CHAPTER-I

1.1 INTRODUCTION

Inventory control is vitally important to almost every type of business, whether product or service oriented. Inventory control touches almost every facets if operations. A proper balance must be struck to maintain proper inventory with the minimum financial impact on the customer. Inventory control is the activities that maintain stock keeping items at desired levels. In manufacturing since the focus is on physical product, inventory control focus on material control.

"Inventory" means physical stock of goods, which is kept in hands for smooth and efficient running of future affairs of an organization at the minimum cost of funds blocked in inventories. The fundamental reason for carrying inventory is that it is physically impossible and economically impractical for each stock item to arrive exactly where it is needed, exactly when it is needed.
Inventory management is the integrated functioning of an organization dealing with supply of materials and allied activities in order to achieve the maximum co-ordination and optimum expenditure on materials. Inventory control is the most important function of inventory management and it forms the nerve center in any inventory management organization. An Inventory Management System is an essential element in an organization. It is comprised of a series of processes, which provide an assessment of the organization's inventory.

1.2 PROFILE OF THE COMPANY

1.2.1 WHIRLPOOL CORPORATION

Whirlpool Corporation is the world's leading manufacturer and marketer of major home appliances. The company manufactures in 13 countries on 4 continents namely :-- Canada, United States, Mexico, Argentina, Brazil, Slovakia, Germany, Sweden, France, Italy, South Africa, China and India and markets products in more than 170 countries under major Brands (26 including Affiliates) names such as Whirlpool, Kitchen Aid, Roper, Estate, Bauknects, Ignis, Laden, Inglis, Braotemp, Crolls, Acros and Consul. Whirlpool is also the principal supplier to Searo, Roebuck and company of many major home appliances marketed under the Kenmore brand names. Head quartered at Benton Harbour, Michigan, U.S.A, Whirlpool Corporation is the world's leading manufacturer and marketer of major home appliances. Washing Machines, Dryer, Dish-washers, Refrigerators, Freezers, Cookers, Micro-wave Ovens, Room air-conditioners, Small Kitchen Appliances, etc.

Whirlpool of India Limited, a fully owned by Whirlpool Inc. US, ($12 billion), a leading global consumer durable player. Whirlpool of India limited manufactures and markets refrigerators and washing machines. The company has diversified its product range into Air Conditioners and Microwave Ovens. The growth in the consumer durable industry has slowed down due to lack of demand. The year 2000 has been a bad year for the industry as the overall growth was flat. The refrigerators registered a flat growth; washing machines saw a negative growth while the air conditioner segment performed well exhibiting a growth rate of 20%. Whirlpool Corporation has a management system called WES (Worldwide Excellence System) and a value to aged performance system called HPC (High Performance Culture), which drives, are the actions and initiatives of unit.

1.2.2 WHIRLPOOL CORPORATION TODAY

- **BUILDING CUSTOMER LOYALTY WORLDWIDE**

Whirlpool Corporation arrived in the new century and millennium as the world's leading manufacturer and marketer of major home appliances. Today, Whirlpool's global platform provides our operations with resources and capabilities no other manufacturer can match and with brands that consumers trust.

To sustain the productivity savings that is being achieved by our operations, they have embedded their Operational Excellence Process - based on Six-Sigma and lean manufacturing skills and capabilities - within each of their worldwide manufacturing facilities. The company's global information technology organization provides Internet tools that cut the complexity and costs of doing business for Whirlpool and its trade partners. Whirlpool's unique global platform allows the company to transfer key innovations and processes across regions and brands. Based on the continuing success of the company's global innovation process, which began in 1999, Whirlpool has introduced unique product innovations to consumers worldwide.

Inspired by their bold innovations and designs, increasing numbers of customers around the globe are trusting Whirlpool to make their lives easier. More than ever before, Whirlpool Corporation employees and brands are connecting with customers in ways that will last a lifetime.

- **IMPROVING FUNCTION AND PERFORMANCE**

At Whirlpool Corporation, They take pride in the quality of appliances to market and manufacture. They are committed to building products that consumers around the world can depend on to meet their daily needs. Their commitment to quality begins in the concept stages and continues throughout the lifetime of the appliance. They are constantly seeking out new and unique ways to improve the function, performance and sustainability of our products. They want our brands to be the brands customers trust in every home everywhere.

1.2.3 HISTORY OF WASHING MACHINE

Ancient peoples cleaned their clothes by pounding them on rocks or rubbing them with abrasive sands and washing the dirt away in local streams. Evidence of ancient washing soap was found at Sapo Hill in Rome, where the ashes containing the fat of sacrificial animals was used as soap. The earliest washing "machine" was the scrub board invented in 1797. American, James King patented the first washing machine to use a drum in 1851, the drum made King's machine resemble a modern machine, however it was still hand powered. In 1858, Hamilton Smith patented the rotary washing machine. In 1874, William Blackstone of Indiana built a birthday present for his wife. It was a machine, which removed and washed away dirt from clothes. The first washing machines designed for use in the home. The Hurley Machine Company of Chicago, Illinois introduced the first electric-powered washing machine (the Thor) in 1908. Alva J. Fisher was the inventor. The machine was a drum type with a galvanized tub and an electric motor, for which a patent was issued on Aug. 9, 1910.

The Whirlpool Corporation started in 1911 as the Upton Machine Co., founded in St. Joseph, Michigan, to produce electric motor-driven wringer washers. US electric washing machine sales increased after World War I, reaching 913,000 units in 1928. The main reason why so many people bought the washing machine was because it saved people lots of time in domestic tasks, and the result was that society's expectations for cleanliness went up.

In 1951, production of Europe's first automatic washing machines started. In 1978, the first microchip-controlled automatic washing machines were produced. Washer design improved markedly during the 1930s; the mechanism was now enclosed within a cabinet; more attention was paid to electrical safety; spin dryers were introduced, to replace the dangerous power wringers of the day.

Bendix introduced the first automatic washing machine in 1937, having applied for a patent in the same year. General Electric introduced the first top loading automatic also in 1947. This machine had many of the features that are incorporated into modern machines. A large number of US manufacturers introduced competing automatic machines (mainly of the top loading type in the

late 1940's early 1950s. Several manufacturers even produced semi-automatic machines, where the user had to intervene at one or two points in the wash cycle.

In the UK, electric washing machines did not become popular until the 1950s. The early electric washers were single tub, wringer-type machines, and automatic washing machines being extremely expensive. During the 1960s, twin tub machines briefly became very popular, helped by the low price of the Rolls Razor washers. In the late 1990s, the British inventor James Dyson launched a type of washing machine with two cylinders rotating in opposite directions; which, it is claimed, reduces the wash time and produces cleaner results; however, this machine is not currently in production.

➢ 1.2.4 CORE COMPETENCIES

- **Innovation:** Unique and compelling solutions valued by our customers and aligned to our brands create competitive advantage and differentiated shareholder value.
- **Operational Excellence (OPEX):** A methodology for solving problems & continuous improvement of products & processes through pursuit, acquisition, and utilization of knowledge using critical thought and planned experimentation helps us achieve operational excellence.
- **Customer Excellence:** Excelling the customer expectation from the company, its brands, products and services are a three-step process. The three steps are: Know a customer, be a customer, Serve a customer.

Knowing a customer helps us know who our customers are, how to treat them, how we add value, and what the drivers of brand loyalty are. This information is gathered from the customer's data base history. This way we are better able to customize products for them and recommend the right product to solve problems. Being a customer is important to share customer knowledge and insights, drive actions based on customer insights, be passionate about our brands and customer loyalty and provide a positive voice for our brands. We show empathy for customers and seek to resolve their problems by creating consistent customer touch-points, with our endeavor always being to provide unique solutions for the customer.

1.2.5 PRODUCTION

MANUFACTURING FACILITIES IN INDIA

- **FARIDABAD**

The refrigerator facilitated at Faridabad in Haryana manufactures direct cool. Refrigerators ranging from 165 liters to 310 liters. Infusion of technology and up gradation of machinery along with streamlining of processed has enhanced the plant capacity from 7, 00,000 units to 8, 50,000 units annually. Whirlpool's focus at this plan in on manufacturing refrigerators that are made to suit Indian conditions and requirements, while matching Whirlpool global quality standard.

- **PUDUCHERRY**

The washer's facility at Puducherry on the East coast, manufacturer's semi-automatic and automatic washers. Constant feedback from consumers has resulted in improved product quality and styling, leading to an improved market share. This unit was awarded the coveted ISO 9001 certification in 1994 and ISO 14001 certification in 1996.

- **RANJANGAON**

A state of art gallery for the manufacturers of the Global No Frost refrigerator at Ranjangaon near Pune, this Rs.300 crore plant built to exacting world-class standards, underlines Whirlpool's commitments to India. It has been designed in accordance with the ecological and environmental criteria that have become such a concern in today's scenario the world over.

1.2.6 WHIRLPOOL BRANDS

- **North American Brands**

United States	:	Whirlpool, Kitchen Aid, Roper, Estate, Gladiator.
Canada	:	Whirlpool, Inglis, Kitchen Aid.
Mexico	:	Whirlpool, Acros, Supermatic, Scrolls.

- **Principal Products**

Air Purifiers, Automatic Dryers, Automatic Washers, Built-in Ovens, Dehumidifiers, Dishwashers, freezers, Hot Water Heaters, HVAC, Microwave Ovens, Ranges (Gas and Electric, Freezers, Side-by-Side), Room Air Conditioners, Trash Compactors, washers.

- **Kitchen Aid Products**

Blenders, Food Processors, Hand Mixers, Hot-water Dispensers, Stand Mixers, Toasters, Coffee Makers, Juicers.

- **Primary Markets Served**

United States, Canada and Mexico.

- **Principal Products**

Built-in Ovens, Cookers (Gas and Electric, Freestanding, Built-in and Surface Units), Dishwashers, Dryers, Freezers (Upright and Chest), Microwave Ovens, Refrigerators (Built-in, Combis and Side-by-Side), Washers (Front and Top Loading).

- **Primary Markets Served**

Europe, Middle East, Africa, Asia Pacific.

- **Principal Products**

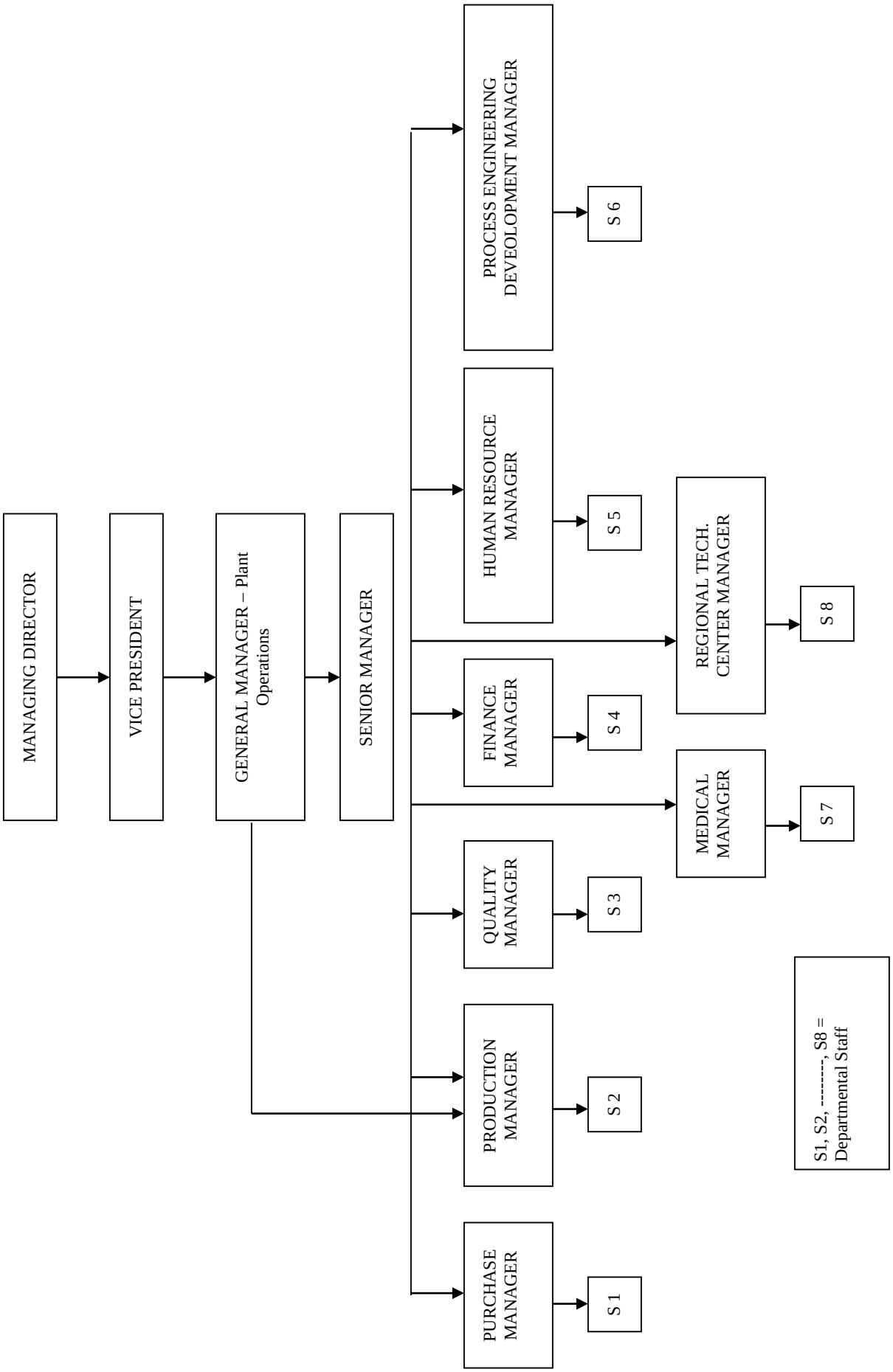
Freezers, Gas and Electric Ranges, Micro Ovens, Refrigerators, Room Air Conditioners, Washers, Compressors.

1.2.7 ACHIEVEMENTS

Whirlpool came to India on the crest of a long trail of achievements and has since furthered this record. By end-1999, Whirlpool became the largest selling appliance brand in the country. A couple of years later, it also became the largest exporter of home appliances from India. In the course of this growth and development, Whirlpool has also achieved immense brand equity in the Indian market. Whirlpool has successfully established new rules of marketing and branding in the home-market sector. Its rivals have adopted the new practices, but the Whirlpool brand stands out to the extent that authoritative surveys reported it to be the most preferred brand in refrigerators and washing machines in 2003. (Millward Brown Brand Track).

Whirlpool of India exports to more than 50 high-value markets in Asia and other parts of the world as well. Its products are customized to the local standards and different needs of each of these markets. These qualities of Whirlpool are exemplified in its Indian sales as well. The company has set up a highly equipped product development centre in Pune, which provides global design services to three other Whirlpool research and development facilities based in Brazil, Italy and the US. Indeed, the Indian operations of Whirlpool are a very important contributor to its global vision of "Being in every home, everywhere". In washer products, Whirlpool was again the first to come out with a Combimatic – a single tub semi-automatic washing machine that did away with the hassle of shifting clothes from one tub to another.

1.2.8 Company is shown by a flat Organization Structure as below:



1.3 NEED FOR THE STUDY

Every organization needs inventory for smooth running of its activities. It serves as a link between production and distribution processes. The investment in inventories constitutes the most significant part of current assets/working capital in most of the undertakings. Thus, it is very essential to have proper control and management of inventories. The purpose of inventory management is to ensure availability of materials in sufficient quantity as and when required and also to minimise investment in inventories. So, in order to understand the nature of inventory management of the organization, I took this Inventory Management as a topic for my project, to give findings and suggestions by adopting and analyzing different inventory control techniques.

CHAPTER-II

REVIEW OF LITERATURE

2.1 MEANING OF INVENTORY

Inventory generally refers to the materials in stock. It is also called the idle resource of a company. Inventories represent those items which are either stocked for sale or they are in the process of manufacturing or they are in the form of materials which are yet to be utilized.

It also refers to the stockpile of the products a firm would sell in future in the normal course of business operations and the components that make up the product.

Inventory is a detailed list of those movable items which are necessary to manufacture a product and to maintain the equipment and machinery in good working order.

2.2 TYPES OF INVENTORIES

A manufacturing firm generally carries the following types of inventories:

- Raw Materials.
- Bought out parts.
- Work-in-process inventory (WIP).
- Finished goods inventories.
- Maintenance, repair and operating stores.
- Tools inventory.
- Miscellaneous inventory.
- Goods in transit.
- Goods for resale.
- Scrap Material.

2.3 REASONS FOR HOLDING INVENTORY

- To stabilize production.
- To take advantage of price discounts.
- To meet the demand during the replenishment period.
- To prevent loss of orders.
- To keep pace with changing market conditions.

2.4 MOTIVES OF HOLDING INVENTORIES

- The Transaction Motive which facilitates continuous production and timely execution of sales orders.
- The Precautionary Motive which necessities the holding of inventories for meeting the unpredictable changes in demand and supplies of materials.
- The Speculative Motive which induces to keep inventories for taking advantage of price fluctuations, saving in re-ordering costs and quantity discounts etc.,.

2.5 COSTS ASSOCIATED WITH INVENTORY

- Production cost.
- Capital cost.
- Ordering cost.
- Carrying cost.
- Shortage cost.

2.6 INVENTORY CONTROL

The main objective of inventory control is to achieve maximum efficiency in production & sales with minimum investment in inventory.

Inventory control is a planned approach of determining what to order, when to order and how much to order and how much to stock, so that costs associated with buying and storing are optimal without interrupting production and sales.

2.7 BENEFITS OF INVENTORY CONTROL

The benefits of inventory control are:

- Improvement in customers' relationship because of the timely delivery of goods and services.
- Smooth and uninterrupted production and hence, no stock out.
- Efficient utilization of working capital.
- Economy in purchasing.
- Eliminating the possibility of duplicate ordering.

2.8 PRINCIPLES OF INVENTORY CONTROL

- Inventory is only created by spending money for materials and the labour and overhead to process the materials.
- Inventory is reduced through sales and scrapping.
- Accurate sales & production schedule forecasts are essential for efficient purchasing, handing & investment in inventory.
- Management policies which are designed to effectively balance size and variety of inventory with cost of carrying that inventory are the greatest factor in determining inventory investment.
- Forecasts help determine when to order materials. Controlling inventory is accomplished through scheduling production.
- Records do not produce control.
- Control is comparative & relative, not absolute. It is exercised through people with varying experiences and judgment rules & procedures establish a base from which the individuals can make evaluation and decision.
- With the consistent practices being followed, inventory control can become predictable and properly related to production and sales activity.

2.9 INVENTORY CONTROL – TERMINOLOGY

- **Demand:**

It is the number of items required per unit of time. The demand may be either deterministic or probabilistic in nature.

- **Order cycle:**

The time period between two successive orders is called order cycle.

- **Lead time:**

The length of time between placing an order and receipts of items is called lead time.

- **Safety stock:**

It is also called buffer stock or minimum stock. It is the stock or inventory needed to account for delays in materials supply and to account for sudden increase in demand due to rush orders.

- **Inventory turnover:**

If the company maintains inventories equal to 3 months consumption. It means that inventory turnover is 4 times a year i.e., the entire inventory is used up and replaced 4 times a year.

2.10 INVENTORY COST RELATIONSHIPS

There are two major cost associated with inventory. Procurement cost and carrying cost. Annual procurement cost varies with the numbers of orders. This implies that the procurement cost will be high, if the item is procured frequently in small lots. The annual procurement cost is directly proportional to the quantity in stock. The inventory carrying cost decreases, if the quantity ordered per order is small. The two costs are diametrically opposite to each other. The right quantity to be ordered is one that strikes a balance between the two opposition costs. This quantity is referred to as “Economic Order Quantity”.

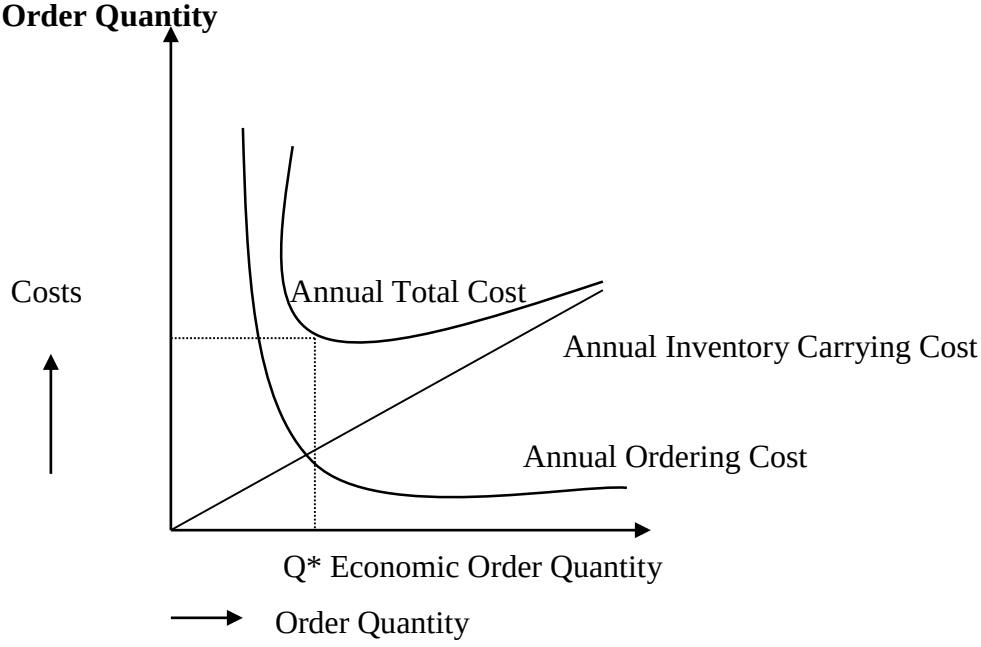
2.11 ECONOMIC ORDER QUANTITY

A decision about how much to order has great significance in inventory management. The quantity to be purchased should neither be small nor big because costs of buying and carrying materials are very high. Economic order quantity is the size of the lot to be purchased which is economically viable. This is the quantity of materials which can be purchased at minimum costs. Generally economic order quantity is the point at which inventory carrying costs are equal to order costs. In determining economic order quantity it is assumed that cost of managing inventory is made up solely of two parts i.e., ordering cost and carrying cost. The cost relationships are shown in below figure.

FORMULA FOR CALCULATING ECONOMIC ORDER QUANTITY (EOQ)

$$EOQ = \sqrt{\frac{2 * \text{Demand} * \text{Re-order Cost}}{\text{Carrying Cost}}}$$

Economic Order Quantity



2.12 SAFETY STOCK

The economic order quantity formula is developed based on assumption that the demand is known and certain and that the lead time is constant and does not vary. In actual practical situations, there is an uncertainty with respect to the both demand as well as lead time. The total forecasted demand may be more or less than actual demand and the lead time may vary from estimated time. In order to minimize the effect of uncertainty due to demand and the lead time, a firm maintains safety stock, reserve stocks or buffer stocks.

The safety stock is defined as "the additional stock of material to be maintained in order to meet the unanticipated increase in demand arising out of uncontrollable factors".

In simple it is tells about which is used to protect against uncertainties.

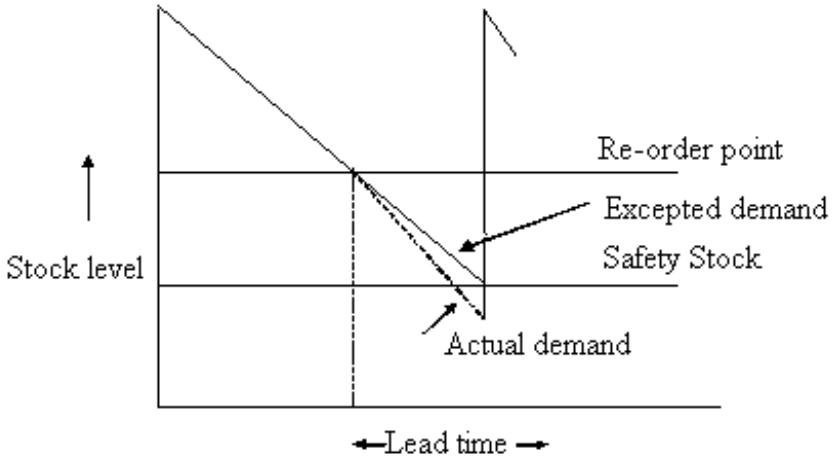
Because it is difficult to predict the exact amount of safety stock to be maintained, by using statistical methods and simulation, it is possible to determine the level of safety stock to be maintained.

DETERMINATION OF SAFETY STOCK

If the level of safety stock is maintained is high, it locks up the capital and there is a possibility of risk of obsolescence. On the other hand, if it is low, there is a risk of stock out because of which there may be stoppage of production. When the variation in lead time is predominant, the safety stock can be computed as:

Safety Stock = (Maximum Lead time- Normal Lead time) * Demand

SAFETY STOCK



The service level of inventory thus depends upon the level safety stocks. Large the safety stocks, there is a lesser risk of stock out and, hence, higher service level. Sometimes higher service levels are not desirable as they result in increase in costs, thus, fixing up a safety stock level is critical. Using past date regarding the demand and lead time data, reliability of suppliers and service level desired by management, safety stock can be determined with accuracy.

2.13 ABC ANALYSIS

The inventory of an organization generally consists of thousands of items with varying prices, usage rate and lead time. It is neither desirable nor possible to pay equal attention of all items.

ABC analysis is a basic analytical tool which enables management to concentrate its efforts where results will be greater. The concept applied to inventory is called as ABC analysis.

Statistics reveal that just a few items account for bulk of the annual consumption of the materials. These few items are called A class items which hold the key to business. The other items known as B & C which are numerous in number but their contribution is less significant. ABC analysis thus tends to segregate the items into three categories A, B & C on the basis of their values. The categorization is made to pay right attention and control demanded by items.

FEATURES OF ABC ANALYSIS

A Class (High Value)	***B Class (Moderate Value)***	***C Class (Low Value)***
1. Tight control on stock levels	Moderate control	Less control
2. Low safety stock	Medium	Large
3. Ordered frequently	Less frequently	Bulk ordering
4. Individual posting in stores	Individual	Collective posting
5. Weekly control reports	Monthly control	Quarterly control
6. Continuous effort to reduce lead time	Moderate efforts	Minimum efforts

ADVANTAGES

- This approach helps the manager to exercise selective control & focus his attention only on a few items.
- By exercising strict control on A class items, the materials manager is able to show the results within a short period of time.
- It results in reducer clerical costs, saves time and effort and results in better planning and control and increased inventory turnover.
- ABC analysis, thus, tries to focus and direct the effort based on the merit of the items and, thus, becomes an effective management control tool.

2.14 FSN ANALYSIS

All the items in the inventory are not required at the same frequency. Some are required regularly, some occasionally and some very rarely. FSN analysis classifies items into fast moving, slow moving, non-moving items.

2.15 INVENTORY TURNOVER RATIO

Kohler defines inventory turnover as "a ratio which measures the number of times a firm's average inventory is sold during a year".

A higher turnover rate indicates that the material in question is a fast moving one. A low turnover rate, on the other hand, indicates over-investment and locking up of working capital on undesirable items.

Inventory turnover ratio may be calculated in different ways by changing the numerator, but keeping the same denominator. For instance, the numerator may be materials consumed, cost of goods sold or net sales. Based on any one of these, the ratio differs from industry to industry.

Stock turnover is measured in terms of the ratio of the value of materials consumed to the average inventory during the period. The ratio indicates the number of times the average inventory is consumed and replenished. By diving no. of days in a year by turnover ratio, the number of days for which the average inventory is held, can be ascertained.

Comparing the no. days in the case of two different materials, it is possible to know which is fast moving & which is slow moving. On that basis, attempt may be made to reduce the amount of capital locked up, and prevent over-stocking of slow moving items.

$$\text{Inventory turnover ratio} = \frac{\text{Net sales}}{\text{Avg. inventory}}$$

$$\text{Inventory velocity} = \frac{\text{No. of days in a year}}{\text{Inventory turnover ratio}}$$

CHAPTER-III

OBJECTIVES OF THE STUDY

PRIMARY OBJECTIVE

- To analyze the efficiency of Inventory Management of Whirlpool of India Ltd.

SECONDARY OBJECTIVE

- To identify optimum level of inventory which minimizes the cost.
- To identify the safety stock level for various components.
- To classify the various components based on its value and movements.
- To identify inventory requirement of the company for the next year.

CHAPTER-IV

RESEARCH METHODOLOGY

4.1 RESEARCH

Research is a process in which the researcher wish to find out the end result for a given problem and thus the solution helps in future course of action. The research has been defined as "A careful investigation or enquiry especially through search for new facts in branch of knowledge"

4.2 RESEARCH DESIGN

The research design used in this project is Analytical in nature the procedure using, which researcher has to use facts or information already available, and analyze these to make a critical evaluation of the performance.

4.3 DATA COLLECTION

- **Primary Sources**

1. Data are collected through personal interviews and discussion with Finance-Executive.
2. Data are collected through personal interviews and discussion with Material Planning- Manager.

- **Secondary Sources**

1. The data are collected from the annual reports maintained by the company for the past six years viz., 2007-2013
2. Data are collected from the company's website.
3. Books and journals pertaining to the topic.

4.4 TOOLS USED IN THE ANALYSIS

- Economic Order Quantity.
- Safety Stock.
- ABC Analysis.
- FSN Analysis.
- Linear Regression method.
- Inventory turnover ratios.

CHAPTER-V

DATA ANALYSIS AND INTERPRETATION

5.1 ECONOMIC ORDER QUANTITY (EOQ)

Economic Order Quantity is the Inventory management technique for determining optimum order quantity which is the one that minimizes the total of its order and carrying costs.

TABLE 5.1.1 ECONOMIC ORDER QUANTITY

Sl. No.	Components	Demand Per year	Re-Order Cost/ order	Carrying Cost/unit /year	EOQ	No. of units Ordered	No. of order per year
1.	Bearing - Ball Sealed – 6006	3,60,000	12,200	2	66,272.17	30,000	5.43
2.	Bearing - Ball Sealed - 6205 - Swift	48,000	6,200	2	17,251.09	4,000	2.78
3.	Drive assly - NBO - China (Agitator) - 2 pin drive	1,44,000	1,700	36	3,687.82	12,000	39.05
4.	Drive assly - ECO Dlx - NBO - China (Impeller)	96,000	1,700	36	3,011.09	8,000	31.88
5.	Driven Pulley - NBO - China (Same pulley)	2,40,000	1,700	36	4,760.95	20,000	50.41
6.	Wash timer - Eco Dlx (Ningbo) - With buzzer (S60)	30,000	1,700	2	7,141.43	2,500	4.20
7.	Wash timer - Eco Dlx (Ningbo) - Without buzzer (Sl 60)	42,000	1,700	2	8,449.85	3,500	4.97
8.	Heater (WW)	21,600	4,700	2	10,075.71	1,800	2.14
9.	Heater (Chandini)	9,600	6,200	2	7,714.92	800	1.24
10.	Pig tail connector-3.0	3,60,000	6,200	2	47,244.05	30,000	7.62
11.	Pig tail connector-3.8	1,80,000	6,200	2	33,406.59	15,000	5.39
12.	Seal drive tube - Swift	42,000	6,200	2	16,136.91	3,500	2.60
13.	Seal tub support - Swift	42,000	6,200	2	16,136.91	3,500	2.60
14.	WW Motor - Welling	90,000	6,200	18	7,874.01	7,500	11.43
15	Splash Motor	42,000	6,200	18	5,378.97	3,500	7.81

16.	Motor - Jeamo	3,00,000	65,200	18	46,619.02	25,000	6.44
17.	Clamp tub	66,600	10,100	2	25,935.69	5,550	2.57
18.	Suspension Spring Assly FLT 70 (Fimstud)	7,200	10,000	2	8,485.28	600	0.85
19.	Door Lock - High End	1,800	15,400	2	5,264.98	150	0.34
20.	Door Lock, Low End, FLT70	1,800	15,400	2	5,264.98	150	0.34
21.	Ball Bearing-Outer, FLT70	3,600	8,400	2	5,499.09	300	0.65
22.	Ball Bearing-Inner, FLT70	3,600	8,400	2	5,499.09	300	0.65
23.	Heating Element , High/Mid End,FLT70	1,800	8,400	2	3,888.44	150	0.46
24.	Heater Low end	1,800	8,400	2	3,888.44	150	0.46
25.	Pressostat, FLT70	3,600	8,400	2	5,499.09	300	0.65
26.	Timer T2-EC6018-FLT	1,800	8,900	2	4,002.50	150	0.45
27.	Water Distribution Actuator, FLT70	1,800	7,900	2	3,770.94	150	0.48
28.	Nut Push In, FLT70	21,600	16,400	2	18,821.26	1,800	1.15
29.	Heater Clip,FLT70	3,600	7,750	2	5,282.05	300	0.68
30.	Bellow, FLT70	3,600	84,300	2	17,420.68	300	0.21
31.	Shock Absorber Assy, FLT70	7,200	9,800	2	8,400.00	600	0.86
32.	Universal Motor Assy, Mid&High End,FLT70	1,800	49,200	18	3,136.88	150	0.57
33.	Motor Low end	1,800	57,200	18	3,382.31	150	0.53
34.	Window Glass,FLT70	3,600	23,100	18	3,039.74	300	1.18
35.	Drain Pump, FLT	1,800	20,100	2	6,014.98	150	0.30
36.	On / Off Switch Low end (Push button switch)	1,800	7,700	2	3,722.90	150	0.48
37.	Thermostat Variable, Low End, FLT70	1,800	8,500	2	3,911.52	150	0.46
38.	Poly V Belt,FLT70	1,800	1,700	2	1,749.29	150	1.03
39.	Tub Sealing, FLT70	3,600	1,700	2	2,473.86	300	1.46
40.	SS Coil	2,40,000	52,200	18	37,309.52	20,000	6.43

ANALYSIS & INTERPRETATION:

In the above table the EOQ & the no. of orders purchased per year for various components are calculated. The calculated EOQ is compared with the no. of units of each component purchased in the organization. It is found that, there is a variation in the EOQ & no. of unit purchased. It is understood that the company is not following EOQ for purchasing the materials & therefore the inventory management is not satisfactory.

5.2 SAFETY STOCK

Safety stocks are the minimum additional inventory which serve as a safety margin to meet an unanticipated increase in usage resulting from an unusually high demand and an uncontrollable late receipt of incoming inventory.

Table 5.2.1 Safety stock

Sl. No.	Components	Max. Lead Time	Normal Lead Time	Demand	Safety Stock
1.	Bearing - Ball Sealed – 6006	0.27	0.166	3,60,000	37,440
2.	Bearing - Ball Sealed - 6205 – Swift	0.27	0.166	48,000	4,992
3.	Drive assly - NBO - China (Agitator) - 2 pin drive	0.27	0.166	1,44,000	14,976
4.	Drive assly - ECO Dlx - NBO - China (Impeller)	0.27	0.166	96,000	9,984
5.	Driven Pulley - NBO - China (Same pulley)	0.27	0.166	2,40,000	24,960
6.	Wash timer - Eco Dlx (Ningbo) - With buzzer (S60)	0.27	0.166	30,000	3,120
7.	Wash timer - Eco Dlx (Ningbo) - Without buzzer (SI 60)	0.27	0.166	42,000	4,368
8.	Heater (WW)	0.27	0.166	21,600	2,246.4
9.	Heater (Chandini)	0.27	0.166	9,600	998.4
10.	Pig tail connector-3.0	0.27	0.166	3,60,000	37,440
11.	Pig tail connector-3.8	0.27	0.166	1,80,000	18,720
12.	Seal drive tube – Swift	0.27	0.166	42,000	4,368
13.	Seal tub support – Swift	0.27	0.166	42,000	4,368
14.	WW Motor – Welling	0.27	0.166	90,000	9,360
15.	Splash Motor	0.27	0.166	42,000	4,368
16.	Motor - Jeamo	0.27	0.166	3,00,000	31,200
17.	Clamp tub	0.27	0.166	66,600	6,926.4
18.	Suspension Spring Assly FLT 70 (Fimstud)	0.27	0.166	7,200	748.8
19.	Door Lock - High End	0.27	0.166	1,800	187.2
20	Door Lock, Low End, FLT70	0.27	0.166	1,800	187.2

21.	Ball Bearing-Outer, FLT70	0.27	0.166	3,600	374.4
22.	Ball Bearing-Inner, FLT70	0.27	0.166	3,600	374.4
23.	Heating Element , High/Mid End,FLT70	0.27	0.166	1,800	187.2
24.	Heater Low end	0.27	0.166	1,800	187.2
25.	Pressostat, FLT70	0.27	0.166	3,600	374.4
26.	Timer T2-EC6018-FLT	0.27	0.166	1,800	187.2
27.	Water Distribution Actuator, FLT70	0.27	0.166	1,800	187.2
28.	Nut Push In, FLT70	0.27	0.166	21,600	2,246.4
29.	Heater Clip,FLT70	0.27	0.166	3,600	374.4
30.	Bellow, FLT70	0.27	0.166	3,600	374.4
31.	Shock Absorber Assy, FLT70	0.27	0.166	7,200	748.8
32.	Universal Motor Assy, Mid & High End,FLT70	0.27	0.166	1,800	187.2
33.	Motor Low end	0.27	0.166	1,800	187.2
34.	Window Glass,FLT70	0.27	0.166	3,600	374.4
35.	Drain Pump, FLT	0.27	0.166	1,800	187.2
36.	On / Off Switch Low end (Push button switch)	0.27	0.166	1,800	187.2
37.	Thermostat Variable, Low End, FLT70	0.27	0.166	1,800	187.2
38.	Poly V Belt,FLT70	0.27	0.166	1,800	187.2
39.	Tub Sealing, FLT70	0.27	0.166	3,600	374.4
40.	SS Coil	0.27	0.166	2,40,000	24,960

ANALYSIS & INTERPRETATION:

In the above table, safety stock for the various components calculated are shown. Actual demand is given for each component for a period of 1 year and the lead-time is calculated at a maximum of 100 days & normal of 60 days and these were converted into per annum. So, from calculation of safety stock, we can able to determine how much the company can hold the inventory in reserve stock per annum.

5.3 ABC ANALYSIS

The ABC system is a widely used classification technique to identify various items of inventory for purposes of inventory control. On the basis of unit cost involved, the various items are classified into 3 categories:

(1) A, consisting of items with the large investment,
(2) C, with relatively small investments but fairly large number of items and
(3) B, which stands mid-way between category A & C.

Category A needs the most rigorous control, C requires minimum attention and B deserves less attention than A but more than C.

A Class (High Value)

Drive assly - NBO - China (Agitator) - 2 pin drive
Drive assly - ECO Dlx - NBO - China (Impeller)
Wash timer - Eco Dlx (Ningbo) - With buzzer (S60)
Heater (WW)
Heater (Chandini)
WW Motor - Welling
Splash Motor
Motor - Jeamo
Heating Element, High/Mid End,FLT70
Heater Low end
Timer T2-EC6018-FLT
Water Distribution Actuator, FLT70
Bellow, FLT70
Thermostat Variable, Low End, FLT70
Universal Motor Assy, Mid & High End,FLT70
Motor Low end
Window Glass,FLT70
Drain Pump, FLT

B Class (Moderate Value)

Bearing - Ball Sealed - 6006

Bearing - Ball Sealed - 6205 - Swift

Wash timer - Eco Dlx (Ningbo) - Without buzzer (SI 60)

Door Lock - High End

Door Lock, Low End, FLT70

Ball Bearing-Outer, FLT70

Ball Bearing-Inner, FLT70

Seal drive tube - Swift

Seal tub support - Swift

Pressostat, FLT70

Shock Absorber Assy, FLT70

On / Off Switch Low end (Push button switch)

SS Coil

Poly V Belt,FLT70

C Class (Low Value)

Driven Pulley - NBO - China (Same pulley)

Pig tail connector-3.0

Pig tail connector-3.8

Clamp tub

Suspension Spring Assly FLT 70 (Fimstud)

Nut Push In, FLT70

Heater Clip,FLT70

Tub Sealing, FLT70

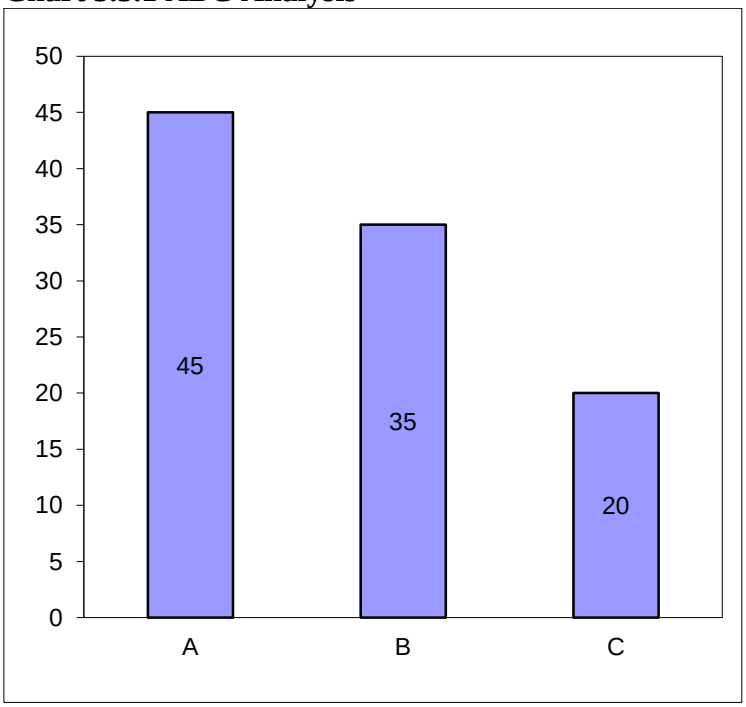
Table 5.3.1 ABC ANALYSIS

Categories	**Total No. Items in Classes**	**Percentage**
A	18	45
B	14	35
C	8	20
Total	**40**	**100**

ANALYSIS & INTERPRETATION:

The above table shows the classification of various components as A, B & C classes using ABC analysis techniques based on unit value. From the classification A classes are those whose unit value is more than Rs.100 and constitutes 45% of total components. B classes are those whose unit value is between Rs.25-100 constitutes 35% of total components and C classes are those whose unit value is less than Rs.25 constitutes 30% of total components. It is good that the company maintains its inventories based on its value using controlling techniques.

Chart 5.3.1 ABC Analysis



5.4 FSN ANALYSIS

All the items in the inventory are not required at the same frequency. Some are required regularly, some occasionally and some very rarely.

FSN classifies items into Fast moving, Slow moving and Non-moving.

FAST MOVING ITEMS

Bearing - Ball Sealed - 6006

Bearing - Ball Sealed - 6205 - Swift

Drive assly - NBO - China (Agitator) - 2 pin drive

Drive assly - ECO Dlx - NBO - China (Impeller)

Driven Pulley - NBO - China (Same pulley)

Wash timer - Eco Dlx (Ningbo) - With buzzer (S60)

Wash timer - Eco Dlx (Ningbo) - Without buzzer (SI 60)

Heater (WW)

Heater (Chandini)

Pig tail connector-3.0

Pig tail connector-3.8

Seal drive tube - Swift

Seal tub support - Swift

WW Motor - Welling

Splash Motor

Motor - Jeamo

SS Coil

SLOW MOVING ITEMS

Clamp tub

Suspension Spring Assly FLT 70 (Fimstud)

Door Lock - High End

Door Lock, Low End, FLT70

Ball Bearing-Outer, FLT70

Ball Bearing-Inner, FLT70

Heating Element , High/Mid End,FLT70

Heater Low end

Pressostat, FLT70

Timer T2-EC6018-FLT

Water Distribution Actuator, FLT70

Nut Push In, FLT70

Heater Clip,FLT70

Bellow, FLT70

Shock Absorber Assy, FLT70

Universal Motor Assy, Mid & High End, FLT70

Motor Low end

Window Glass,FLT70

Drain Pump, FLT

On / Off Switch Low end (Push button switch)

Thermostat Variable, Low End, FLT70

Poly V Belt,FLT70

Tub Sealing, FLT7023 17

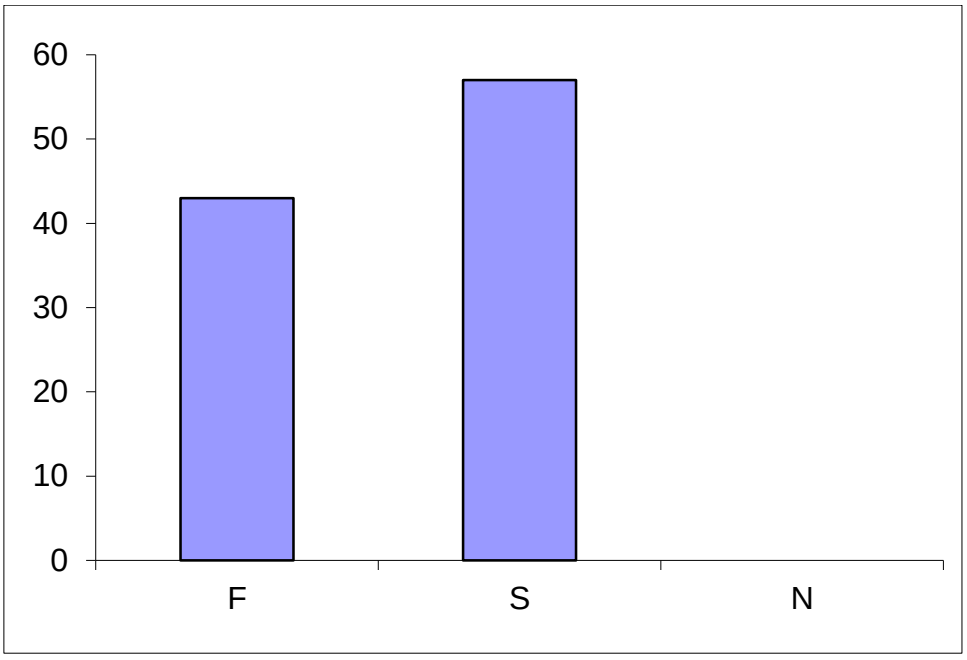
Table 5.4.1 FSN ANALYSIS

Categories	**Total No. items in Classes**	**Percentage**
F	17	43
S	23	57
N	0	0
Total	**40**	**100**

ANALYSIS & INTERPRETATION:

In the above table shows the classification of various components as FSN items using FSN analysis techniques based on movements. From the classification F items are those which moves fastly and constitutes 43% of total components. S items are those which moves slowly constitutes 57% of total components and N items are those which doesn't move (Non-moving items). According to data given, there is no Non-moving items. It is not good as the company maintains low percentage in moving items.

Chart 5.4.1 FSN Analysis



5.5 TREND ANALYSIS

Regression means dependence and involves estimating the values of a dependent variable Y, from an independent variable X.

$Y = a + bx$

Where $a = y - b\ x$; $\quad b = \frac{\Sigma xy - n\ \bar{x}\ \bar{y}}{\Sigma x^2 - n\bar{x}^2}$

Table 5.5.1 CALCULATION OF INVENTORY TREND

YEAR (x)	**Inventories (Rs.) Y**	**X X=x-2011**	**X^2**	**XY (Rs)**
2009	9,17,88,514	-2	4	-18,35,77,028
2010	8,66,68,300	-1	1	-8,66,68,300
2011	20,37,85,550	0	0	0
2012	17,58,61,213	1	1	17,58,61,213
2013	17,22,82,014	2	4	34,45,64,028
TOTAL(Σ)	**73,03,85,591**	**0**	**10**	**25,01,79,913**

$\bar{x} = \Sigma x/n = 0/5 = 0$

$\bar{y} = \Sigma y/n = 73,03,85,591/5 = 14,60,77,118.2$

$b = \frac{\Sigma xy - n\ \bar{x}\ \bar{y}}{\Sigma x^2 - n\bar{x}^2} = \frac{25,01,79,913 - 5 * 0 * 73,03,85,591}{10-5*0} = 2,50,17,991.3$

$a = \bar{y} - b\ \bar{x} = 14,60,77,118.2 - 2,50,17,991.3 * 0 = 14,60,77,118.2$

$y = a + bx$

= 14, 60, 77,118.2 + 2, 50, 17,991.3 x

The forecast of inventory for the year 2014 is computed by substituting x = 2014 in the above equation.

=14, 60, 77,118.2 + 2, 50, 17,991.3 x

=14, 60, 77,118.2 + 2, 50, 17,991.3 (x-2011)

=14, 60, 77,118.2 + 2, 50, 17,991.3 (2014-20011)

=14, 60, 77,118.2 + 2, 50, 17,991.3 (3)

=14, 60, 77,118.2 + 7, 50, 53,973.9

=22, 11, 31,092.1

Therefore inventory for the year 2014 will be approximately Rs.22, 11, 31,100

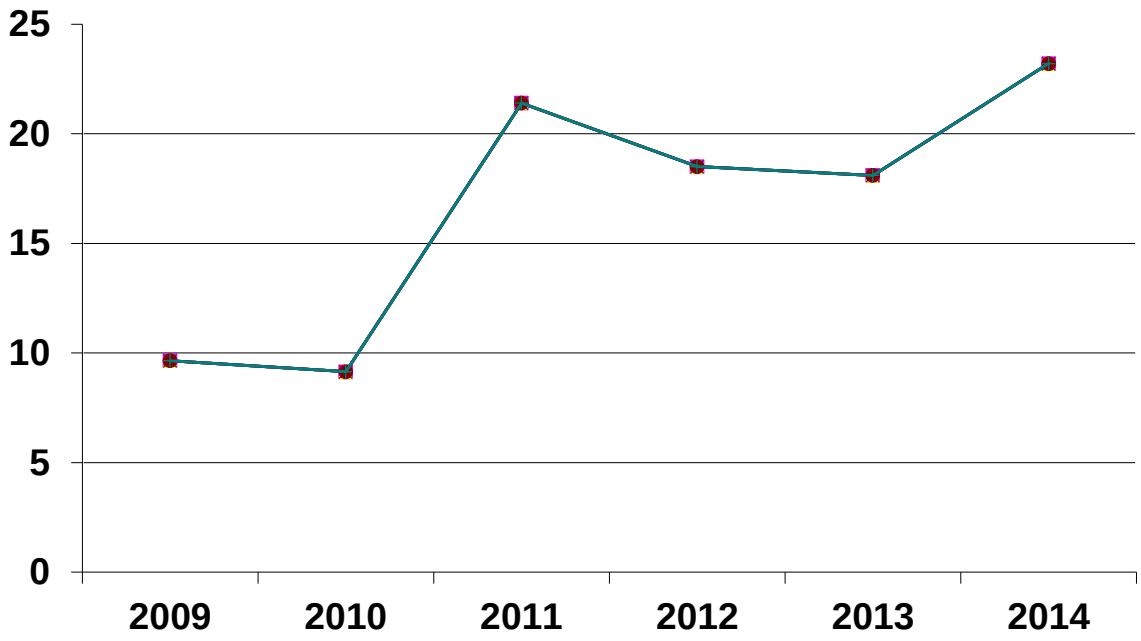
Table 5.5.2 INVENTORIES PERCENTAGE

Years	**Inventories**	**Percentage**
2009	9,17,88,514	9.65
2010	8,66,68,300	9.15
2011	20,37,85,550	21.40
2012	17,58,61,213	18.50
2013	17,22,82,014	18.10
2014	22,11,31,100	23.20
TOTAL	**95,15,16,691**	**100**

ANALYSIS & INTERPRETATION:

In the above table shows the percentage of inventories increases from 9.65 to 18.10 in the year 2007-2013. the inventory for the year 2014 is expected to be 23.20 which is again in the increasing trend. This infers that the inventory requirement is increasing in the future period also. It shows satisfactory position of inventories as it implies increasing production & demand for the product.

Chart 5.5.2 TREND OF INVENTORY



CHAPTER-VI

6.1 FINDINGS OF THE STUDY

- It is found that, there is a variation in the EOQ & no. of unit purchased. It is understood that the company is not following EOQ for purchasing the materials. So, the inventory management is not satisfactory.

- From calculation of safety stock, we can able to determine how much the company can hold the inventory in reserve stock per annum.

- From the classification a classes are those whose unit value is more than Rs.100 and constitutes 45% of total components. B classes are those whose unit value is between Rs.25-100 constitutes 35% of total components and C classes are those whose unit value is less than Rs.25 constitutes 30% of total components. It is good that the company maintains its inventories based on its value using controlling techniques.

- From the classification F items are those which moves fastly and constitutes 43% of total components. S items are those which moves slowly constitutes 57% of total components and N items are those which doesn't move (Non-moving items). According to data given, there is no Non-moving items. It is not good as the company maintains low percentage in fast moving items in compared to slow moving inventories based on movements using controlling techniques.

- From the calculation it shows, that the percentage of inventoried increases from 9.65 to 18.10 in the year 2007-2013. The inventory for the year 2014 is expected to be 23.20 which is again in the increasing trend. This indicates increasing efficiency of the management.

6.2 SUGGESTIONS AND RECOMMENDATIONS

- ✓ According to EOQ, as the company does not follow EOQ for its purchasing, the company can be adjusted to order materials. This will reduce the cost & help to enhance the profit of the company.

- ✓ The company is required to maintain safety stock for its components in order to avoid stock-out conditions & help in continuous production flow.

- ✓ Under ABC analysis, the management must have more control on A than B&C, because A class constitutes more (45%) of higher values. There should be tight control exercised on stock levels, to avoid deterioration. This is done through maintaining low safety stock, continuous check on schedules & ordered frequently in inventories, in order to avoid over investment of working capital.

- ✓ The company must not go to the Non-moving items as far as possible, because there will be unnecessary blocking of working capital. This would hinder the other activities of the organization.

CHAPTER-VII

CONCLUSION

A better inventory management will surely be helpful in solving the problems the company is facing with respect to inventory and will pave way for reducing the huge investment or blocking of money in inventory. From the analysis we can conclude that the Company can follow the Economic Order Quantity (EOQ) for optimum purchase and it can maintain safety stock for its components in order to avoid stock-out conditions & help in continuous production flow. This would reduce the cost and enhance the profit. Also there should be tight control exercised on stock levels based on ABC analysis & maintain high percentage in fast moving items in inventories as per on FSN analysis for efficient running of the inventory. Since the inventory Turnover ratio shows the increasing trend, there will be more demand for the products in the future periods. If they could properly implement and follow the norms and techniques of inventory management, they can enhance the profit with minimum cost.

CHAPTER-VIII

8.1 LIMITATIONS OF THE STUDY

- The study takes into account only the quantitative data and the qualitative aspects were not taken into account.
- The assumption made in the EOQ and Safety stock formulas restrict the use of the formula. In practice, unit cost, lead time, requirements of inventory items are not accurately predictable. Rate of consumption varies in many cases. As such application of the formula often becomes a difficult and complicated matter.
- ABC analysis is not one time exercise and items are to be reviewed and recategorised periodically.

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