

# An Introduction to Inventory Management with reference to Bokaro Steel Plant

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## ABSTRACT

*This paper includes introduction of Inventory Management along with the practices of Inventory Management in SAIL-Bokaro Steel Plant (BSL) in order to analyze role of different types of inventories towards different sources to maintain their position in the steel market, to find out the practices of maintaining inventories and to study the techniques of controlling inventory, to meet the demand so that production & turnover are smooth. Nowadays steel industries is even more dynamic than it was not a decade ago. In BSL 80% of coal is being imported from abroad because of its good quality, it is further converted into Coke by heating in coke oven plant as it is one of the major raw material in formation of steel and it cost high to firm & require proper maintenance. 60% of sales is used in purchase of raw material, which incurred high expenditure. In India for exporting of semi/finished goods, excise duty is not levied in order to attract exporter results in foreign exchange. This study will also be helpful for the company's future strategy's point of view. Company can quickly take required steps to rectify the existing problems and enhance its performance.*

**Keywords-** Inventory management, Just- In Time Inventory, holding inventory, movement of inventories

## 1.Introduction

Inventories are stockpile of the products a firm is offering for sale in the components that make up the product. An inventory is composed of assets that will be sold in future in the normal course of business operation. The assets which firms store as inventory in anticipation of need are Raw material, Work-in-process (semi-finished goods) and finished goods. The raw material inventory contains items that are purchase by the firm from others and are converted into finished goods through production process. The work-in-process inventory consists of items currently being used in the production process. They are normally semi-finished goods inventory consists of items that have been produced but are yet to be sold.

The aspect of management of inventory is especially important in respect to the fact that in country like India, the capital block in terms of inventory is about 70% of the current assets. It is therefore, absolutely imperative to manage efficiently and effectively in order to avoid unnecessary investment in them. Although to maintain low inventories may prove to be profitable but to maintain very low inventories may prove risky on the contrary.

A company should maintain adequate stock of materials for a continuous supply to the factory for an uninterrupted production. It is not possible for a company to procure raw material instantaneously whenever needed. A time lag exists between demand and supply of material. Also, there exists an uncertainty in procuring raw material in time at many occasions. The procurement of materials may be delayed because of factors beyond company's control e.g. transport disruption, strike etc. Therefore, the firm should keep a sufficient stock of raw material at a time to have streamline. Other factors which may incite us to keep stock of inventories is the quantity discounts, expected rise in price.

The work in process inventory builds up because of the production cycle. Production cycle is the time span between the introduction of raw material in to the production and the emergence of finished goods at the completion of production cycle. Till the production cycle completes, the stock of work in process has to be maintained. Efficient firms constantly try to make the production cycle smaller by improving their production techniques.

The stock of finished goods has to be held because production and sales are not instantaneous. A firm cannot produce immediately when goods are demanded by customers. Therefore to supply finished goods on regular basis, their stock has to maintain for sudden demand of customers, in case the firm sales are seasonal in nature, substantial finished goods inventory should be kept to meet the peak demand. Failure to supply products to customer, when demanded, would mean loss of the firm's sales to the competitors.

The basic objective in holding raw material inventory is separate purchase and production activities and in holding finished goods inventory is to separate production and sales activities. If raw material inventory is not held, purchase would have to be made regularly at the time of usage. This would mean production interruptions and high cost of

ordering.

A sufficiently large inventory has to be maintained of finished goods so as to meet the fluctuating demands. If a close link is maintained between the sales and the production department then an organization can do with a small inventory also. In the process, inventory is also necessary because production cannot be instantaneous. But it should be seen that the size of production cycle should be small.

#### **Objectives of Inventory Management:**

The main objectives of the inventory management are:

- To minimize investment in inventory.
- To meet the demand for product by efficiently organizing the production and sales operation.

Discussion relating to the objective of inventory management is firstly, it needs to ensure that there is enough inventories to meet demand such that production and sales operations would be smooth. By holding less inventory, cost can be minimized but there is a risk that the operation will be disturbed as the emerging demand cannot be met secondly, by holding a large inventory, the chances of disruption of operations are reduced but the cost will increase. The appropriate level of inventory should be determined in terms of trade-off between benefit and cost associated with maintaining inventory.

They are the two danger points that a company should try to avoid and should always try to maintain optimum level of inventory. The excessive investment in the inventory has the following drawbacks:

- Unnecessary tie up of firm's fund and loss of profit.
- Excessive carrying cost.
- The risk of liquidity.

The over investment of funds in inventory eat up the precious funds which could have been put to some profitable use. The carrying cost incurred, cannot be ignored, this is the cost of storage, handling insurance, recording and inspecting. These all costs incurred in order to have large inventories impair the profitability of the firm. Another danger of carrying excessive inventory is the deterioration, obsolescence and pilferage of raw materials.

Maintaining inadequate inventory is also dangerous. The consequences of under investment in inventory are:

- Production hold ups
- Failure to meet commitment

If the inventory of finished goods is not adequate than the demand of customer is peak periods may be left unmet and it the under investment is in the area of raw materials that is likely that the production process may be held up frequently. The aim of inventory management thus should be to avoid excessive and inadequate level of inventory and to maintain sufficient inventory for smooth production and sales operation efforts should be made to place an order at the right time to right source to acquire right amount at the right price and for right quantity. The aspects of a effective inventory management should take care of are

- Ensure continuous supply of material to facilitate uninterrupted production.
- To maintain sufficient stocks of raw material in the periods of short supply and evident price rise.
- To maintain sufficient inventory of finished goods for smooth sales operation.
- Minimize carrying cost and time.
- Control investment and keep it to the optimum level.

#### **Costs of Holding Inventory:**

Costs associated with inventory fall under two categories:

- **Ordering/Set-up cost** – is a fixed cost of placing and receiving an inventory order. These cost can be minimized by placing fewer order for a larger amount. But acquisition of a large quantity would increase the cost associated with the maintenance of inventory i.e. carrying cost.
- **Carrying Cost-** are the variable cost per unit of holding an item in inventory for a specified time period. The cost of holding inventory may be divided into two categories: Those that arises due to storing of inventory and the opportunity cost of funds.
- **Total Cost-** is the sum of ordering cost and carrying cost of inventory.

**Benefits of Holding Inventory:**

Benefits associated with holding inventory fall under four categories:

- Benefits in purchasing.
- Benefits in production.
- Benefits in work-in-process.
- Benefits in sales.

**Decisions areas in Inventory Management:**

The major problem area that comprises the heart of inventory control are:

- **Classification problem: A B C system** - is an inventory management techniques that divides the inventory into three categories of descending importance based on the rupee investment in each.

**Group A:** Items included in group A involves the largest investment. Therefore, inventory control should be the most rigorous, intensive and sophisticated inventory control technique.

**Group B:** Items in mid-way, deserves less attention than A but more than C.

**Group C:** It consists items of inventory which involve relatively attention.

- **Order Quantity Problem: Economic Order Quantity (EOQ) Model** – is the inventory management techniques for determining optimum order quantity which is the one that minimizes the total of its order and carrying cost; it balances fixed ordering cost against variable ordering cost. It is also known as the economic lot size.

The EOQ model can be illustrated by following assumption:

-Trial and error (Analytical) Approach

-Mathematical (Short cut) Approach:

$$EOQ = \sqrt{2AB/C}$$

Where, A= Annual usage of inventory (units)

B= Buying cost per order

C= Carrying cost per order

- **Order Point Problem:** The EOQ determines the size of an order to acquire inventory so as to minimize the carrying as well as ordering cost. The aspect of inventory management is cover under the reorder point problem.

**Reorder point** – is that level of inventory when a fresh order should be placed with supplier to procure additional inventory equal to the EOQ. It is that inventory level which is equal to the consumption during the lead time plus safety stock.

$$\text{Reorder point} = \text{lead time in days} \times \text{avg. daily usage of inventory}$$

- **Safety Stock** – implies extra inventories that can be drawn down when actual lead time and usage rates are greater than expected. It is the minimum additional inventory which serves as safety margin to meet an unanticipated increase in usage resulting from an unusually high demand or an uncontrollable late receipt of incoming inventory.

**Just- In Time Inventory:**

It is an innovative manufacturing system, refers to acquiring materials and manufacturing goods only as needed to fill customer order. It is also called lean production system, it is a demand pull manufacturing system because each components in a production line is produced as soon as and only when needed by the next step in the production line.

The JIT production systems aims to simultaneously – meet customer demand in timely way, with high quality product and at the lowest possible total cost.

The measures of performance that managers use to evaluate and control JIT are personal observation, financial and non-financial measures.

**Practice of Inventory Management in Bokaro Steel Plant:**

In case of raw materials, **ABC analysis** is followed on consumption pattern and **JIT analysis** is followed on stock available at the end of year. For optimum utilization of inventory a proper blend between ABC & JIT analysis is used.

**Automatic Procurement (AP) MANAGEMENT**

When common items are put under centralized procurement then Automatic Procurement Management come into action. It is helpful in maintaining the uniqueness of an item.

**Management of AP Items**

AP items shall have the following characteristics:-

1. It should be a general consumable with standard specification.
2. It should be generally required by more than one department. However, items required by only one department shall also be included into AP list as recommended by the Standing AP Committee and approved by Head of Maintenance & Head of Material Management. For such cases, Stock control may also obtain approval of Head of Material Management for inclusion into AP without routing through the committee depending upon the exigency.
3. It should have regular consumption pattern.

The objective of Stock Control is to make AP items available.

**Standing Committee on AP:**

There shall be a standing committee for AP items constituted with the approval of Head of Maintenance. The Standing Committee shall review the AP items every three years for up gradation of specifications with possible vendor base where felt necessary. However, any issue relating to specification shall be referred to the Standing Committee for revision.

The Standing Committee for AP, shall review the list for deletions/ additions of items into list. The item shall be deleted/ added into AP list after the recommendation of the Standard Committee is approved by Head of Maintenance & Head of Materials. The list for addition/ deletion shall be put up to the Standing Committee every year by Stock Control.

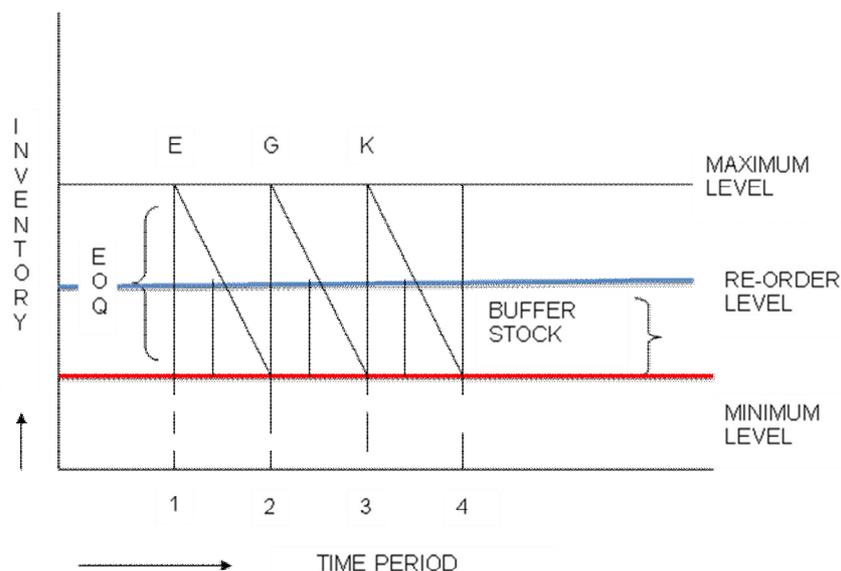
**Raising Of Material Purchase Requisition (MPRs):**

All MPRs for AP items shall be raised through Computer. Since intending is based on an approved logic, no screening shall be done for AP indents.

All AP items shall be classified into vital & non-vital categories. Vital items are those which directly affect production & shall be identified with the help of users.

The AP items shall be classified into ABC category based on consumption value during the previous financial year:-

- Top 10% = A class
- Next 20% = B class
- Last 70% = C class



**Figure 1:** Graphical presentation of EOQ model of Automatic Procurement item

Minimum Level (Safety Stock) = 3 months

Buffer Stock = 6 months

Reorder Level = 9 months of NOMC (No. of Monthly Consumption)

Procurement Lead Time = 6 months

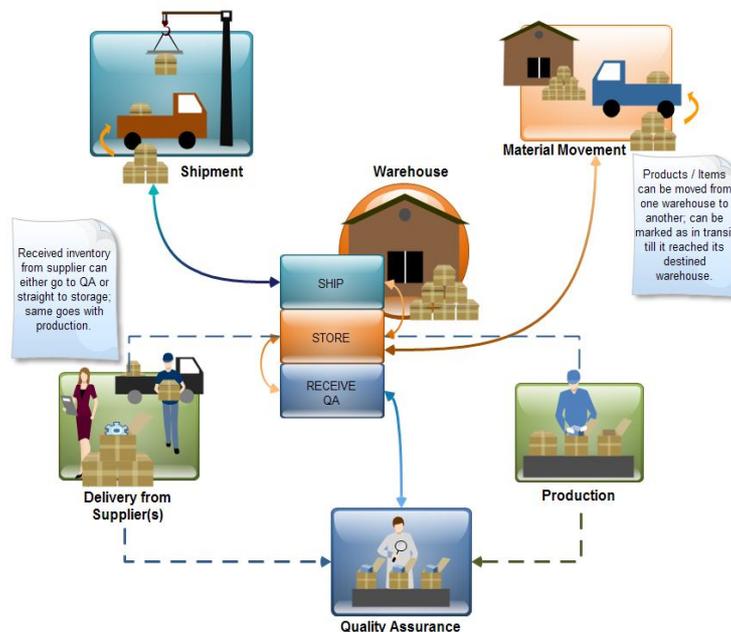
**Role of Store and Purchase Department in Purchasing Process:**

The most important function of public procurement is to maintain transparency which not only ensure a level of playing field to the suppliers/ contractors but also result in qualitative improvement in material/ services received due to increased competition.

CMO (Central Marketing Organization) places an order with specification to Bokaro Steel Plant as per demand. Now inside plant, Production Planning Control & Sales Co-ordination department makes production planning for different department.

Year	Inventories (in crore)	Total current assets	% of inventories to current assets
2008-09	1755.02	2312.02	75.9
2009-10	1583.10	2134.26	74.17
2010-11	2534.39	3222.58	78.64
2011-2012	2832.12	3623.21	78.16

**Movement of Inventories:**



**Finding and Analysis:**

The ultimate aim of the study is to highlight the, besides having good amount of inventory, there is breakdown in production because of use of old technology which require high expenditure cost on maintenance.

- Inventory in BSL is always on rising trend due to inflation(i.e. increase in price)
- Inventory used in BSL is on need basis, it is not fix year wise year

- Decrease in profit of BSL is due to increase in investment on procurement of raw material.
- Store inventory items –store & spare materials are kept at different location. It rises from Rs692.51cr (2011-12) to 805.12cr (2012-13)
- Raw material inventory-3 month stock or inventory of RM is kept. It rises from Rs377.86cr(2011-12) to Rs526(2012-13)
- Finished/semi-finished goods inventory- ready for sale.
- Scrap inventory-formed during processing of final product.

**Conclusion and Recommendation:**

During 2011–12, profit before tax of Bokaro Steel Plant (BSL) is Rs. 703.43crore which is less as compared to profit before tax of 2010-11 that is Rs. 1259.58 crore, although there is rise in production &turnover. It is because of decrease in price of flat product in domestic and global market due to recession. Although the market is dull, BSL is able to make profit which shows the continuous strengthening of the company’s financial fundamentals. This was the outcomes of multi-pronged strategy – including increase in production and sales volume, improvement in product mix, cost reduction major, reduction in borrowing coupled with buoyancy in the steel market.

In view of the analysis and with the change in industrial scenario it is felt that a company must reorient its policies for betterment. BSL produces flat product and now a days there is tough competition in the market of flat product. Hence company needs certain best policies for competition with its competitor in domestic as well as global market.

In brief the following suggestions are:-

- Company use perpetual inventory, which is very costly. Hence the company should use both perpetual and periodic inventory.
- Besides automatic procurement items there is no specific system for calculating reorder level, minimum and maximum level. A proper system for different items should be developed.
- Lead time for receipt of stores and spare items is around 6 months, which is very high. The lead time should be brought down by decreasing the time duration in paper work.

As understand from the explanation of the management, there is huge volume of non-moving and obsolete stores and spare items which are yet to be disposed off.