the firms selected for the study do not have any fixed period to review inventory levels and these firms review as and when they feel it necessary. Thirty percent of the firms review the inventory levels every quarter or remaining twenty percent of firms review once a year. Thus, a wide variation exists among the firms with regard to the review period of inventory levels. For better inventory control, it is desirable that review of inventory levels particularly those of 'A' items should take place regularly at shorter intervals, so that necessary corrective steps are taken in time. A review of levels of all the items of inventory once in a year is not considered satisfactory.
Ordering systems of Inventory

There are two important systems, which enable the management to control inventories. 1) Fixed quantity system. 2) Fixed period system.

1. Fixed quantity system

Under this system, the quantity ordered is fixed, but order period varies from time to time. This system is also popularly known as Economic Order Quantity system (EOQ)

a) Economic Order Quantity

One of the most effective techniques for determination of quantity to be ordered is called 'economic order quantity'. The basic objectives are to economies on the total cost of purchases.

The economic order quantity is one of the most commonly used techniques of inventory management and control. The economic order quantity may be defined as that level of inventory order that minimises the total cost associated with the inventory management. It is also known as economic lot size. This technique will help the enterprise to determine the appropriate order quantity of purchases, which provides maximum economy in purchasing of materials and ultimately it contributes to maintain optimum level of materials at a minimums cost. The economic order quantity is determined bared on.
1) Ordering costs and ii) carrying costs

1) Ordering costs

These are the costs of placing an order with the supplier and mainly include cost of stationary, salaries, postage, telephone etc. These are normally staked in terms of cost per order.

2) Carrying costs

These are the costs of holding the stocks in storage. These include cost of operating stores interest on capital locked up in stores, deterioration and wastage of material and opportunity costs. These are is the nature of variable costs and they are expressed as rupees per unit for a period.

Economic order Quantity

\[
\text{EOQ} = \sqrt{\frac{2 \times \text{annual consumption} \times \text{cost of ordering per order}}{\text{cost per unit} \times \text{carrying cost in percentage}}}
\]

Thus, EOQ technique determines the size of an order to acquire inventory so as to minimise the carrying as well as ordering costs. In other words, the EOQ provides an answer to the question of how many inventories should be ordered in one lot. Another important question pertaining to efficient inventory management is that when should the order being placed to procure the inventory. This aspect of inventory management is covered under the re-order point.
Re-order point

The re-order point is the quantity level at which a replenishment order should be issued to ensure that fresh supplies will arrive in sufficient time to keep the item from running out of stock. In other words, the re-order point may be defined as that level of inventory when fresh order should be placed with the suppliers for procuring additional inventory equal to the economic order quantity. This level is fixed by knowing the material usage rate and lead-time for procurement assuming both are constant. This can be computed by multiplying lead time in days for procurement with average daily usage or else in the procurement lead time in days for procurement with average daily usage or in the procurement lead time leads to temporary stock out position. To avoid this, safety stock is to be maintained.

Fixed period system

This system is also called as periodic re-ordering system or periodic review system or replenishment system. In this system, the economic order quantity is converted into this scale and this period is known as fixed while order quantity order is varied. This system takes full care of the variations in the lead-time consumption. In this system, we have to plan for any increase in consumption during the period between the orders. Since the system takes care of variations in demand during lead-time and review time, the levels on inventory in this system are obviously higher than the levels in EOQ system. But the great advantage lies in the reduction of monitoring labour and launching orders. It is not an effective system for high value i.e., 'A' items. This system however, is extremely useful for 'B' and
'C' items. This is because; items in these classes can be grouped together on the basis of the same review time. The review is the same for items with the same annual consumption value, the review period is fixed with the help of EOQ, the annual demand, divided by EOQ, gives a number of orders in a year.

\[ N = \frac{D}{EOQ} \]

Where, \( N \) is the number of orders per annum

\( D \) is the annual consumption

\( EOQ \) is the economic order Quantity.

Variety Reduction

In an organisation, which has to stock innumerable items, it is imperative to reduce the number of items carried in an inventory, the number of items, particularly the different small items, which are sparingly used. In case of work in progress the increase in varieties may be due to technical bottlenecks. With the increase in the items of raw materials, work in progress, and output, inventory control becomes more and more cumbersome. An organisation will therefore have to take proper steps to ensure that variety reduction is made possible.

Reduction in the variety of stocks can be achieved through

(a) Standardisation, where instead of having ten different types of materials or components, it is decided to standardise on one type. The result is elimination of variety and this is called variety reduction.

(b) Codification usually results in variety reduction. Often different names and invariably all these are separately stocked call the same part. Codification
leads to variety reduction. The latter has main advantage that it reduces inventory. The smaller the number of items carried the lesser are clerical costs required to maintain them, and reduction in inventory leads to lower working capital requirements.

While dealing with variety reduction and standardisation, the committee on public understanding mentioned that another reason for large inventories in public undertakings was that the items of stores were multitudinous in variety. The committee on public undertakings desired that the matter should be pursued vigorously by public sector undertakings in co-ordination with Indian agencies.

**Standardisation**

Value analysis programmes are usually designed to reduce the cost of an item. Standardisation programmes may eliminate the item-entirely. Standardisation is essential to a modern mass production economy. Almost every major industry has standards to classify its products. A standard is defined as that which has been established as a model to which an object or an action may be compared. The purpose of a standard is to provide a criterion for judgement. The companies are standard both for the products they design and for the materials designed by their suppliers. Standardisation is therefore, required not only for ensuring procurement of the right quality of incoming material, but also for cost reduction.

**Inventory Control Practices in Thermal Power Stations**

Inventory control is the most important function of the materials management and it forms the nerve centre in any material management
organisation. Inventory control is the process of deciding the kind and quantity of various items, which are to be kept in stock. It also determines the time and quality of various items to be procured.

**Inventory Levels**

a. **Safety Stock Level**: A certain amount of stock maintained to meet any sudden fluctuation of demand or supply is known as safety stock level. The safety stock acts as a cushion or buffer. There are many sophisticated ways to calculate safety stock level. In power industry the safety stock may be taken as consumption depending upon the criticality / availability of stores.

i. Imported items and spares - 6 months

ii. Indigenous items and spares - 3 to 4 months

b. **Minimum Level**: For most of the items, it is taken as the same as safety stock level but for some insurance / imported stores, the level may be higher than the safety stock level.

c. **Maximum Level**: The maximum amount of admissible stock, which can be kept. This level can be determined as stock level and twice the lead time consumption. It should normally vary from three to eight months' consumption depending upon the lead-time and safety stock level.

d. **Re-order Level (or) Re-order Point**: This is represented by the safety stock and lead-time consumption. It is known as minimum level in stock holding.
e. **Lead time:** It is the time that elapses between submission of a want sheet for anything and the time taken to satisfy the need by supplying the material.

f. **Lead time consumption:** The average consumption of any item during the lead-time is known as lead-time consumption.

i) Lead time stock for imported items 6 to 16 months.

ii) Lead time stock for indigenous items three to six months.

Lead time changes depending on the items to be procured. The factors influencing the determination of the lead time in the thermal stations in Andhra Pradesh are; a) Transport facility b) official procedure c) tender processing time d) Location of the supplier and the e) price factor.

For an effective inventory control, the TPS (Thermal Power Stations) have applied and adopted different techniques and methods. They are fixation of inventory levels, analysing consumption pattern, determining economic order quantities, budgetary control, ratio analysis, ABC analysis, FSN analysis, XYZ analysis, codification, standardisation, perpetual inventory system and continuous stock verification. It is observed that the perpetual inventory control is the most prominent technique of inventory control. The other techniques of control are also in vague in the thermal power stations. The important techniques of inventory control practiced in thermal power stations are discussed here under.
ABC Analysis

The most important of all the techniques of inventory control is the ABC Analysis "Always Better Control". The basis of analysing the annual consumption cost goes after the principle, "Vital few-rival many" and the criterion used here is the money spent and not the quantity consumed. The general pattern of ABC analysis will be as following.

<table>
<thead>
<tr>
<th>Class</th>
<th>Percentage of total Items</th>
<th>Percentage of Annual Consumption cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-Item</td>
<td>10</td>
<td>70</td>
</tr>
<tr>
<td>B-Item</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>C-Item</td>
<td>70</td>
<td>10</td>
</tr>
</tbody>
</table>

A-Item

a) Since, these items account for over 70 percent of the total value, they should be ordered more frequently to reduce the capital locked up at a time in such inventories.

b) There would be some items for which the consumption varies considerably from time to time during a year. For such items, the expected future consumption should be estimated in advance and they should then be procured on a planned basis, so that only the required quantities arrive a little before they required.

c) Annual or six monthly contracts, which scheduled delivers with a specific period of order, are essential.
d) As far as possible, two or more suppliers should be selected for each item so that the dependency on one supplier is avoided. Due to strike, fire, lockout or any other eventualities if one supplier fails to supply, the other supplier can be approached.

B. Items

a) The policies for 'B' items in general are intermediate between 'A' and 'C' items.

b) Order quantities, re-order points and safety stock should be fixed for 'B' items and barring exceptions, and revisions once a year is adequate.

C. Items

a) Since these items are too many and the value is less, the policies are to be aimed to reduce the ordering and stock keeping to an extent possible, and ensuring the availability at all times by stacking liberal quantities.

b) Stocks to last for six months to one year can be kept since 'C' items do not involve much capital tie-up.

c) Annual or six monthly orders should be placed to reduce paper work and also to take advantage of discount for bulk purchases.

ABC analysis is carried out in the thermal power station in Andhra Pradesh under the Control of Andhra Pradesh Power Generation Corporation (APGENCO).

The monthly material consumption statements are prepared for each thermal station (KTPS, VTPS< RTP, NTS) (NTS was taken out of service with effect from
showing the class of inventory items consumed and based on such statements, annual, consumption figures are estimated and controlled. It is also observed that a small percentage of inventory items constituted a major portion of the total consumption in rupees. Such items include, coal, oil, specific oil, belts, wire ropes, GI Pipes etc. These items are again classified as Super-A items, which are subjected to rigorous control to ensure that investment in inventory is efficiently used. Items are about 10 percent of the total value. Hence, they are most important from the point of inventory control. B-items are 20 percent of the total number and account for 20 percent of the total value. There are other items which are large in number but account for only a small portion of the total consumption in terms of value which are classified as 'C' items and are relatively least important. Thus, by exercising a stringent control on a small number of items, which contribute for a very large value of inventory, it would be possible to control the overall inventory in the organisation.

**XYZ Analysis**

XYZ analysis is to stock what ABC analysis is to consumption. It is the counterpart of ABC in stock. It focuses the attention on the management of materials, which have been procured at a faster rate than their consumption rate. Hence, its procurement policy needs a review or has become obsolete and hence is to be disposed off.

a) 'X' items - items that have not moved for 2-3 years.

b) 'Y' items - items that have not moved for 3-5 years.

c) 'Z' items - items have not moved for 5-10 years.
d) 'Z' items - items have not moved for more than 10 years.

In order to concentrate on few, the non-moving items are further classified is to three classes;

a) With inventory value more than Rs.1,00,000-X class
b) With inventory value in between RS. 50,000 and Rs.1,00,000-Y class
c) With inventory value less than Rs.50,000-z class.

FSN Analysis:

Movement of various items of inventory forms the basis for FSN classification. Based on consumption pattern of various inventory items they are classified as fast moving, slow moving and non-moving items. FSN analysis is especially useful to combat the accumulation obsolete and non-moving items of inventory. To look into the various aspects of FSN analysis an inventory committee has been constituted, in the Generating power corporation. The committee has identified. Certain items as non-moving items and list of such items costs circulated to all the area stores to ensure that further orders are not placed for these items. In view of the significance of selective control techniques in the control of inventory investment, the efforts were initiated in the corporation to implement techniques with the help of computerisation.

System of Inventory Control in GENCO

The objectives of inventory control or

a) Economy of provisioning at minimum investment and cost without jeopardizing essential production; and.
b) Insurance against losses due to stock out of materials.
To achieve these objectives, one or a combination of the following systems are practiced in APGENCO.

a) **Periodic review system:**

Under this system, the items are periodically reviewed depending upon the essentiality of the items for stocks and the consumption pattern. Necessary action for procurement and delivery are taken after the review is done.

b) **Two Bin system**

The most common practical implementation of the re-order policy is the two-bin system. Under this system two bins of the stocked items are kept and replenishment order is placed when the stock in the first bin is exhausted. Further stock is withdrawn from the second bin when only the replenishment order is received to refill the second bin, the first remainder being placed in the first bin. The quantity of stock held in the second bin, therefore represents the size of the re-order.

c) **Stock Level System**

Stock level system is now days widely used. Once the levels of safety stock, re-order, maximum and minimum are fixed along with economic order quantity, the inventories are maintained within upper and lower limits. The levels are specified in the stock cards (Bin Card) and flags are attached to these cards of different
colour, to indicate the levels. For example, if the red is meant for safety stock level, immediate action is taken when the level is indicated by red flag.

Green indicated re-orders level. When the stock reached are-order level or nearing to re-order level, the stock keeper concerned has to bring it to the notice of Dy. COS/ADE stores for taking immediate follow up action the supplier, if orders are pending, and if not, with the purchase department for early placement of the orders. Such lists are to be submitted by all the storekeepers (section -in change) to Dy. COS/ADE stores once in a month to take immediate action for replenishment.

The APGENCO is a public sector undertaking; it cannot follow such simplified technique. This was only stated to show how much importance is paid according to the classification of the items of inventories. The most useful control method is establishing maximum and minimum inventory levels, though theoretically the minimum inventory level could be zero. In such a case, the last limit of the inventory would be used and at the same time, the new shipment will arrive. Maximum inventory than be the economic or correct ordering quantity. in practice, however, it would be unwise to follow this policy since it will involve planning, much close to safety and may result in stock -outs. Normally inventory point consists of the safety stock plus the correct ordering quantity.

Inventory control Measures and provisioning

It is desirable to review periodically the items where stocks have gone beyond the optimum level to share the inventory of such items. Compiling a statement of such items at regular intervals in the stores can do this. The list of over-stocked items can be hold, from computer every quarter where
computerization has been introduced and half-yearly, where computer stores accounting has not been introduced. The list of such over stocked items is to be items to the chief purchase and stores by all the area stores. The C.O.S will circulate the list to all other stores for indicating the requirement of these items for their area with particulars of average consumption per month, stock and pending orders. The C.O.S will arrange for inter-area transfers.

Action would also be taken by the purchase department to stagger the deliveries appropriately and even cancel the purchase orders is the case of such items where over-stocking has been detected. A list of unmoved items should be compiled for every six months/are year, in descending order of value. Their statement should indicate the quantity on hand and its value, quantity on order and the date of all issue for items, which have not moved for 1,2 or 3 years and above. After identifying such unmoved items and further procurement of such items should be stopped.

Despite introducing the above control measures the inventory cannot be effectively contrive, if the consumption of materials is not controlled. The best way to control the consumption is to fix the consumption norms for issue of consumable materials by the competent authority to the consuming units. The quotes of material to be issued. Can be provisionally determined on the basis of the past consumption pattern and taking into consideration the production in the want-sheet at the time of provisioning. The consumption norms should approve by director thermal/chairman and Managing Director.
The quota thus fixed is to be watched over a period of time and based on the further consumption data obtainable from the monthly consumption statements and reports sent by consuming units, the quota should be reviewed half yearly to cater to the actual needs of the consuming units. It is a continuous, but important process, which will depend to a great extent on the feed back data obtainable from the consuming units and the availability position.

**Inventory control & provisioning the Spare parts**

This is very important subject as, the most of the surpluses that accrue constitute the spare parts. Only indenting of first set of space for the equipment should be done on the basis of the manufacturers' recommended lists of spare parts, duly trimmed and adjusted so as not to exceed 10 to 15 percent of the total value of the equipment. Here also, it would be desirable to order smaller quantities in the initial stage and only after gaining experience by maintaining proper records of consumption for each type of equipment, larger quantities of spares should be powered. The items covering the first set of spares will be processed simultaneously along with the equipment in order to ensure availability of initial spares for preventive maintenance, when the new equipment are put into commission.

The second set of spares will be provided to cover the maintenance requirements for the third and fourth year operation of the equipment. The range of spares required will be on the manufacture's recommendations suitably adjusted in the light of experience gained in the first two years of equipment operation and the maintenance scales developed by engineers. It is very important to build up proper
consumption data right from the stage of commissioning the equipment, which should form the basis for all further requirements. The ten users based on the consumption pattern duly projected to cover the anticipated requirements and taking into consideration, the actual working conditions and the maintenance sales, will do the provisioning of subsequent requirements of spare parts.

**Standardisation and spares control**

The advantages of standardisation and variety reduction are too well known and need little reiteration. Training its relevance to the subject standardisation of plant and equipment in perhaps the effective way of controlling material (and spares) costs in an industry. Chart No: 6.2 show the effect of standardisation on spares management and maintenance costs of plant and equipment. In practice it has been found that an in-plant standardisation and variety reduction of production machinery helps in reducing, to in greatest extent, the number of spares parts and maintenance materials in stock and thus decreases the capital tied-up in these articles. The danger of associated with standardisation and variety reduction programme helps in establishing a realistic consumption pattern and maximum stock thus ensuring a more reasonable and realistic estimates for procurement.

It should however be borne in mind that standardisation is a means to an end and not an end in it self. Standarisation must begin to operate at certain stages of equipment procurement/purchase activities. If this is not done, standarisation at a later stage become difficult. Five sages can be distinguished is equipment procurement/purchase activities.
Stage 1 - Initial purchase procedures and tendering period

Stage 2 - Period of technical scrutiny and negotiations with firm (5)

Stage 3 - Equipment delivery

Stage 4 - Installation and commissioning period

Stage 5 - Plant and equipment operation.

Standardisation must operate at stage 1, 2, and 3. When once the equipment has been delivered and stage 4 i.e. installation and commissioning period, has started, it becomes difficult to decide on standardisation.

Obsolete, Surplus and Scrap management

Obsolete items are those materials and equipments which are not damaged and which have economic worth but which are no longer useful for company's operation owing to many reasons such as changes in product line, process, materials and so on. Thus, items, which are out of date, mostly superseded by a later design, are known as obsolete items. Thus, if a new type of grill has been designed for a motorcar, the previous one is called obsolete type. Surplus items are those materials and equipments, which have no immediate use but accumulated due to faulty planning, forecasting and purchasing. Duplication of inventory always leads to surplus inventory, thus, surplus is the state of an item when the stock is likely to last longer than a reasonable period or when it is no longer required for a job for which it was purchased. Scrap is defined as process wastage such as ash, turnings, borings, screws, scrap tools, empties, and used oil. They may have end use with in the plant. In any case they have a market value. The scrap is salable.
Salvage materials are those which cannot be used for original purpose, but out of which certain parts can be removed and used probably after reconditioning them.

From the above definitions, we can list out the reasons for the generation and accumulation of obsolete surplus and scrap items.

a) Changes in the product design.
b) Rationalisation of materials
c) Cannibalisation

d) Faulty planning and forecasting.
e) Faulty Purchase practices, and
f) Other causes.

An efficient redistribution and reuse of surplus and obsolete networks has a significant bearing upon the profitability of the firms and the economic strengths of the nation. No firms want to produce surplus, as they are materials constantly produced. They are virtually the only resources that are never depleted but constantly replenish themselves with proper processing and redistribution; they are perpetual sources of some raw materials vital to the continued existence of our industrial society.

Disposal of Materials in TPS

In APGENCO, during the last decade i.e. from 1994-95 to 2004-05 thermal power production witnessed a quantum jump from 10842 MU to 22455 MU. This increase was a result of huge capital investment and associated inventory holdings, in the form of cool, oil and spare parts. It is worth noting that over a period of time cools, oil and spares are liable to become obsolete and some spares tend to become
non-moving. These obsolete and non-moving items become financial burden to the organisation as considerable capital is locked up in the form of investment, without serving any useful purpose. Hence, there is a need for identification and review of obsolete and non-moving items at regular intervals.

Further, disposal of obsolete and non-moving items is a function of liquidation of unnecessary holdings in return for a price. It releases valuable storage space and locked up investment. It is therefore, necessary to resort to the disposal of unwanted holdings, with due regard to economy and administrative convenience. Now it is proposed to present the treatment of obsolete unwanted and non-moving item in TPS (APGENCO).

**Unwanted holdings**

The unwanted holdings consists of

a) Surplus serviceable equipment, stores and spare parts.
b) Old and unserviceable plant, machinery and equipment
c) Second-hand empties and scrap
d) Discarding of old equipment, which becomes unsuitable to the revised working methods or uneconomical to operate.
e) Spare parts applicable to obsolete or old equipment which are rendered redundant,
f) Spare parts of current usage rendered surplus due to faulty planning.
g) Equipment and material becoming unserviceable due to constant use and by wear and tear.
h) Items of perishable nature rendered unserviceable due to long storage.
i) Scrap materials arising in manufacturing process and equipment rendered unserviceable by accidents or severe damage in transit.
Surplus Material

A list of unmoved items will be obtained quarterly from chief Accounts officer in various thermal stations of the state, and the Director Generation/COS, will circular the same to all the area stores for careful scrutiny by the Dy, COS/ADE stores and technical authorities concerned. They will determine the insurance items, which would be required to be kept for use in an emergency and the items, which will be required for, eventual over haul of the equipment in use. The Dy. Controller of stores will then prepare the final lists of unwanted items and forward the same to the chief P&S/COST duly approved by the General Manager for disposal action.

Surplus second hand empties

The remnants of second-hand serviceable empties like lubricating oil drums will be returned from thermal plant to the Area stores. The Area stores officer will notify the availability of such second hand empties to the chief, p and s for arranging disposal. The chief, p and s will conclude sale contracts as per the procedures laid down in the stores manual.

Unserviceable materials and Scrap

The items, which have outlived their utility due to wear and tear or accident and equipment, declared beyond economical repairs by a competent technical authority (G.M./C.E), which are termed as unserviceable equipments/materials. The unserviceable equipment, material and scrap materials will be held in a separate lots in a suitable; salvage area in each area stores, depending on the nature of the items viz. iron, steel and cooper. Even in the case of iron and steel scrap, like scrap arising out of unserviceable coat belts, separate lots should be formed.

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The following measures have been taken in the APGENCO in order to control surplus, obsolete and unserviceable inventories.

a) Arrangement made for buying inventories of the correct specification with proper packaging.

b) The inventory control section takes care of quality control and regular inspection, ensuring for acceptance of the material of required quality.

c) Maintenance of accurate records, keeping them up to date with efficient handling and storage.

These measures of inventory control wills go a long way in controlling obsolete and surplus inventory.

It is proposed to examine the opinions of the directors of APGENCO regarding the accounting and control of obsolete and surplus inventory. The obsolete inventory, The obsolete inventory in uncontrollable, but surplus inventory is controllable. It seems that there is no proper control on obsolete and surplus inventory. Instead of unnecessarily locking up of funds in inventory, such funds can be effectively invested for other productive and profitable purpose. Hence, it is suggested that necessary steps should be taken in planning and controlling in order to avoid the obsolete and surplus inventories in the corporation.

**Control of non-moving items**

Non-moving items are those items, which have not been consumed during the last three years. The APGENCO has appointed a committee to review the non-moving item. On the recommendations of the committee, it was decided to adopt three years as specified period for identification of the items as non-moving.
The above-mentioned techniques of inventory control are prescribed in the stores manual of the APGENCO. The corporation is following them on selective basis. It is ascertained during the course of field study that at station level ABC Analysis is followed according the their requirements. Similarly xyz any analysis is followed in recent times for exercising control over non-moving items.

The corporation is following the perpetual inventory system ABC Analysis, XYZ analysis, FSN analysis, in order to control inventories in the stores of the corporation. The corporation is also following some other inventory control techniques like fixing maximum and minimum stock levels, periodic review system, budgetary control, ratio analysis, standardisation and codification.

**Perpetual Inventory system**

If the stores is very big and very large number of materials are stocked, a year-end stock verification would be a very difficult task unless a large number of stock verifiers are employed. A technique to over come this problem is the perpetual inventory method. It is also some times called as the rotational system of stock checking. There is usually a team of two or three stock verifiers who take up work the four times each day and check the stocks. The discrepancies are recorded and immediately investigated.

The APGENCO has been following the perpetual inventory system in all the thermal stations including the main-stores at Hyderabad for recording receipts and issues regularly. Every receipt and issue is recorded both in bin card and stores ledgers. Then the balance of stock is brought out simultaneously. This system has been introduced for all the items of stores.
The measures taken by the corporation for the disposal of surplus, obsolete and scrap are not sufficient and adequate, and certain improvements are to be made in the methods of accounting, disposal and control of the surplus slow and non-moving items. Even though the corporation authorities are not paying much attention to dispose and account for scrap. In order to exercise control over obsolete and non-moving items, the corporation is maintaining a separate cell at the corporate main stores.

**Inventory control and some Difficulties**

Some organisations experience the following difficult with regard to the effective inventory control

a) The step-motherly treatment of materials department by the top management; not enough care is taken in staffing the department by qualified and experienced personnel.

b) A path and complacence as well as almost obstructive tactics by the traditionally stronger departments and personnel in marketing, sales, production, inventory, control; and

c) Lack of authentic data and real data for timely action.

In regards to (c) - many organisations feel that once they have installed a computer is no need to worry at all. But; in fact, input data and programming have to be continually reviewed and various statements are to be 'value-analysed'. We have found that the computerization has led to complacency in some organisations and in other organisations there is an ineffective use of computer data. On the other hand, unnecessary data are also obtained, which hardly any one looks at.
Essentials for inventory control

For an effective control of inventory the following are essential.

a) Awareness at all levels including top management of the importance of inventory control.

b) Ensuring integrated approach to inventory management;

c) Obtaining necessary performance and other data for periodical appraisal, control and decision-making activities.

d) Availability of expertise for inventory control in one's own organisation.

e) Continuity of planning, review and updating action throughout the year.

Inventory control necessitates control in Many Areas

To control inventories, it is necessary to control inter alia consumption, indenting, purchases, deliveries and replenishment. Hence, the inventory management and control requires an integrated approach by all departments concerned including, inter-alia, the following.

a) Materials department-purchases, store-keeping, material control and disposal.

b) Quality control and inspection

c) Marketing and sales

d) User departments such as production/maintenance/operation/consumption/contracts.

e) Finance-Cost accounting, management accounting

f) Design, research and development

g) Industrial Data processing centre; and Computer Data processing centre.
The committee on public undertakings in their 40th Report (Third Lok Sabha) which is entitled ‘Material management in Public undertakings recommended the adoption of a number of measures, which would if properly implemented ensure scientific inventory, management. The administrative Reforms commission in their report on public sector undertakings has also impressed upon the government, the immediate requirements in the filed of material management.

As the above mentioned requirements reports contain complete in depth study of entire problem and any executive who is serious in his intentions to tack inventory situations should apply all feasible solutions after going through the reports apply all feasible solutions after going thorough the reports as well as other study reports referred to in the original. A brief summary of the recommendations of these is however, reproduced below.

a) A material management manual should be prepared incorporating scientific concepts and improved technically.

b) Periodical review of planning and system for prepared incorporating spares and also the examination of stock levels.

c) Avoidance of over stocking of spares purely on manufacture' recommendations without an independent assessment or review.

d) Proper classification, codification and standardisation

e) Setting limits for all stocks including finished and semi-finished goods.

f) ABC analysis for minimising the risk of stock outs as well as over stocking.
g) Provision of materials to the users in the right quantity at right time and at the overall cost, taking into account the buying cost, inventory carrying cost and the penalty if any for shortages i.e. adoption of economic order quantity system.

b) Evaluation of control procedures suitable for multiplant locations consistent with economy and appropriate decentralization.

i) Material inspection procedures.

j) Automatic replenishment or recorder of items of regular use and fixing of minimum and maximum stock levels.

k) Value analysis for cost reduction

l) Import substitution

m) Norms for consumption or utilization in the production of stores components

n) Care, custody, preservation of stocks

o) Limits of process losses, handling losses, and storage losses

p) Proper utilization of by products.

The committee on public undertakings has also suggested the adoption of a reporting system in each undertaking to cover the following aspects.

a) Details of purchases above certain limits

b) Purchase over certain limit where the lowest tenders were not accepted.
c) Details of rush and emergency purchases showing the items purchased, their value, source and the reasons.

d) Particulars of outstanding indents showing their number and the reasons for delay.

e) Stock position about major raw materials, stores, and finished goods.

f) Show moving non-moving stores, extent of surplus stores and other disposal.

g) Foreign exchange utilization and imports substitution.

h) Steps taken and results achieved on import substitution

i) progressive on value analysis.

It should, however, be borne in mind that each organisation in the public sector possesses its own unique characteristics. A common basis or yard-stick should not be used, as uniformity can be sought only in terms of policy objectives and basic principles. Each undertaking should be experience to the extends applicable and compile a clear and concise e manual for material management. The instructions so prepared should be reviewed from time to time to ensure that the practices and procedures which are appropriate and adequate to meet the changing requirements of each business.
Inventory Management Cell

In the APGENCO, an inventory management cell (IMC) has been formed under industrial engineering department: inventory management cell maintains the records pertaining to the purchase orders, such as date on which confirmatory orders are placed and re-order quantity. Other functions to be performed by the IMC are:

a) Data collection and codification
b) Listing out standard specifications
c) Listing of purchase orders, and
d) Preparation of list of vendors

The above particulars are essential for an effective inventory management in conjunction with the computers.
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42. "Report of the study group on the extent to which credit needs of industry and made are likely to be inflated and how such trends could be checked summary", RBI Bulletin, November, 1969, p.1792.


44. Opportunity cost means the sacrifice made on withdrawing funds from a productive activity to invest them in inventories See R.S.Chada, "Inventory Management in India", Allied Publishers, Mumbai, 1971, p.21.


46. This is also known as reorder quantity, which has some assumptions such as usage is constant for a given period, the orders can be replenished immediately.


