A STUDY ON INVENTORY MANAGEMENT AT ELLEN PUMPS PRIVATE LIMITED

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BONAFIDE CERTIFICATE

Certified that this project report titled, "**A Study On Inventory Management At Ellen Pumps Private Limited**" is the bonafide work of **Mr.P.Sivasankar (1120400085)** who carried out the project under my supervision. Certified further, that to the best of my knowledge the work reported herein does not form part of any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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Internal Examiner   External Examiner

DECLARATION

I affirm that the project work titled "**A STUDY ON INVENTORY MANAGEMENT AT ELLEN PUMPS PRIVATE LIMITED**" being submitted in partial fulfillment for the award of Master of Business Administration is the original work carried out by me. It is not a part of any other project work submitted for the award of any degree or diploma, either in this or any other university.

Signature of the Candidate

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I certify that the declaration made above by the candidate is true.

Signature of the Guide

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SYNOPSIS

Inventory management is the process of efficiently overseeing the constant flows of units into and out of an existing inventory. This process usually involves controlling the transfer of units in order to prevent the from becoming too high,or dwindling to levels that could put the operation of the company into jeopardy.competent inventory management also seeks to control the costs associated with the inventory, both from the perspective of the total value of the goods included and the tax burden generated by the cumulative value of the inventory.

Ellen pumps private limited,Coimbatore is a pioneer in the field of agricultural and domestic monoblocs and pumpsets in India. Ever since its founding in 1960, its products have been highly sought after. Home for ELLEN is Coimbatore, India where entrepreneurial spirit, technical innovation and quality have become a tradition. The company now has a peak production capacity of 25,000 Motors and Pumpsets and 500 Tonnes of high- grade ferrous castings per month.

The objective of the study is to know about the inventory management system at the company and to improve the inventory management by using the techniques like ABC analysis and Economic Order Quantity. This will help the company to have better management of raw materials and help in continuous production without any hindrance. This study focuses on ten models of pumps manufactured by the company and improves the inventory management system by implementing the above techniques.

CHAPTER 1 : INTRODUCTION

1.1 INTRODUCTION TO THE STUDY:

Everything has a price; nothing in this world is for free. These statements talks about the goods and services available to consumers and customers alike throughout the globe. The Pump industry is no way an exception to this statement, rather fact.

ORIGIN OF THE WORD INVENTORY

The word inventory was first recorded in 1601. The French term inventaire, or "detailed list of goods," dates back to 1415.

BUSINESS INVENTORY

The inventory management system that control of process provides information to efficiently manage the flow of materials, effectively utilize people and equipment, coordinate internal activities, and communicate with customers

Inventory management and the activities of inventory control do not make decisions or manage operations; they provide the information to managers who make more accurate and timely decisions to manage their operations.

The emphases on each area will vary depending on the company and how it operates, and what requirements are placed on it due to market demands. Each of the areas above will need to be addressed in some form or another to have a successful program of inventory management and control.

Inventories consistent the most significant part of current assists of the large majority of company in India. On average, approximately 60 percentages of current assets in companies in India. Because of the large size of inventories maintained by firm, a considerable amount of funds is required to be committed them. A firm neglecting the

management of inventories will be jeopardizing its long-run profitability and may fail ultimately.

It is a possible a company to reduce its level of inventories to a considerable degree, e.g., 1 0 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 company's profitability.

Inventory is a list for goods and materials, or those goods and materials themselves, held available in stock by a business. Supply delay is longer than delivery delay, and also to ease the effect of imperfections in the manufacturing process that lower production efficiencies if production capacity stands idle for lack of materials, effective and efficient management of inventories helps in minimizing holding inventories, risk and losses due to stock out and keeping the investment in inventories at a reasonable level.

Nature of inventories:

Inventories are stock of the product of a company in manufacturing for a sale and component that make up the product. The various forms of inventories are

• Raw materials
• Work-in progress
• Finished goods
• Spare parts.

Raw materials are those basic inputs that are converted into finished products through the manufacturing process. Inventories are raw materials are those units, which have been purchased and stored for future productions

Work-in progress inventories are semi-manufactured products, the represent products that need more work before they become finished products for sale.

Finished goods inventories are those completely manufactured products, which are ready for sale. Stocks of raw materials and work in progress facilitate production, while stock of finished goods required for smooth marketing operation.

Spare parts include office and plant cleaning materials like soap, brooms, oil, fuel, light bulbs. These materials do not directly involved production, but are necessary for production process.

The reasons for keeping stock

There are three basic reasons for keeping an inventory:

• **Time** - the time lags present in the supply chain, from supplier to user at every stage, requires that you maintain certain amount of inventory to use in this lead time".

• **Uncertainty** —inventories are maintained as buffers to meet uncertainties in demand, supply and movements of goods.

• **Economies** of scale-ideal condition of one unit at a time at a place where user needs it, when he needs it" principle tends to incur lots of costs in terms of logistics. So bulk buying, movement and storing brings in economies of scale, thus inventory.

Objective of inventory management:

The purpose of inventory is to reduce materials holding cost that is inventory carrying cost and the ordering costs. This helps the company's to save their cost of capital and utilize their resources for a better investment opportunity.

- To maintain a large size of inventories of raw materials and work in progress for efficient and smooth production and of finished goods for uninterrupted sales operation.
- To maintain a minimum investment in inventories to maximize profitability.
- To avoid the both over stocking and under stocking of inventory.
- To keeping material cost under control so they contribute in reducing cost of production and overall costs.
- To ensure a right quantity goods at reasonable time

Benefits of inventory control:
- Keeps down investment
- Eliminates duplication
- Better utilization of available stock
- Minimizes stock out situations
- Re-sale of obsolete inventory.
- Adequate supply of materials

Cost associated with inventories:

The effective management of inventory involves a trade off between having too little and too much inventory. In achieving this trade off, the finance manager should realize that costs may be closely related.
- Ordering costs
- Carrying inventory costs

Ordering costs:

The term ordering costs is used in case of raw materials and includes the entire costs of acquiring raw material. Any manufacturing organization has to purchase materials. Ordering costs refer to the cost associated with the preparation of requisition forms by the user department, set up costs to be incurred by the manufacturing department and transport, inspection at the user department.

By and large, ordering costs remain more or less constant irrespective of the size of the order although transportation and inspection cost may vary to a certain extent depending upon order size. But this is not going to significantly affect the behavitheir of ordering costs. As ordering costs are considered invariant to the order size, the total ordering costs can be reduced by increasing the size of the orders.

Carrying inventory costs:

These are the expenses of storing goods. Once the goods have been accepted, they become part of the firms inventories. These costs include insurance, rent/depreciation of warehouse, and salaries of storekeeper, his assistants and security personnel, financing cost of money locked up in inventories, obsolescence's, spoilage and taxes.

By and large, carrying costs are considered to be given percentage of the value of inventory held in warehouse, despite some of the fixed elements of costs that comprise only a small portion of total carrying costs. Approximately. carrying costs are considered to be around 25 percentage of the value of the inventory held in storage. The greater the investment in inventory, the greater the carrying costs.

Ordering costs	Carrying costs
• Requisitioning	• Warehousing
• Order placing	• Handling
• Transportation	• Clerical and staff
• Receiving, inspecting	• Insurance
• Clerical and staff	

Growth of Pump Industry

Although some pumps were used in 19th century the real growth of Pump Industry took place in 20th century:

1905: Multistage Centrifugal Pumps were developed.

1929: Considerable light was thrown on the vexing problem of pressure pulsations in large hydraulic turbines & pumps.

1932: Proper understanding of the origin and nature of pressure pulsation & the accompanying, vibratory, structural, mechanical response.

1955: Dependence of cavitation erosion on liquid was established. This led to an understanding of why high-energy pumps are more likely to suffer from this damaging phenomenon.

1956: How the thermodynamic vaporization properties of the pump liquid could lead to reduction of cavitation activity at high temperatures at the same NPSH (Net Positive Suction Head) (Liquid pressure head in excess of vapour pressure head).

1994: 1-low cavitation can cause profound instabilities in pump & inducer operation.

1990-2000: It is found that sometimes obscure fluid phenomena can produce mechanical instability in rotodynamic pumps.

Drivers of pump development

I.   **Industrial Revolution:** Pump industry had been fuelled by the massive demands of the industrial revolution that built our modern society.

2.   **Post World War II Expansion:** In order to satisfy the pent-up demand that had gone unfulfilled in war years. Here the emphasis was on large, multistage electric utility boiler feed water pumps & oil-field injection & pipeline pumps.

3.   **Energy Crisis:** Energy crisis all over world led to lot of research & development work for developing energy efficient pumps & systems.

4.   **Environmental Challenges:** Curbing emissions was the paramount concern. This influence has led to better sealing of pumps including sealless, magnetically coupled chemical pumps. The ultimate product in this regard could be integral motor pump'.

5.   **Globalization:** The fluid engineering & other technical challenges are assumed to be solvable by the MNC who emphasize quality, productivity & faster delivery of the product in order to battle global market share. The apparently mature pump product has a lot of room for improvement. The technical improvements will continue to be necessary to maintain global competitiveness.

The applications of pumps

Transportation: It is a prime function.

- **Circulation:** For homogenizing the temperature and/or composition of fluid.
- **Mixing:** Two or more streams can be connected at the suction of pump & mixing can be achieved.
- **Injecting:** High pressure can be developed by using pump and fluid can be injected in pipe or tank.
- **Metering:** Pumps can he used as metering device.
- **Pressure Reducing Device:** Rotary pumps can be used for reducing the pressure in polymers.
- **Agitator Pump:** Submersible pump keep the solids in suspension & prevent setting.
- **Vacuum Generation:** Liquid ring vacuum pumps are well known. Dry vacuum pumps are also developed.
- **Reactor:** When two liquids are to be reacted with very small residence time then pump can be used.
- **Cavitation Reactor:** When one liquid and another in vapor form are to be reacted, the principle of cavitation can be used.

Indian pump industry at present met the pump requirements of 95% of applications.

Some Recent Developments in Pumps

- One supplier has developed dry industrial vacuum pump. They use claw technology with a built in roots mechanism & facilitate high speed evacuation down to an ultimate vacuum of 0.05 mbar. Peak pump capacity is 560 cubic rn/hr. Despite high pumping capacity, manufacturer claims less energy consumption.

- Another has developed vertical dual-screw dry running vacuum pump. It has an electric drive control integral with pump unit & can also be remotely controlled. It meets the stringent electrical, mechanical & instrumentational safety standards of legislation. (Received award in 40th International Mech. Engineering Exhibition at BRNO in Czech Republic).

- One foreign supplier has developed ultra high pressure plunger pumps (Pressure 2500 bar & flow 15 to 20 lit/mm., Temp. : 50°C) can be used for
- Sensitive paint stripping from metal and concrete surfaces.
- Surface preparation prior to painting & coating.
- Cutting of metals, concrete, reinforced material.

- Computational Fluid Dynamic studies are carried out by Canfield University for:
- Flow prediction in pumps
- Three dimensional transonic flow simulations using a time marching scheme.
- Erosion studies during cavitation.

- **"SMART PUMPS":** Depending on the changes in suction conditions and /or changes in the discharge requirement the pump should act accordingly by using "SMART SENSORS" which will be based on optical fibres.

- **High Efficiency Small Circulation Pumps:** The conventional efficiency of small pumps is of the order of 5 to 10%. When these pumps are used as part of solar-auxiliary system, the efficiency of pump plays a vital role. The efficiencies of the pump have improved dramatically (+80%) using permanent magnet motors & hydraulically optimized impellers.

- One supplier has developed mechanical seal (for oil service at 660°F & water at 320°F) where cooling is achieved by using extended surfaces (fins), thus cooling water requirement is eliminated.

- Enterprise Asset Management (EAM) software applications reduce energy consumption & improve pump reliability by automatic monitoring of process pumps.

- Abroad, favourable experience of variable speed drive for power conservation in high HP equipment has led to development of micro drives.

- **The challenges ahead:**
- Stabilizing the head characteristics of large, high specific speed mixed flow pumps by using CFD (Computational Fluid Dynamics) techniques.
- Predicting the performance curves of pump using CFD.
- Eliminating vibrations & off-design pressure & flow fluctuations.
- Finding solutions to both rotor & structure related vibrations using FEA (Finite Element Analysis).
- Performance & life of pump is drastically affected due to cavitation. An improved blade shape reduces / eliminates cavitation damage.

- Develop highly reliable pump such that no standby pump is required.

Role of pump user
- Now a days pumps are purchased based on life cycle cost analysis. Hence, user will have to keep a track record of all the pumps for expenditure on utilities consumption, spare parts consumption, maintenance etc. and give feedback to consultants and manufacturers.
- For any technical problem, the user should contact consultant if they do not get satisfactory services from manufacturer and also address the problem to Pump Manufacturer's Association.
- The user should replace old inefficient pumps with efficient pumps. This will save national energy to a great extent. Use of variable speed drives wherever possible can he implemented.
- Wherever possible use 50% spare capacity instead of 100% spare capacity. For example instead of 200m3'hr. capacity (I working + 1 standby) use I 00m3/hr. capacity (2 working + I standby) pumps.
- Ensure preventive maintenance of all pumps.

Role of Technical Consultant
- A technical consultant is a very important link between pump user & manufacturer. He is responsible for selecting suitable type of pump for the given application.
- Consultant should ensure that material of construction of all fluid—contact parts are suitable for given application.
- Consultant should ensure proper equipment layout, upstream and downstream line sizing, strainers etc.
- Consultant should participate in seminar / workshops & share their experiences with user & manufacturers.

The role of Pump Manufacturers

- Manufacturers to ensure that maximum possible indigenous pumps are locally available & thus avoid import of pumps. Thus save on foreign exchange. Depending on feasibility study import substitute as well as export market can be explored. For example, Ceramic pumps, High performance alloys, High precision gear pump for spinning rn/c. in manmade fibre industry, peristaltic pumps, magnetic drive pumps etc.
- Pumps consume about 30% total power. Pump is an item which will consume more energy throughout its life if it is not energy efficient. Hence, it is necessary to improve on energy efficiency of the pump. Even for small Kw rating it is essential to have high energy efficiency because in future, we will likely to use solar energy where pump efficiency plays vital role.
- In Germany, 20% increase in energy efficiency by 2005 is made mandatory. In Netherlands, 33% improvement in energy efficiency compared to 1995 to be achieved by 2020.
- In European industry I 5-20% of energy saving potential is widely accepted through implementation of new technologies which are commonly available but not widely applied at present. What about India?
- In India, in 1 5% of the cases. motor selection is by consultant where as more than 45% of the cases motor selection is by manufacturers. Hence by selecting energy efficient motors & variable speed drive, pump manufacturers can contribute to energy saving.
- There is demand from user that manufacturer should take the responsibility for optimization of material selection. Here manufacturers should focus on application of new materials of construction. E.g. Ceramic coating.
- Manufacturers should arrange training programs for user & consulting engineers.
- Manufacturers to ensure 'PASS'. (Prompt After Sales Service)

- ❖ IPMA (Indian Pump Manufacturers Association) should

1. arrange more national / international seminars / exhibitions for further business developments.
2. submit their recommendations about export I import policies, excise, custom duties policies etc. to Govt. of India at least once in a year.
3. take a lead role in setting up of laboratory facility required for pump manufacturers.

1.3 ORGANIZATION PROFILE

ELLEN is a pioneer in the field of agricultural and domestic monoblocs and pumpsets in India. Ever since its founding in 1960, its products have been highly sought after. Home for ELLEN is Coimbatore, India where entrepreneurial spirit, technical innovation and quality have become a tradition. The company now has a peak production capacity of 25,000 Motors and Pumpsets and 500 Tonnes of high- grade ferrous castings per month.

ELLEN — motors, pumpsets and others

Started by a family of technocrats, as a small-scale unit, has now grown multifold. ELLEN has more than four decades of rich experience in the engineering industry. It is not only one of the leading manufacturers of pumps and Motors, but also, produces ferrous castings and Aluminum Pressure Die-castings and stampings for both captive consumption and sale. It has diversified its operations to include engineering, textiles, medical care, education, real estate, and social service. Today the ELLEN group of companies has a turnover of over rupees 500 million.

ELLEN - Sophisticated manufacturing facilities.

The group is engaged. in the manufacture of various types of Motors, Monoblocs, Submersibles. Wet Grinders, Ferrous Castings, Aluminium Pressure Die-castings and Stampings. There are well equipped facilities with latest machineries to carry out the

entire operations required for the manufacture of pumpsets, right from production of castings and stampings to assembly, painting and packing.

MEASURE AND TESTING.

ELLEN believes that quality comes first. Ellen has state of the art laboratory facilities and procedures to meet ISI & ISO 9001 requirements. Strict acceptance tests according to 151 requirements, rigid input inspection, continuous in process inspection, endurance tests, and on-site testing are the marks of ELLEN product that enters the marketplace. Highly skilled, dependable staff use the latest gauges and instruments in this important task.

ELLEN - where customer satisfaction is paramount.

The ELLEN quality policy is to meet and exceed customer expectations.

ELLEN — the water source for the entire nation.

ELLEN has supplied hundreds of thousands of motors and pumpsets all over India. As a traditional customer oriented company it is essential to provide proper technical advice and customer service on the spot. Our customer support engineers provide essential on site support for all customers, from large organisations in metropolitan cities to small farmers in remote villages.

To carry out this essential function, the group has its own well-established and wide spread sales and service centers in Andhra Pradesh, Karnataka, Kerala, TamilNadu, Maharashtra, Madhya Pradesh, Rajasthan and Chattisgarh.

A network of morethan 1000 dealers operates throughout the country. The dealers through their sales and service centers market more than 80 % of Ellen's products.

ELLEN — stands for dependability.

ELLEN is an ISO 9001 company whose products bears the ISI Mark, indicative of their high level of quality. ELLEN is in the approved list of suppliers of National Small Scale Industries Corporation, New Delhi, Nationalised and Scheduled Banks, Maharashtra and Madhya Pradesh Co-operative Federations, Kerala Agro Industries Corporation, and Andhra Pradesh S.C. Corporation, Approval from T.W.A.D. Board and RITES.

AWARDS

The company has been given the following awards and certification for the Quality standards.

- Certificate of Excellence   -   Gold Medal
- Certificate of Merit   -   International Tradefare Diamond
                                      studded super selection award.
- National Award for Quality   -   Awarded by the Institute of Economic studies
- Excellence Award

1.4 STATEMENT OF THE PROBLEM

Inventory Control is a key function in Cost and Financial Management. Improper inventory control may lead to either production run problems or over-investment in inventory. Hence, identifying and classifying the inventory according to its need, values, and importance are considered as a problem for the study.

1.5 OBJECTIVES OF THE STUDY

Primary objective:

To study the inventory management system adopted by Ellen Pumps, Coimbatore.

Secondary objective:

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- ▪ To classify the inventory into A,B, & C categories based on their cost and to estimate the Economic Order Quantity Value for the components

1.6 SCOPE OF THE STUDY

- ▪ The study focuses on the inventory control at the shop floor level. The study is confined to the ten models of pumps manufactured by Ellen Pumps, Coimbatore.

CHAPTER 2: REVIEW OF LITERATURE:

David Zalkind[1],observed that the system analyzed in this paper is the scheduling-periodorder-level, *tZ*, system where every t units of time an order is placed for an amount equal to the difference between a predetermined order-level Z and the sum of what is currently on hand and already on order. Shortages are backordered. Lead-time, the time lag between the placing of an order and its arrival, is stochastic. Separate orders have independent identically distributed lead-time distributions. Orders are thus not restricted to arrive in the same sequence in which they were placed.

WARREN H. HAUSMAN[2],observed that the recording the number of unite of a product which are backordered, in certain situations it is appropriate to focus on the number or percentage of customer line items (requests for a particular item) which are backordered. By combining an approximate backorder cost per customer line item backordered with the usual ordering and carrying costs, an approximately optimal reorder point (or safety stock) formula is derived. The formula is applied to a stratified sample of 500 products from an actual inventory system, and an estimated 13% reduction in customer line items backordered is obtained with no increase in total inventory investment.

[1] David Zalkind(1978),"order level inventory systems with independent stochastic lead times",Management science vol.24,no.13,September 1978

[2] Warren h.hausman(1969),"Minimizing Customer Line Items Backordered in Inventory control Management Science vol.15,no 12,august 1969

LEROY B. SCHWARZ[3], observed that the many inventory policy decisions encountered by management scientists relate to a system of stocking points, e.g., a multi technology manufacturing system or a multi location distribution system. In such systems the optimal policy for any one stocking point depends at least to some extent upon the costs, constraints, and policies imposed upon it by the other stocking points in the system. This paper is a study of one special type of such an inventory system: a one-warehouse IV-retailer inventory system where stocking policy decisions are centralized in order to achieve system optimal rather than locally optimal policies. Such systems are encountered frequently e.g. a group of company owned gasoline service stations supplied by a single company owned bulk storage facility, or a chain of discount department stores supplied by a single regional warehouse, etc. This paper considers this type of inventory system with known demands; a subsequent paper will treat the stochastic case.

G. HADLEY AND T. M. WHITIN[4], observed that the model minimizes the sum of liquidation losses Inventory carrying charges, and stock-out costs. Naturally, the optimal final Inventory decreases as the date of obsolescence draws nearer. For some extremely low demand items or items with very high set up costs, the optimal final inventory will be stocked at the outset, although typically procurement orders will be placed for a substantial portion of the lifetime. The model includes both costs which are incurred at a fixed point in time such as liquidation losses and costs which are a function of time, such as carrying charges and stock-out penalties

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[3] Leroy b.schwarz(1973),"A simple continuous Review Deterministic one warehouse Iv-Retailer inventory problem"Management science vol.19,no.5,January ,1973

[4]G.Hadley and M.whitin,"an optional final inventory model",University of Chicago and university of California,Berkeley.

JEBERMAN[5], observed that the issuing sequence of goods from a store is of particular interest when the utility of the goods depends on time and hence on the selected order of issue (1). If there are n units in the store, and if they are issued one by one, each being released when the usefulness of the previously issued unit has been completely exhausted, there are ni methods in which the n units can be scheduled for issue. The usefulness of a unit in the field is often measured by its "field life" fix,), which may be dependent on the age of the unit upon issue (i e on the time t it spent in the store prior to issue) In evaluating which issuing policy to adopt, it is often desirable to maximize the total field life derived from the n units in the stockpile. Two notable methods used in industry are FIFO (= first in first out) and LIFO (= last in first out).

AXSATER[6],observed that the information delay is a consequence of business processes, which can be expedited by removing organizational boundaries and impediments to the flow of information. In this endeavor, computer systems such as RFID (radiofrequency identity) tags or enterprise resource planning can be useful. However, the fixed cost of installing these systems can run up to several million dollars, which is why many companies are reluctant to install new computer systems unless their benefits are clearly documented. Depending on these benefits, deployment of big-ticket computer technologies may not be economically feasible according to Axsater (2001). Our objective here is to quantify the benefit of expediting inventory information.

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[5] Lieberman(1958),"FIFO and LIFO policies in inventory management" Management science vol.5,No.1,oct.1958

[6] Axsater(2001),"Economic Evaluation of systems that Expedite Inventory information",productions and operations management vol.16,no 3,may –june 2007.pp.300-368

Rong-Ruey Duh and Thomas W. Lin[7], observed that ABC system incorporates both volume-based and non-volume based drivers, which considers the effect of rework on product costs.The existing volume-based cost system overestimates the costs of high-volume products and underestimates the costs of products with high production-complexity. Finally, the company still stays at the analysis phase of the ABC system implementation, possibly due to revision of strategy, no linkage to incentives, lack of MIS support, and inadequate inventory control.

Rommert Dekker and J.B.G. Frenk[8], observed that a single-location inventory system of a slow moving item with Poisson demand where the demand rate drops to a lower level at a known future time. Under the assumptions of full backordering and fixed lead times, we incorporate obsolescence into a one-for-one policy with the option to reduce the base stock level in advance.

Peter Matheus and Ludo Gelders[9], observed that most inventory management models are based upon rather restrictive assumptions, e.g. unit sized demands and thenormal distribution for total demand during replenishment time. In a majority of inventory management systems,circumstances seem to allow these simplifications, and inventory policies based upon these assumptions yield satisfying results.

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[7] Rong-Ruey Duh and Thomas W. Lin," The design and implementation of activity-based costing"2009

[8] Rommert Dekker and J.B.G. Frenk," Service Parts Inventory Control under Obsolescence"

[9] Peter Matheus and Ludo Gelders,"The (R, Q) inventory policy subject to a compound Poisson demand pattern" Int. J. Production Economics 68 (2000) 307}317,1999

E. Borgonovo_and L. Peccati[10],observed that with the sensitivity analysis (SA) of inventory management models when uncertainty in the input parameters is given full consideration. They make use of Sobol.function and variance decomposition method for determining the most ifluential parameters on the model output.They show that by performing global SA in parallel to the modeling process an analyst derives insights not only on the EOQ structure when its expression is not analytically known, but also on the relevance of modeling choices, as the inclusion of .nancing policies and special orders.

Robert Kee and Charles Schmidt[11],observed that Activity-based costing (ABC) and the theory of constraints (TOC) represent alternative paradigms for evaluating the economic consequences of production-related decisions. However, their application can lead to contradictory productmix decisions. To resolve this conflict, it is frequently suggested that the TOC is appropriate for the short run, while ABC is appropriate for the longer term. This paper models the selection of a product mix with the TOC and an ABC model integrating activity-based cost with the capacity of production-related activities.

Nacreyz Roztocki and Heinz Roland[12],observed that Many firms in emerging economies invest in information technology primarily with the objective of protecting their cost advantages. This paper presents a framework for evaluating information technology investments by integrating the value chain model with activity-based costing. The proposed four-step approach is illustrated with a numerical example of a hypothetical manufacturing company seeking improvements in its cost structure.

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[10] E. Borgonovo_and L. Peccati," Global Sensitivity Analysis in Inventory Management" IMQ, Bocconi University Viale Isonzo Milano, Italy

[11] Robert Kee and Charles Schmidt," A comparative analysis of utilizing activity-based costing and the theory of constraints for making product-mix decisions, University of Alabama, Culverhouse School of Accountancy, Tuscaloosa,USA.1998

[12] Nacreyz Roztocki and Heinz Roland," Using Activity-Based Costing for Evaluating Information Technology Related Investments in Emerging Economies: A Framework",2004

Leroy B.Schwarz[13],observed that the economic order-quantity model considers the tradeoff between ordering cost and storage cost in choosing the quantity to use in replenishing item inventories.A larger order-quantity reduces ordering frequency, and, hence ordering cost/ month, but requires holding a larger average inventory, which increases storage (holding) cost/month. On the other hand, a smaller order-quantity reduces average inventory but requires more frequent ordering and higher ordering cost/month.

Jesper Thyssen,Poul Israelsen and Brian Jørgensen[14],observed that ABC was chosen because it is a costing method that in principle takes a total cost perspective which as it is argued in the paper is a necessary perspective when evaluating modularity. The ABC-analysis is structured in such a way that it shows how much higher the materials cost of the over-specified modularised component can be compared to the average materials cost for the product-unique components that it substitutes. This procedure provides case-specific insights to the designers.

Joseph Geunes, Zuo-Jun Shen, H. Edwin Romeijn[15],observed that Standard approaches to classical inventory control problems treat satisfying a predefined demand level as a constraint. In many practical contexts, however, total demand is comprised of separate demands from different markets or customers. It is not always clear that constraining a producer to satisfy all markets is an optimal approach. Since the inventory-related cost of an item depends on total demand volume, no clear method exists for determining a market's profitability *a priori,* based simply on per unit revenue and cost. Moreover, capacity constraints often limit a producer's ability to meet all demands.

[13] Leroy B.Schwarz," The Economic Order-Quantity (EOQ) Model", Purdue University,2008

[14] Jesper Thyssen,Poul Israelsen and Brian Jørgensen," Activity Based Costing as a method for assessing the economics of modularization – a case study and beyond",September 2004.

[15] Joseph Geunes, Zuo-Jun Shen, H. Edwin Romeijn," Economic Ordering Decisions with Market Choice Flexibility", *Department of Industrial and Systems Engineering, University of Florida,2003*

CHAPTER 3: RESEARCH METHODOLOGY:

Research methodology is a way to systematically solve the research problem it may be understood as a science of new research is done scientifically.

Meaning of the research

A careful investigation or inquiry especially through search for new facts in any branch of knowledge.

3.1 Type of research

A research design is the arrangement of condition and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure.

Case Study research

A detailed intensive study of a unit, such as a corporation or a corporate division, that stresses factors contributing to its success or failure

The present study uses Case Study Research Design.

3.2 DATA COLLETION METHOD

The data can be classified as;

I. Primary data

2. Secondary data

Primary data

The primary data are those which are collected a fresh and for the first time and thus happen. It is original in character.

Secondary data

The secondary data are those which have already been collected by some one else and which already been passed through the statistical process. Information for this study has been collected from the secondary data sources, like.

- Inventory report
- Bill of Material

3.3SAMPLING TECHNIQUE:

The study analyses all the 10 cases/models of pumps produced by Ellen Pumps (P) Limited.

3.4TOOLS USED FOR ANALYZING DATA

The following tools used for this study

- ABC analysis
- Economic order quantity

Economic order quantity

Economic order quantity is that level of inventory that minimizes the total of inventory holding cost and ordering cost. The framework used to determine this order quantity is also known as Wilson EOQ Model. The model was developed by F. W. Hanis in l913.The most economical quantity of a product that should be purchased at one time. The EOQ is based on all associated costs for ordering and maintaining the product. EOQ refers to the size of the order which gives maximum economy in punches of materials.

Formula

$$EOQ = sq.rt \ (12 \ AO \ / C1)$$

Where A   = Annual usage in unit.

O   = Ordering cost.

C 1   = Carrying cost.

ABC Analysis

ABC analysis is a business tenn used to define an inventory categorization technique often used in materials management. ABC analysis provides a mechanism for identifying items which will have a significant impact on overall inventory cost whilst also providing a mechanism for identifying different categories of stock that will require different management and controls

When carrying out an ABC analysis, inventory items are valued (item cost multiplied by quantity issued/consumed in period) with the results then ranked. The results are then grouped typically into three hands. These hands are called ABC codes.

Formula:

Total Value = Total Quantity * Cost Per Order

$$Consumption \ Value \ Percentage = \frac{Value \ of \ single \ Item}{Total \ Value \ of \ Item} *100$$

ABC codes:

1. "A class" inventory will typically contain items that account for 75% of total value
2. "B class" inventory will have around 20% of total value
3. "C class" inventory will account for the remaining 5%

4.1 ABC Analysis:

4.1.1 Table Showing Items For The Pump O.5HP 25D CSS-E1(31) 1PH HOWS SS 3M

Item	Description	Size / Qty / Wt	Rate / Unit	Values	Total (Inc tax)	Contribution % on Total RMC
0.5 HP 25D CSS – E1(31) 1PH HOWS SS 3M						
RC1CUW1001	Copper wire 0.6	0.460	666.00	306.36	351.43	16.68
RM1PANL1001	Panel board	1.000	300.00	300.00	312.00	18.37
RS5BODY1001	S.S. Body 160mm	1.000	225.00	225.00	258.10	15.58
RO3CAST1002	RC Casing	3.300	57.00	188.10	215.77	13.17
RC1CUW1002	Copper wiring 0.5	0.265	676.00	179.14	205.50	6.83
RS3STAM1001	Stamping stator	2.370	82.00	194.34	202.11	6.72
R03CAST1001	RC. Backet	2.350	57.00	133.95	153.66	5.11
RE1BUSH1001	Bush LTB -4 27 X 18 X 25	2.000	52.00	104.00	119.30	3.97
R03CAST1003	RC. Impeller	1.450	63.00	91.35	104.79	3.48
RS5PADX1001	Thrust Pad set	1.000	90.00	90.00	93.60	3.11
R03CAST1004	RC. Cover	1.330	57.00	75.81	86.96	2.89
RC2CABL1001	Cable 1.5sqmm 3m	3.000	24.45	73.35	84.14	2.80
RE1TOPX1001	T.O.P. S0670	1.000	70.00	70.00	80.30	2.67

4.1.1 Chart Showing Classification of Items for the Pump O.5HP 25D CSS-E1(31) 1PH HOWS SS 3M
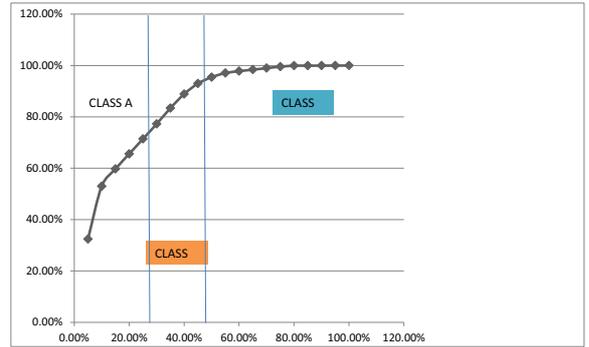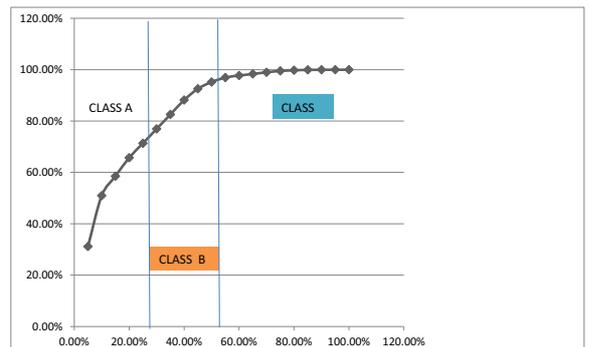

INTERPRETATION

For the Pump O.5HP 25D CSS-E1(31) 1PH HOWS SS 3M,there are 5 A class items ,4 B class items and 8 C class items

4.1.2 Table Showing Items For The Pump 1.0HP A12/AJ2 (MSF) 32 X 25 X 25MM 1P (31) J.C.F.

Item	Description	Size / Qty / Wt	Rate / Unit	Values	Total (Inc tax)	Contribution % on Total RMC
1.0HP A12/AJ2 (MSF) 32 X 25 X 25MM 1P (31) J.C.F.						
JTSJEASJ011	Jet assembly brass 1 ¼ " x 1"	1.000	520.00	520.00	540.80	18.65
JTSSTCSJ011	Cleated stator stamping crno 2P 45mm	3.950	102.00	402.90	462.17	16.30
RC4WICO0171	Copper wire 20 SWG	0.680	543.47	369.56	423.93	13.92
JTSCASIJ011	RC Casing GI	4.400	57.00	250.80	287.70	16.89
JTSBRACJ011	RC Bracket CI	4.200	57.00	239.40	274.62	11.58
JTSIMPEJ011	Impeller SS410	1.000	190.00	190.00	217.95	5.57
RC4WICO0321	Copper wire 23SWG	0.335	546.47	183.07	210.00	4.42
JTSSTDRJ011	Die cast rotor 45mm Stamping	1.000	146.50	146.50	168.05	4.20
JTSBOXXJ011	Box cor 17 ½ " 9 ½" 16 ½"	1.000	116.50	116.50	133.64	3.31
RH1BEAR0391	Bearing deep groove ball 6204 ZZ	1.000	103.00	103.00	118.15	3.10
JTSBODYJ011	Body M.S 165 x 143.5 x 2.5	1.000	95.00	95.00	108.98	2.71
W401150021	Rod SS 410 25mm Rough Round	1.260	65.00	81.90	93.95	2.47
JTSCOVAJ011	RC. Control valve CI	1.550	57.00	88.35	101.35	2.43

4.1.2 Chart Showing Classification of Items for the Pump 1.0HP A12/AJ2 (MSF) 32 X 25 X 25MM 1P (31) J.C.F.
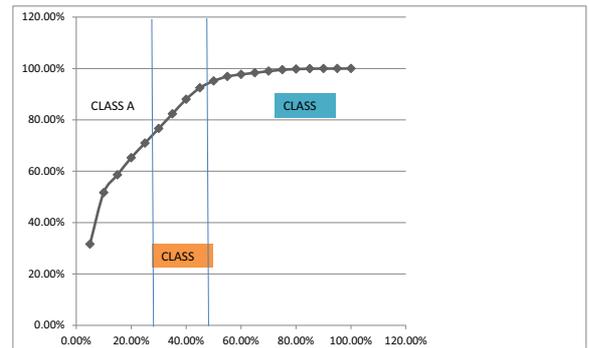

INTERPRETATION

For the Pump 1.0HP A12/AJ2 (MSF) 32 X 25 X 25MM 1P (31) J.C.F. there are 5 A class items,5 B class items and 7 C lass items

4.1.3 Table Showing items for the Pump 1.5HP ACM – A20 65X50MM (31) 1PH B CL

1.5HP ACM – A20 65X50MM (31) 1PH B CL						
Item	**Description**	**Size / Qty / Wt**	**Rate / Unit**	**Values**	**Total (Inc tax)**	**Contribution % on Total RMC**
RC4WICO0221	Copper wire 21SWG	1.010	544.47	549.91	618.69	20.17
RS3STCS1001	Cleated stator AM116R SI 2P 111mm	1.000	511.00	511.00	586.18	19.37
R03C1BY2501	RC.MB.BODY 1.5HP (B) Class 160mm	6.500	57.00	370.50	425.01	15.42
R03C1CU1101	RC.MB.Cashing ACM 9	4.400	57.00	250.80	287.70	12.05
RS3STDR1111	Die cast Rotor AM116R SI 1.75 – 2.00 2 110mm	1.000	205.00	205.00	235.16	10.77
R03CIBF0701	RC.MB.Bracket.ECM 3 N	3.200	57.00	182.40	209.23	5.13
RC4WICO0321	Copper wire 23SWG	0.310	546.47	169.41	190.59	4.67
RC4WICO0351	Copper wire 24SWG	0.270	547.47	147.82	166.30	4.08
RHIBEAR0221	Bearing Deep groove ball 6304ZZ	1.000	144.10	144.10	165.30	4.05
RP2BOXX5311	Box Cor 19.09" 10.04" 13.39: 7Ply 220/180GSM ACBM – 15 – 2W	1.000	115.00	115.00	131.92	3.23
RS5RODX0741	Rod SS 410 25mm Rough Round	1.270	65.00	82.55	94.69	2.32

4.1.3 Chart Showing Classification of Items for the Pump 1.5HP ACM – A20 65X50MM (31) 1PH B CL
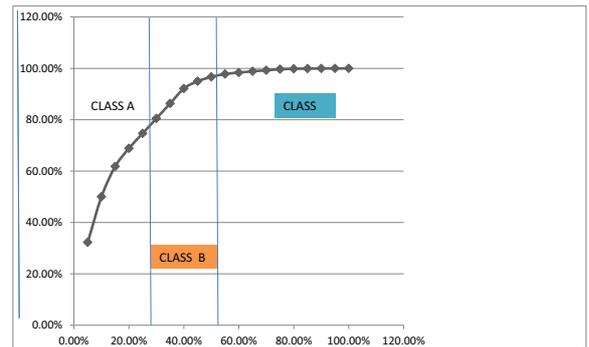

INTERPRETATION

For the Pump 1.5HP ACM – A20 65X50MM (31) 1PH B CL there are 5 A class items,4 B class items and 9 C class items.

4.1.4 Table Showing Items For The Pump 0.5HP ACM – 43 (AF) 40X40MM (31) 1PH ES

0.5HP ACM – 43 (AF) 40X40MM (31) 1PH ES						
Item	**Description**	**Size / Qty / Wt**	**Rate / Unit**	**Values**	**Total (Inc tax)**	**Contribution % on Total RMC**
RC4WICO0251	Copper wire 22.50SWG	0.570	546.47	311.488	350.44	19.69
R03CICV1501	RC.MB.Casing.ACM	4.950	57.00	282.150	323.66	18.57
RC4WICO0381	Copper wire 25SWG	0.325	548.47	178.253	200.55	14.41
RS3STCS0801	Cleated stator AM100RI SI 2P 46MM	1.000	163.00	163.000	186.98	11.84
R03CIBF3801	RC.MB.Bracket.ACM B 12 Akash	2.500	57.00	142.500	163.46	9.85
RAIBODY0281	Body CPI 105 121Alu	0.608	223.58	135.937	155.94	6.54
R03CIFQ0201	RC.MB.Flance 1 1/2 "	1.680	55.00	92.400	105.99	4.44
RS3STDR0841	Die cast rotor AM100R1 SI 1.50 – 1.75 2O 45MM	1.000	86.00	86.000	98.65	4.14
RP2BOXX0801	Box Cor 12.25" 9.25" 13.50" 5Ply 200 / 180GSM ACBM – X2 – 1P ACM – 12	1.000	67.45	67.450	77.37	3.24
R03C11M2501	RC.MB.Impeller, ACM B 12.	0.950	63.00	59.850	68.66	2.88
RS5RODX0691	ROD SS 410 22mm Rough Round	0.790	65.00	51.350	58.90	2.47

4.1.4 Chart Showing Classification of Items For The Pump 0.5HP ACM – 43 (AF) 40X40MM (31) 1PH ES
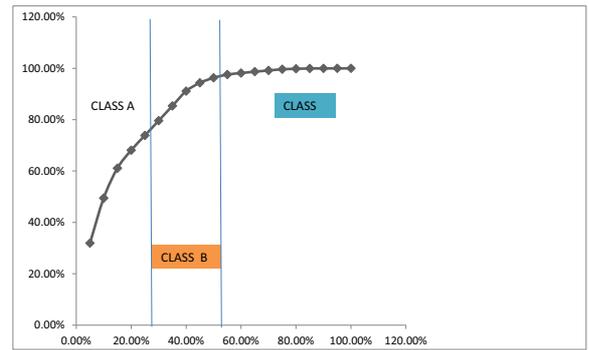

INTERPRETATION

For The Pump 0.5HP ACM – 43 (AF) 40X40MM (31) 1PH ES there are 5 A class items,5 B class items,7 C class items.

4.1.5 Table Showing Items For The Pump 0.5HP ACM – 46 (AF) 50X50MM (31) 1PH

Item	Description	Size / Qty / Wt	Rate / Unit	Values	Total (Inc tax)	Contribution % on Total RMC
RC4WICO0351	Copper wire 24SWG	0.650	547.47	355.86	400.36	20.10
RS3STCS0841	Cleated stator AM100R1 SI 2P 71mm	1.000	249.00	249.00	285.63	15.77
W30C1BY0901	MC.MB.BODY.ACM 0	4.340	57.00	247.38	283.77	15.70
R03C1BY1301	RC.MB.Casing.ACM 4 1 FL.	4.150	57.00	236.55	271.35	15.23
RC4WICO0321	Copper wire 23SWG	0.370	546.57	202.19	227.48	10.58
R03CIBF2201	RC.MB.Backet..ACM 2S N	2.280	57.00	129.96	149.08	5.62
RS3STDR0881	Die cast rotor AM100R1 SI 1.50 – 1.75 2p 70MM	1.000	125.00	125.00	143.39	5.41
RH1BEAR0101	Bearing Deep Groove Ball 6203 ZZ	2.000	49.00	98.00	112.42	4.24
R03C1IM0701	RC.MB.Impeller.ACM4	1.090	63.00	68.67	78.77	2.97
RP2BOXX0801	BOX Cor 15.25" 9.25" 13.50: 5ply 200 / 180GSM ACBM – X2 – 1P ACM – 12	1.000	68.60	68.60	78.69	2.97

4.1.5 Chart Showing Classification of Items for the Pump 0.5HP ACM – 46 (AF) 50X50MM (31) 1PH

. INTERPRETATION

For The Pump 0.5HP ACM – 46 (AF) 50X50MM (31) 1PH ,there are 5 A class items,5 B class items and 8 C class items.

4.1.6 Table Showing Items For The Pump 0.5HP ACM – A25 25X25MM (31) 1PH B CL

Item	Description	Size / Qty / Wt	Rate / Unit	Values	Total (Inc tax)	Contribution % on Total RMC
RC4WICO0381	Copper wire 24SWG	0.928	548.47	508.98	572.63	24.73
W30C1BY1201	MC.MB.BODY.ACM B 0	4.350	57.00	247.95	284.43	18.29
RS3STCS0811	Cleated stator AM100R1 SI 2P 51mm	1.000	180.00	180.00	206.48	17.92
W30C1CU0201	MC.MB.Cashing ACM 1	2.750	57.00	156.75	179.81	12.77
W30CIBF1901	MC.MB.BKT.ACM 1CI	2.270	57.00	129.39	148.43	10.41
RS3STDR0851	Die cast Rotor AM100R1 SI 1.50 – 1.75 2P 50mm	1.000	95.00	95.00	108.98	4.71
W30C1IM0201	MC.MB.Impeller.ACM 1 N	1.150	63.00	72.45	83.11	3.59
RP2BOXX0821	BOX Cor 15.50" 9.25" 13.50: 5ply 200 / 180GSM ACBM – X2 – 1P ACM – 1	1.000	68.60	68.60	78.69	3.40
RS5RODX0691	Rod SS 410 22mm Rough Round	0.800	65.00	52.00	59.65	2.58
RHIBEAR0101	Bearing Deep Groove ball 6203zz	1.000	49.00	49.00	56.21	2.43

4.1.6 Chart Showing Classification of Items For The Pump 0.5HP ACM – A25 25X25MM (31) 1PH B CL
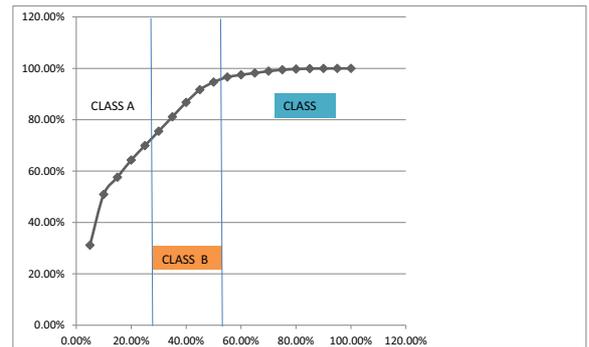
INTERPRETATION

For The Pump 0.5HP ACM – A25 25X25MM (31) 1PH B CL ,there are 5 A class items,5 B class items and 7 C class items.

4.1.7 Table Showing Items for The Pump 0.5HP ACM – A12 40X40MM (31) 1PH EXT

Item	Description	Size / Qty / Wt	Rate / Unit	Values	Total (Inc tax)	Contribution % on Total RMC
RC4WICO0381	Copper wire 25SWG	0.925	548.47	507.335	570.78	22.74
W30C1CU0801	MC.MB.Casing.ACM 5	4.700	57.00	267.900	307.31	17.24
W30C1BY0901	MC.MB.Body.ACM 0	4.350	57.00	247.950	284.43	16.33
RS3STCS0811	Cleated Stator AM 100R1 SI 2P 51mm	1.000	180.00	180.000	206.48	13.23
W30C1BF3901	MC.MB.BKT.ACM B 12 CI	2.400	57.00	136.800	156.93	7.25
RS3STDR0851	Die cast Rotor AM100R1 SI 1.50 – 1.75 2P 50mm	1.000	95.00	95.000	108.98	4.34
W30CIFQ0201	MC.MB.Flance 1 ½ " A square	1.680	55.00	92.400	105.99	4.22
RP2BOXX0801	BOX COR 15.25" 9.25" 13.50" 5PLY 200 / 180GSM ACBM – X2 – 1P ACM – 12	1.000	67.45	67.450	77.37	3.08
W30C1IM2501	MC.MB.Impeller.ACM B 12	0.980	63.00	61.740	70.82	2.82

4.1.7 Chart Showing Classification of Items for The Pump 0.5HP ACM – A12 40X40MM (31) 1PH EXT
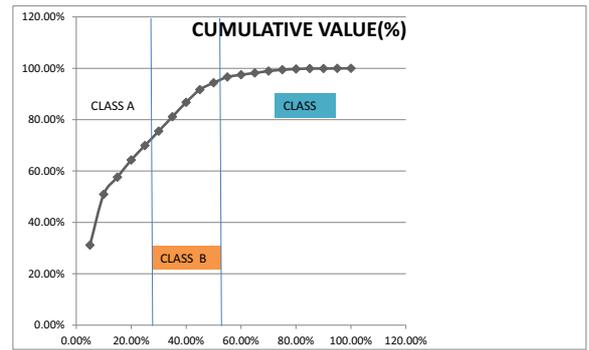
INTERPRETATION

For The Pump 0.5HP ACM – A12 40X40MM (31) 1PH EXT ,there are 5 A class items,5 B class items,8 C class items.

4.1.8 Table Showing Items For The Pump 0.5HP ACM – A12 40X40MM (31) 1PH

Item	Description	Size / Qty / Wt	Rate / Unit	Values	Total (Inc tax)	Contribution % on Total RMC
RC4WICO0191	Copper wire 21.50SWG	0.62	545.47	338.19	380.49	20.50
RS3STCS0831	Cleated stator AM100R1 SI 2p 61mm	1.00	214.00	214.00	245.48	20.00
W30CICV0901	MC.MB.Casing.ACM 2 S L FL	3.60	57.00	205.20	235.39	19.59
RA1BODY0311	Body CP1 105 136 ALU	0.85	223.58	190.04	218.00	11.88
RC4WICO0381	Copper wire 25SWG	0.35	548.47	191.96	215.97	8.80
W30C1BF2201	MC.MB.BKT.ACM 2S N	2.28	57.00	129.96	149.08	6.07
RS3STDR0871	Die cast Rotor AMI00R1 SI 1.50 – 1.75 2P 60mm	1.00	109.00	109.00	125.04	5.09
W30C1IM0501	MC.MB.Impeller.ACM 2S	1.65	63.00	103.95	119.24	4.86
RH1BEAR0101	Bearing Deep Groove ball 6203 ZZ	2.00	49.00	98.00	112.42	4.58
RP2BOXX0821	BOX COR 15.25" 9.25" 12.25" 5PLY 200 / 180GSM ACBM – X2 – 1P ACM – 1	1.00	68.60	68.60	78.69	3.20

4.1.8 Chart Showing Classification of Items For The Pump 0.5HP ACM – A12 40X40MM (31) 1PH
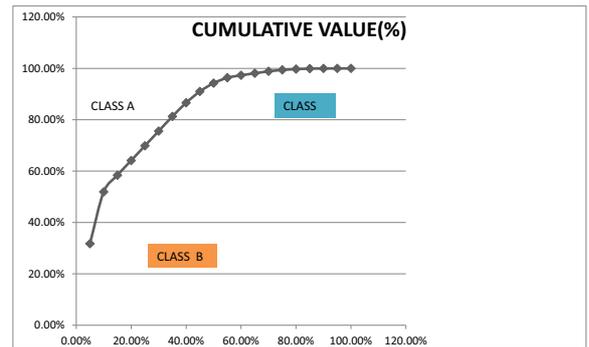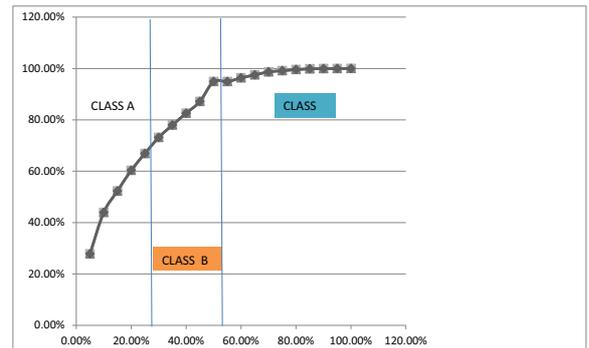

INTERPRETATION

For The Pump 0.5HP ACM – A12 40X40MM (31) 1PH ,there are 5 A class items,5 B class items and 8 Class items.

4.1.9 Table Showing Items For The Pump 0.5HP ACM – A25 25X25MM (31) 1PH B CL

Item	Description	Size / Qty / Wt	Rate / Unit	Values	Total (Inc tax)	Contribution % on Total RMC
		0.5HP ACM – A25 25X25MM (31) 1PH B CL				
RC4WICO0381	Copper wire 25SWG	0.928	548.47	508.98	572.63	24.77
W30COBY1201	MC.MB.BODY.ACM B 0	4.350	57.00	247.95	284.43	22.30
RS3STCS0811	Cleated stator AM100R1 SI 2P 51mm	1.000	180.00	180.00	206.48	18.93
W30C1CU0201	MC.MB.Casing.ACM 1	2.750	57.00	156.75	179.81	10.78
W30CIBF1901	MC.MB.BKT.ACM I CI	2.270	57.00	129.39	148.43	6.42
RS3STDR0851	Die cast Rotor AM100R1 SI 1.50 – 1.75 2P 50mm	1.000	95.00	95.00	108.98	4.71
W30C1IM0201	MC.MB.Impeller.ACM 1 N	1.150	63.00	72.45	83.11	3.59
RP2BOXX0821	Box Cor 15.50" 9.25" 12.25" 5PLY 200 / 180GSM ACBM-X1-1P ACM-1	1.000	68.60	68.60	78.69	3.40
RS5RODX0691	Rod SS 410 22mm Rough Round	0.800	65.00	52.00	59.62	2.58
RHIBEAR0101	Bearing deep groove ball 6203 zz	1.000	49.00	49.00	56.12	2.43

4.1.9 Chart Showing Classification of Items For The Pump 0.5HP ACM – A25 25X25MM (31) 1PH B CL
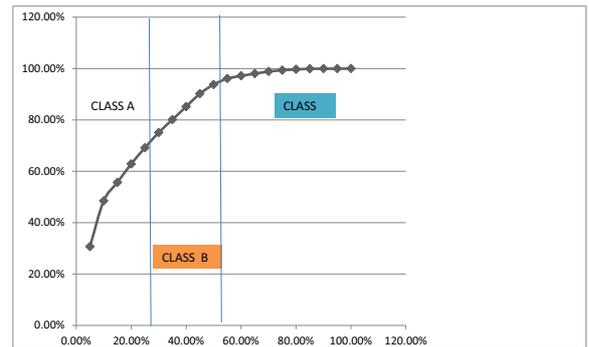

INTERPRETATION:

For The Pump 0.5HP ACM – A25 25X25MM (31) 1PH B CL ,there are 5 A class items,4 B class items and 8 C class items.

4.1.10 Table Showing Items For The Pump 0.5HP ACM – A25 25X25MM (31) 1PH

Item	Description	Size / Qty / Wt	Rate / Unit	Values	Total (Inc tax)	Contribution % on Total RMC
		0.5HP ACM – A25 25X25MM (31) 1PH				
RC4WICO0381	Copper wire 25SWG	0.530	546.47	289.63	325.85	16.47
RC4WICO0381	Copper wire 25SWG	0.295	548.47	161.80	182.03	15.20
R03CICV0201	RC.MB.Casing.ACM 0 L FL	2.700	57.00	153.90	176.54	17.92
R02CIBF4001	RC.MB.Backet.ACM 0 L	2.400	57.00	136.80	156.93	15.93
RS3STCS0781	Cleated stator AM100R SI 2P 36mm	1.000	128.00	128.00	146.83	12.42
RAIBODY0381	Body CP1 105 96 ALU	0.450	223.58	100.61	115.41	5.83
RS3STDR0821	Die cast Rotor AM100R SI 1.50 – 1.75 2P 35mm	1.000	76.00	76.00	87.18	4.41
R03C1IM0101	RC.MB.Impeller.ACM 0	1.150	63.00	72.45	83.11	4.20
RP2BOXX0821	Box Cor 15.50" 9.25" 12.25" 5PLY 200 / 180GSM ACBM-X1-1P ACM-1	1.000	51.70	51.70	59.31	3.00
RHIBEAR0101	Bearing deep groove ball 6202 ZZ	1.000	49.00	49.00	56.21	2.84
RS5RODX0691	ROD SS 410 22mm Rough Round	0.700	65.00	45.50	52.19	2.64
RHIBEAR0081	Bearing deep groove ball 6203 ZZ	1.000	44.00	44.00	50.47	2.55

4.1.10 Chart Showing Classification of Items For The Pump 0.5HP ACM – A25 25X25MM (31) 1PH

INTERPRETATION:

For The Pump 0.5HP ACM – A25 25X25MM (31) 1PH,there are 5 A class items,5 B class items and 7 C class items.

4.2 ECONOMIC ORDER QUANTITY

4.2.1 Table Showing EOQ for the pump 0.5HP 25D CSS-E1 (31) 1PH HOWS SS 3M

Item	Description	EOQ (Wt / Qty)
RC1CUWI1001	Copper wire 0.6	33.42
RM1PANL1001	Panel Board	52.30
RS5BODY1001	S.S. Body 160mm	57.50
R03CAST1002	RC. Cashing	114.24
RCICUWI1002	Copper wire 0.5	33.17
RS3STAM1001	Stamping stator	100.03
R03CAST1001	RC. Bracket	114.24
RE1BUSH1001	Bush LTB – 4 27 X 18 X 25	119.61
R03CAST1003	RC. Impeller	108.66
RS5PADX1001	Thrust Pad Set	95.48
R03CAST1004	RC. COVER	114.24
RC2CABL1001	Cable 1.5sqmm 3M	174.43
RE1TOPX1001	T.O.P. S06 70	103.09

INTERPRETATION

The above table shows the Economic Order Quantity for all the 'A' Class items. The annual demand for the pump is 3200 units. The ordering cost is Rs.40, and the inventory carrying cost is 30 percent of the total inventory value of the item. When the Recorder Level is attained the following amount of quantity can be ordered for better inventory.

4.2.2 Table Showing EOQ for the pum 1.0HP A12/A12 (MSF) 32 X 25 XMM 1P (31) J.C.F.

Item	Description	EOQ (Wt / Qty)
JTSJEASJ011	Jet Assembly brass 1 ¼ " x 1"	42.13
JTSSTCSJ011	Cleated stator Stamping CRNO 2P 45mm	90.58
RC4WICO0171	Copper wire 20 SWG	39.24
JTSCASIJ011	RC. Casing GI	121.17
JTSBRACJ011	RC. Bracket CI	121.17
RTSIMPEJ011	Impeller SS410	66.37
RC4WICO0321	Copper wire 23SWG	39.13
JTSSTDRJ011	Die cast rotor 45mm stamping	75.58
JTSBOXXJ011	Box DOR 17 ½ " 9 ½ " 16 ½ "	84.76
RHIBEAR0391	Bearing deep groove ball 6204 ZZ	90.14
JTSBODYJ011	Body M.S. 165 X 143.5 X 2.5	93.86
W40J1150021	ROD SS 410 25MM Rough Round	113.47
JTSCOVAJ011	RC. Control valve CI	121.17

INTERPRETATION

The above table shows the Economic Order Quantity for all the 'A' Class items. The annual demand for the pump is 3200 units. The ordering cost is Rs.40, and the inventory carrying cost is 30 percent of the total inventory value of the item. When the Recorder Level is attained the following amount of quantity can be ordered for better inventory.

4.2.3 Table Showing EOQ for the pum 1.5HP ACM-A20 65X50MM (31) 1PH B CL

Item	Description	EOQ (Wt / Qty)
RC1WICO0221	Copper wire 21SWG	27.99
RS3STCS1001	Cleated stator AM116R SI 2P 111mm	28.62
R03CIBY2501	RC.MB.Body1.5HP (B) Class 160mm	85.68
R03CICU1101	RC.MB.Casing.ACM.9	85.68
RS3STDR1111	Die cast rotor AM116R SI 1.75 – 2.00 2P 110mm	45.18
R03CIBF0701	RC.MB.Bracket.ECM. 3 N	85.68
RC4WICO0321	Copper wire 23SWG	27.94
RC4WICO0351	Copper wire 24SWG	27.92
RHIBEAR0221	Bearing Deep Groove Ball 6304ZZ	53.89
RP2BBOXX5311	Box Cor 19.09" 10.04" 13.39" 7PLY 220 / 180GSM ACBM-15-2W	60.32
RS5RODX0741	ROD SS 410 25mm Rough Round	80.23

INTERPRETATION

The above table shows the Economic Order Quantity for all the 'A' Class items. The annual demand for the pump is 1800 units. The ordering cost is Rs.40, and the inventory carrying cost is 30 percent of the total inventory value of the item. When the Recorder Level is attained the following amount of quantity can be ordered for better inventory.

4.2.4 Table Showing EOQ for the pum 0.5HP ACM-43 (AF) 40X40MM (31) 1PH ES

Item	Description	EOQ (Wt / Qty)
RC4WICO0251	Copper wire 22.50SWG	14.73
R03CICVI501	RC.MB.Casing.ACM 5 L FL.	45.16
RC4WICO0381	Copper wire 25SWG	14.70
RS3STCS0801	Cleated stator AM100RI SI 2P 46mm	26.70
R03CIBF3801	RC.MB.Bracket.ACM B 12	45.16
RAIBODY0281	Body CP1 105 121 ALU	22.80
R03CIFQ0201	RC.MB.Flance.1 ½"	45.97
RS3STDR0841	Die cast rotor AM100RI SI 1.50 – 1.75 2P 45mm	36.76
RP2BOXX08011	Box Cor 15.25" 9.25" 13.50: 5PLY 200 / 180GSM ACBM-15-2W	41.51
R03CIM2501	RC.MB.Impeller.ACM B12.	42.95
RS5RODX0691	ROD SS 410 22mm Rough Round	42.29

INTERPRETATION

The above table shows the Economic Order Quantity for all the 'A' Class items. The annual demand for the pump is 500 units. The ordering cost is Rs.40, and the inventory carrying cost is 30 percent of the total inventory value of the item. When the Recorder Level is attained the following amount of quantity can be ordered for better inventory.

0.5HP ACM-A18 (AF) 25X25MM (31) 1PH ES		
Item	Description	EOQ (Wt / Qty)
RC4WICO0351	Copper wire 22.50SWG	31.56
RS3STCS0841	Cleated stator AM100R1 SI 2P 71mm	46.34
W30CIBY0901	MC.MB.BODY.ACM 0	96.85
R03CICV1301	RC.MB.Casing.ACM 4 L FL.	96.85
RC4WICO0321	Copper wire 23SWG	31.58
R03CIBF2201	RC.MB.Bracket.ACM 2S N	96.85
RS3STDR0881	Die cast Rotor AM100RI SI 1.50 – 1.75 2P 70mm	65.40
RHIBEAR0101	Bearing Deep Groove Ball 6203 zz	104.46
R03C1IM0701	RC.MB.Impeller.ACM 4	92.12
RP 2BOXX0801	Box Cor 15.25" 9.25" 13.50" 5PLY 200 / 180GSM ACBM-X2-1P ACM-12	88.28

INTERPRETATION

The above table shows the Economic Order Quantity for all the 'A' Class items. The annual demand for the pump is 1800 units. The ordering cost is Rs.40, and the inventory carrying cost is 30 percent of the total inventory value of the item. When the Recorder Level is attained the following amount of quantity can be ordered for better inventory.

0.5HP ACM-A25 25X25MM (31) 1PH B CL		
Item	Description	EOQ (Wt / Qty)
RC4WOCP0381	Copper wire 25SWG	27.89
W30CIBY1201	MC.MB.BODY.ACM B 0	85.68
RS3STCS0811	Cleated stator AM100R1 SI 2P 51mm	48.21
W30CICU0201	MC.MB.Casing.ACM 1	85.68
W30CONF1901	MC.MB.BKT.ACM 1 CI	85.68
RS3STDR0851	Die cast Rotor ATM100R1 SI 1.50 – 1.75 2P 50mm	66.37
W30C1I,0201	MC.MB.Impeller.ACM I N	81.50
RP2BOXX0821	Box Cor 15.50" 9.25" 12.25" 5PLY 200 / 180GSM ACBM-X1-1P ACM-1	78.10
RS5RODX0691	Rod SS 410 22mm Rough Round	80.23
RHIBEAR0101	Bearing Deep Groove Ball 6203 ZZ	92.41

INTERPRETATION

The above table shows the Economic Order Quantity for all the 'A' Class items. The annual demand for the pump is 1800 units. The ordering cost is Rs.40, and the inventory carrying cost is 30 percent of the total inventory value of the item. When the Recorder Level is attained the following amount of quantity can be ordered for better inventory.

0.5HP ACM-A12 40X40MM (31) 1PH (EXT)		
Item	Description	EOQ (Wt / Qty)
RC4WICO0381	Copper wire 25SWG	34.16
W30CICU0801	MC.MB.Casing.ACM 5	104.94
W30CIBY0901	MC.MB.BODY.ACM 0	104.94
RS3STCS0811	Cleated stator AM100R1 SI 2P 51mm	59.05
W30CIBF3901	MC.MB.BKT.ACM B 12 CI	104.94
RS3STDR0851	Die cast Rotor AM100RI SI 1.50 – 1.75 2P 50mm	81.28
W30CIFQ0201	MC.MB.Flance. 1 ½ " A Square	106.83
RP2BOXX0801	Box Cor 15.25" 9.25" 13.50" 5PLY 200 / 180GSM ACBM-X2-1P ACM-12	96.47
W30C1IM2501	MC.MB.Impeller.ACM B 12	99.81

INTERPRETATION

The above table shows the Economic Order Quantity for all the 'A' Class items. The annual demand for the pump is 2700 units. The ordering cost is Rs.40, and the inventory carrying cost is 30 percent of the total inventory value of the item. When the Recorder Level is attained the following amount of quantity can be ordered for better inventory.

0.5HP ACM-A12 40X40MM (31) 1PH		
Item	Description	EOQ (Wt / Qty)
RC4WICO0191	Copper wire 21.50SWG	32.96
RS3STCS0831	Cleated stator AM100R1 SI 2P 61mm	52.11
W30CICV0901	MC.MB.Casing.ACM 2 S L FL	100.97
RAIBODY0311	Body CP1 105 136 ALU	50.98
RC4WICO0381	Copper wire 25SWG	32.87
W30CIBF2201	MC.MB.BKT.ACM 2S N	100.97
RS3STDR0871	Die cast Rotor AM100RI SI 1.50 – 1.75 2p 60MM	73.02
W30C1IM0501	MC.MB.Impeller.ACM 25	96.05
RHIBEAR0101	Bearing Deep Groove Ball 6203 ZZ	108.91
RP2BOXX0821	Box Cor 15.50" 9.25" 12.25" 5PLY 200 / 180GSM ACBM-IX-1P ACM-1	92.04

INTERPRETATION

The above table shows the Economic Order Quantity for all the 'A' Class items. The annual demand for the pump is 2500 units. The ordering cost is Rs.40, and the inventory carrying cost is 30 percent of the total inventory value of the item. When the Recorder Level is attained the following amount of quantity can be ordered for better inventory.

4.2.9 Table Showing EOQ for the pum 0.5HP ACM-A2S 25X25MM (31) 1PH B CL

Item	Description	EOQ (Wt / Qty)
RC4WICO0381	Copper wire 25SWG	52.18
W30CIBY1201	MC.MB.BODY.ACM B 0	160.29
RS3STCS0811	Cleated stator AM100R1 SI 2P 51mm	90.20
W30CICU0201	MC.MB.Casing.ACM 1	160.29
W30CIBF1901	MC.MB.BKT.ACM 1 CI	160.29
RS3STDR0851	Dia Cast Rotor AM100R1 SI 1.50 – 1.75 2P 50mm	124.16
W30C1IM0201	MC.MB.Impeller.ACM 1 N	152.47
RP2BOXX0821	Box Cor 15.50" 9.25" 12.25" 5PLY 200 / 180GSM ACBM-X1-1P ACM-1	146.11
RS5RODX0691	ROD SS 410 22mm Rough Round	150.10
RH1BEAR0101	Bearing Deep Groove Ball 6203 ZZ	172.88

INTERPRETATION

The above table shows the Economic Order Quantity for all the 'A' Class items. The annual demand for the pump is 6300 units. The ordering cost is Rs.40, and the inventory carrying cost is 30 percent of the total inventory value of the item. When the Recorder Level is attained the following amount of quantity can be ordered for better inventory.

4.2.10 Table Showing EOQ for the pum 0.5HP ACM-0 (AF) 25X25MM (31) 1PH

Item	Description	EOQ (Wt / Qty)
RC4W1ICO0321	Copper wire 23SWG	48.84
RC4W1ICO0381	Copper wire 25SWG	48.75
R03CICV0201	RC.MB.Casing.ACM 0 L FL	149.77
R03CIBF4001	RC.MB.Bracket.ECM.0	149.77
RS3STCS0781	Cleated stator AM100RI SI 2P 36mm	99.94
RAIBODY0381	Body CPI 105 96 ALU	75.62
RS3STDR0821	Die Cast Rotor AM100RI IS 1.50 – 1.75 2P 35mm	129.70
R03C1IM0101	RC.MB.Impeller.ACM.0	142.46
RP2BOXX0821	Box Cor 15.50" 9.25" 12.25" 5PLY 200 / 180GSM ACBM-IX-1P ACM-1	157.26
RHIBEAR0101	Bearing Deep Groove Ball 6203 ZZ	161.53
RS5RODX1691	ROD SS 410 22mm Rough Round	140.25
RHIBEAR0081	Bearing Deep Groove Ball 6202 ZZ	170.46

INTERPRETATION

The above table shows the Economic Order Quantity for all the 'A' Class items. The annual demand for the pump is 5500 units. The ordering cost is Rs.40, and the inventory carrying cost is 30 percent of the total inventory value of the item. When the Recorder Level is attained the following amount of quantity can be ordered for better inventory.

CHAPTER 5:FINDINGS, SUGGESTIONS & CONCLUSION:

5.1 Findings

From the ABC analysis it is inferred that A Class items should be kept under rigorous control as the investment in the inventory constitute more than 75% value of the total investment made in raw material inventory. Although the number of items which constitute B" & C" category is not fairly large investment in these categories are less than 25% and needs minimum attention.

- For the pump O.5HP 25D CSS-El(31) 1HP HOWS SS 3M" there are 5 A class items,4 B class items, and 8 C Class items. The EOQ Ranges from 33.42—174.43(Qty/units)
- For the pump l.0HP A12/AJ2(MSF)32X25X25MM 1P(31) J.C.F" there are 5 A class itcms,5 B class items, and 7 C Class items. The EOQ Ranges from 39.13-124.17(Qty/units)
- For the pump 1 .5HP ACM-A20 65X50MM (3 1)1 PH B CL" there are 5 A class items, 4 B class items, and 9 C Class items. The EOQ Ranges from 27.94-85.68(Qty/units)
- For the pump 0.5HP ACM-43(AF) 4OX4OMM (31) IPH ES" there are 5 A class items, 5 B class items, and 7 C Class items. The EOQ Ranges from 14.7-45.97(Qty/units)
- For the pump 0.5KP ACM-A18 25X25MM (31)1 HP" there are 5 A class items, 5 B class items, and 8 C Class items. The EOQ Ranges from 31.56-104.46(Qty/units)
- For the pump "0.5HP ACM-A25 25X25MM (31)1 HPB CL" there are 5 A class items 5 B class items, and 7 C Class items. The EOQ Ranges from 27.89-92.41(Qty/units)
- For the pump '0.5HP ACM-A 12 4OX4OMM (31) 1 PH (EXT there are 5 A class items, 4 B class items, and 7 C Class items. The EOQ Ranges from 34.16-106.83(Qty/units)

- For the Pump 0.5HP ACM-A 12 4OX4OMM (31) 1 PE" there are 6 A class items, 5 B class items, and 8 C Class items. The EOQ Ranges from32.87- 1 08.91 (Qty/units)
- For the pump "0.5HP ACM-A2S 25X25MM (3l) 1PH B CL" there are 5 A class items,5 B class items, and 9 C Class items. The EOQ Ranges from 52.l8-172.88(Qty/units)
- For the pump -0.5HP ACM-0(AF) 25X25MM (31) 1HP" there are 6 class Items, 4 B class items, and 5 C Class items. The EOQ Ranges from 48.75-170.46(Qty/units)

The Economic order quantity will vary every year according to the demand of the year.

5.2 SUGGESTIONS

The following suggestions can help to save money while stocking inventory:

- Developing new sources of supply so that the lead time of three days can be minimised so that it will minimize the inventory cost.
- Improvement in quality or changes in specifications that would lead to savings in process time or other operating services.
- Routine auditing of inventory level of items in the organization will ensure continuous production
- Update purchase order information to avoid delays in process.
- Stock keeping person should be appointed to monitor inventory systems in the organization.

5.3 CONCLUS1ON

The importance of inventory control in a manufacturing company where large number of items dealt with had been well understood on observing systems followed in the company. The observations at the shop floor and stores have enabled clear understanding of the system and fulfillment of aim of this project. The study on Inventory Management in Ellen Pumps, Coimbatore is concluded that the present inventory management system is found satisfactory. However, the system could be improvised by implementing the ABC system of material control proposed in this study. The economic ordering quantity suggested could be used for effective purchase of materials.

BIBLIOGRAPHY

Journals

David Zalkind (1978), "Order level Inventory Systems with Independent stochastic Lead times", Management science vol.24, no 13, September 1978.

Warren h. Hausman(1969),"Minimizing Customer Line Items Backordered In Inventory Control Management science vol.15, no 12, august 1969.

Leroy b. Schwarz(1973), " A Simple Continuous Review Deterministic One Warehouse Iv- Retailer Inventory Problem" Management Science Vol. 19, No. 5, January, 1973.

G. Hadley and t. M. Whitin, "an optimal final inventory model", University of Chicago and University of California, Berkeley.

Lieberman(1958), "FIFO And LIFO Policies In Inventory Management" Management Science, vol. 5, No. 1, Oct. 1958.

Axsater(2001), "Economic Evaluation of Systems that Expedite Inventory Information", Production and operations management Vol. 16, no. 3, may—June 2007, pp. 360—368

Websites:

ww.ellen pumps. corn

www.search.ebscohost.com