**INVENTORY MANAGEMENT AND CONTROL IN A MANUFACTURING ORGANIZATION**

**Abstract**

Efficient and effective inventory control and management play a crucial role in the sustainability and success of any organisation. Inventory is a term that refers to a collection of idle resources that hold economic value. These resources can be classed in several ways. Production inventories refer to the assortment of raw materials, parts, and components that are utilised in the manufacturing process of a company's products. Maintenance, repair, and operating (MRO) inventories refer to supplies that are utilised in the production process but do not become a part of the final product. In addition, there are in-process inventories, which consist of semi-finished products found at different stages within the production operation. Lastly, there are finished goods, which are fully completed and prepared for shipment.

These inventories necessitate substantial financial resources and investment commitments. Many business professionals perceive inventories and their associated costs as a "necessary evil," leading them to overlook the potential advantages that inventories might bring to their organisation or industry. In the context of a manufacturing organisation, the implementation of a meticulously designed and efficient inventory control system is vital to ensure profitability and accountability to the company's management and shareholders.

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**CHAPTER ONE**

**INTRODUCTION**

* 1. **Background of the study**

T Advancement in all business activities has brought about the need for efficient inventory management and control. For the past decade inventories were handled by a clerk in a routine manner. But in recent times proper attention has been given to it. As a matter of fact, a well planned and effectively controlled inventory can contribute substantially to the organization’s growth and efficiency. Inventory control is a vital element in the management of materials.
However, before delving into this plight, it is appropriate to give the definition of inventory control.
According to Baily [1983:73] inventory control is the means by which materials of the correct quantity is made available as and when required, with due regard to economy in storage and ordering cost, purchase price and use of working capital. It involves the following processes.
[a] Accessing the items to be held in stock
[b] Deciding the extent of stock holding of items individually and collectively.
[c] Regulating the input of stock into the storehouses.
[d] Regulating the issue of stock from the storehouses.
Therefore, through these process, it is possible to adjust continuously the quantity and value of inventory held to confirm to circumstance at all times.
The functionary name given to the activities in the stores is known as inventory control or stock control. The inventory controller or stock controller takes custody of the day to day movement of stocks.
Inventory procedure includes receipt, storekeeping, issue and balance of stocks. In practice, the three major functions involve the overall activities that take place in the stores.
Some of the activities are: communication with other department, identification of stores, receipt and inspection, issue and dispatch, stock records, stores accounting, stock control, stock taking and stock checking, storage of equipment and so on.
Inventory control is the clerical control of the movement of goods into and out of the stores, and of the level of inventories in the stores. Different inventory records are kept to know when inventories fell to minimum, maximum inventory level, and re-order point. The success or failure of any organization depends largely on efficient system of their inventory control, since inventory control is regarded as a procedure in which appropriate system containing information are fed to various department for recording or action.
Actually different systems are operated in different organizations in controlling their inventories. Some of these systems work out well while others failed in their purposes. These systems and other relevant point will be discussed fully in the next chapter.
The researcher could not close the general introduction without giving a brief historical background of the company he is researching on.
Akaraka Industries Nigeria Limited [AINL] was incorporated as a private limited liability company in 1994 under the companies’ allied matters Act of 1990. The company is an industrial/Agro-chemical industry located at Oboama Enyiogugu Aboh Mbaise along Owerri Umuahia road. It has her head office at 186 wetheral road Owerri and her factory at Mbaise in Imo State Nigeria.
It was formed mainly to process solid minerals as industrial chemicals and production started with a capacity of 144 tones per day using two machines at its factory in Mbaise along Owerri – Umuahia road. Each machine has a rated capacity of 3 tones per hour and is capable of pulverizing solid minerals to a more scale of hardness not exceeding 7 and humidity below 6 percent.
The grain size of finished products from the pendulum pulverize may be adjusted in the range of 0.125mm to 0.44mm [equivalent to 120 to 320 mesh per inch] according to customers requirements or specification.
The staff strength of Akaraka Industries Nigeria Limited is about 325 with 75 percent of the total workforce coming from the immediate community.
All raw materials of Akaraka Industries Nigeria Limited are naturally as sedimentary metamorphic and igneous rocks in millions of tones.
Her product range includes:
[i] KAOLIN: Used as filler in plastic, rubber [tyre] and paints manufacture filler in papermaking for making porcelain [crucibles] and ceramics [china wares] and in the manufacture of pharmaceuticals.
[ii] CALCITE: Used as raw materials for manufacture of paints, soap, plastic, cosmetics, adhesives etc, as raw materials in the chemicals, glass and cellulosic industry. It is also use for smelting of iron ore and could be crushed and used as granite for roads and concrete as a flux [coke] in melting of iron and melting steel. Manufacture of cement, detergents, soda, lime, glass, artificial fertilizer etc.
[iii] DOLOMITE: Used in the manufacture of paints, toothpaste, cement and lime. It is also used for building, as ornamental stone and as magnesium ore for the production of magnesium.
[iv] DIATOMITE: Used as a filter to remove impurities in breweries and discoloration from liquids as an abrasive to polish soft materials as an absorbent in the production of dynamite when mixed with nitroglycerine.
[v] FELDSPAR: Used in pottery for making porcelain, in making enamel wares, glass, artificial teeth, in the manufacture of fertilizer and for architectural decorations.
[vi] BARYTE: Used mainly in drilling of crude oil and in paint manufacturing. It is also used for pyrotechnics and for protection against x-rays, as flux in brass meeting, as inter filler in the oil cloth manufacture, linoleum paper and plastic, as a weighing material for textiles and leather.
[vii] GYPSUM: Use for manufacture of plaster of Paris [POP] for soil conditioning for cosmetics and pharmaceutical manufacture as a retarded in Portland cement production, as an extender for paint, as a distributor in insecticides and can also be used as filler for paper.
[viii] TALCUM: Used in cosmetics, soap electric cables, ceramics, paints and crayon manufacture.
[ix] AKACLEAN: Used as a souring power
[x] BONACREAM: Used in cosmetics manufacture and for treatment of keloid.
[xi] AKACREAM: Used as after share and for treatment of general skin infection.
The finished products are usually packaged in 50kg bags but can be bagged in jumbo sack if the need arises.
As a result of increased efforts on research and development, the quality of the company’s chemicals ranks the best in the country and very suitable for export.

* 1. **STATEMENT OF PROBLEM OF THE STUDY**

Inventory control and stores management functions have not been fully understood and carried out by many manufacturing organizations.
It is this general assumption that made the researcher to take up the study of how Akaraka Industries Nigeria Limited, Aboh Mbaise operate theirs, to see if there is a difference or differences from the general assumption.
The researcher is not just out to identify the problems or differences but most importantly to device alternative source within the organizational constraints and yet accomplish the set objectives.

**1.3 OBJECTIVE OF THE STUDY**

The researcher’s reasons in undertaking the study of the inventory management and control in manufacturing organizations taking a case study of Akara Industries Nigeria Limited, Aboh Mbaise are numerous.
The choice is aimed at representing all other manufacturing companies and to attribute the findings to other institutions and organizations.
A well-planned and effectively controlled inventory can contribute substantially to a firm’s profit because inventories are the life-wire of all organizations. It is however necessary to visualize the purpose of this research as follows:

1. To ensure correct quality of stock required.

2. To ensure constant supply and flow of material to the operations.
3. To ensure that the materials are available at the correct time they are needed.
4. To ensure a continuous or steady supply of information for control of production about what to produce in order to keep established level of the organization finished stock.

5. Control of obsolescence of stock ensuring that all stocks held by the organization are being used at a regular rate and therefore have not been superseded by a new or redesigned item. The success of the company as a manufacturing one has a great influence on the researcher to know the secret behind this success, since inventory control is concerned with the success over failure of any company.
The loopholes to be filled in the management of stores and inventory need to be taken care of. The researcher feels that through this medium he can suggest the right professional techniques suitable for stores and inventory management and control in all sectors of the economy.
Review of contributors towards the situation of the case study will be narrated to see the attitude of the nation and individuals towards this discipline. Finally this study will help the organization to recognize the problems and how to resolve them

**1.4 SCOPE OF THE STUDY**

The researcher found it impossible to cover many manufacturing organization in this study so he focused his investigation on Akaraka Industries Nigeria Limited, Aboh Mbaise, Imo State Nigeria as a case study.
The researcher however bases his findings on this study and would relate them to other industries in the same area of activities.

**1.5 RESEARCH QUESTION**

The study will center its findings on the following questions.
1. What is the role and place of stores department in the organization?
2. Is inventory well managed in the organization?
3. Are professionals employed to handle stores?
4. What are the receiving and issue procedure employed in the organization or store?
5. What system of inventory or stock control is adopted?
6. How are scraps, waste, obsolete and redundant materials managed?

**1.6 RESEARCH HYPOTHESIS**

In order to achieve the objective of the study, research hypothesis will be developed and used in the analysis of data collected. The research hypotheses are:

**H0:** The inventory control of the received stock items in the industry is not effective.

**HA:** The inventory control of the received stock item in the industry is effective.
**H0:** The inventory control has no significant impact on purchasing performance in Akaraka Industries.

**HA:** The inventory control has significant impact on purchasing performance in Akaraka Industries.

* 1. **SIGNIFICANCE OF THE STUDY**

The research will serve as a useful guide to manufacturing organization on effective control and management of inventories which form the life blood of their set up. The research work will be a reference material for researchers on how to manage and control inventories in an industry.
It is however the researcher’s belief that the information gathered from this research will help the employers and employees of Akaraka Industries [Nig] Ltd to know whether their method of inventory control procedure are effective or not. The reader might benefit from considering inventory control in manufacturing organizations as he perceives it in his own environment

***1.8 LIMITATIONS OF THE STUDY***
The research is limited to Akaraka Industries Nigeria Ltd. It was not easy to get most heads of departments and supervisors on seat while some of those seen were reluctant to open up. Nevertheless, I am grateful to the very few who not only made data available to me but also provide some useful guidelines and critics.
Scarcity of reference materials in the country really affected the smooth work of the project. Most of the text books in the library were out dated so finding and locating items becomes a problem. Materials required from the library were difficult to get, the librarian kept on giving promises of come today, come tomorrow at the end disappointing the researcher.
Unavailability of adequate finance was another major limitation. The researcher could not attain the desired scope and depth as a result of this financial handicap.

**1.9 DEFINITION OF TERMS**

1. Inventory – All the tangible assets of an organization other than the fixed assets.

2. Stock control and Inventory control – Are used synonymously, whereas stock control originates from Britain, inventory is of America origin. Both mean the same thing.
3. Pre-production Inventory – Comprise parts and materials purchased from outside the organization for manufacture into the products.
4. In-production stock – Comprises the parts and assemblies manufactured inside the organization which are not yet finished products and may for accounting purposes be treated as part of work –in-progress.
5. Post-production stocks – Are finished products held either at the factory or at warehouse and distribution centers elsewhere.
6. Stock taking – Represent the complete process of verifying the quantity balances of the entire range of items held in stock. It is periodic but is usually carried out annually so as to disclose the value and quantity of stock for balance sheet purposes.
7. Stock checking – Represent any other check on physical quantities which may be applied either regularly or intermittently.
8. Minimum stock level [or danger level] – Represents the amount of stock expressed in units of issue below which stock of any given item should not be allowed to fall. When this level is reached, it triggers off urgent action to bring forward delivery of the next order.
9. Maximum Stock Level – Is the amount of stock expressed in units of issue above which the stock should be allowed to rise. The purpose of this level is to curb excess investment.
10. The Ordering Stock Level – Represents the amount of stock expressed in units of issue at which ordering action is indicated in time for the materials to be delivered before stock falls below the minimum.
11. Buffer or Safety Stock – This is the reserve stock held to guard against stock out due to usage or lead time exceeding the average.
12. Lead Time – The time between the placing of new order and the arrival of the order.
13. Out of stock – A state where there is no stock at all in the store.
14. FIFO – First-in-first out.
15. LIFO – Last-in-first out
16. Ltd – Limited.
17. Codification – This is the allocation of number or alphabets to stores items for easy identifications.
18. Surplus – A Usable material, equipment or parts including capital equipment which are in excess of normal manufacturing operating or repair requirements.

19. Scraps – Materials which have lost their original value due to faulting work, obsolescence or other causes. They may also raise through manufacturing out offs or treated as scarp due to non-usage over the years and disposed of as such.
20. Obsolete – A material, or equipment or part which is no longer useable in the service for which it is purchased and therefore cannot be utilized owing to technological, fashion or taste change.
21. Obsolescence – This can be machinery or equipment which is going out of use for operational reasons but not completely phased out or out of use.

22. Deterioration – when material has lost its useful vale naturally or due to poor handing and storage.

23. Discrepancy – this is a non-agreement of the calculated or book balance with the quantity physically found and counted during stocktaking.
24. Dormant Stock – item with no present demand are classified as dormant stock.

25. MRO Items – these are maintenance, repairs and operating supplies which help to facilitate production operation but do not become part of the finished product.

**1.10 ORGANIZATION OF THE STUDY**

This research work is organized in five chapters, for easy understanding, as follows

Chapter one is concern with the introduction, which consist of the (overview, of the study), historical background, statement of problem, objectives of the study, research hypotheses, significance of the study, scope and limitation of the study, definition of terms and historical background of the study. Chapter two highlights the theoretical framework on which the study is based, thus the review of related literature. Chapter three deals on the research design and methodology adopted in the study. Chapter four concentrate on the data collection and analysis and presentation of finding. Chapter five gives summary, conclusion, and recommendations made of the study

**CHAPTER TWO**

 **REVIEW OF RELATED LITERATURE**

**2.1 Introduction**

Inventory management involves a trade-off between the costs associated with keeping inventory versus the benefits of holding inventory. The benefit of an inventory is to assure that goods will be available as required. The primary costs of an inventory are the opportunity cost of the capital used to finance the inventory, ordering costs, and storage costs. Inventory management seeks to maximize the net benefit – the benefits minus costs – of the inventory (Chambers, Lacey, 2011). Different inventory items vary in profitability as well as the amount of space they take up. Higher inventory levels result in increased costs for storage, insurance, spoilage and interest on borrowed funds needed to finance inventory acquisition (Shim, Siegel, 2007). As successful inventory management minimizes inventory, lowers cost and improves profitability, managers should appraise the adequacy of inventory levels, which depend on many factors, including sales, liquidity, available inventory financing, production, supplier reliability, delay in receiving new orders, and seasonality. An increase in inventory lowers the possibility of lost sales from stockouts and the production slowdowns caused by inadequate inventory. Inventory levels are also affected by short-term interest rates. As shortterm interest rates increase, the optimum level of holding inventory is reduced (Shim, Siegel, 2008). McComas (1995) recommends that the following actions take place within a company in the management of inventory:

* establish purchasing review criteria to review the inventory characteristics
* purchase only the amount of raw materials needed for a production run or a period of time
* collaboration with vendors to improve the purchasing practice
* improve inventory control through application of effective inventory control systems
* encourage materials exchange within the company
* consider just-in-time manufacturing.

Financial managers have a responsibility both for raising the capital needed to carry inventory and for the firm’s overall profitability. The goals of inventory management are to ensure that the inventories needed to sustain operations are available, but to hold the costs of ordering and carrying inventories to the lowest possible level. There is always pressure to reduce inventory as part of firms’ overall costcontainment strategies, and many firms are taking drastic steps to control inventory costs (Brigham, Daves, 2004). Economic order quantity analysis should be applied to every product that represents a significant proportion of sales. The economic order quantity is the optimum amount of goods to order each time to minimize total inventory costs. The Economic Order Quantity (EOQ) model of inventory management is used to mark the optimum size of delivery and to choose the cheapest deliverer which guarantees minimization of total costs of investments in inventories. EOQ model is a technique that determines the optimal amount of inventory to order each time the inventory of that item is depleted (Chambers, Lacey, 2011). The Economic Order Quantity (EOQ) model considers the trade-off 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, but requires holding a larger average inventory, which increases holding costs. On the other hand, a smaller order-quantity reduces average inventory, but requires more frequent ordering and higher ordering costs

**2.2 MANAGEMENT OF INVENTORIES**

Materials are simply industrial goods that become part of another physical product. They represent the major component of business cost and profitability According to Ramakrishna (2005), on an average, half the sales income in an organization is spent on materials. This implies that to boost a firm’s profit, there is the need to reduce materials cost which leads to a reduction in manufacturing cost. In the cost structure of most of the products manufactured, materials constitute 50% of the total cost, pointing to the need for the proper budgeting and control on cost of materials which is a core objective of Materials Management Efforts are made to minimize the stock of inputs and outputs by proper planning and forecasting of demand of various inputs and producing only that much quantity which can be sold in the market. The inventory cost is not only interest on stocks but also cost of store building for storage, insurance and obsolesce and movement of inputs from place of storage to the factory where the materials have to be finally used to convert them into finished goods. In Japan industries have adopted concept of JIT (Just in Time) and components, materials are received when required for which detailed instructions are given to suppliers. There are many engineering companies who receive components directly at assembly point and that too only for 3-4 hours requirements at a time. Even in case of bulk materials like iron ore, which is imported from abroad, the minimum possible inventory is kept. As against this by and large in India the inventory of coal, raw materials and packing materials is very high and many items become junk or obsolete causing heavy loss to the enterprise. Lack of inventory planning in India has been pointed out by various committees but due to uncertainties in supplies, problem of timely receipt of railway wagons, lack of planning and unreliable suppliers the investment in inventories is quit high. The fluctuation in demand affects inventory of finished product of which cement industry has been a victim many times. The situation in cement industry has been analyzed in this chapter after studying the principles of inventory control and relating it with cement industry. In case of raw materials the first requirement is to study lead time between the date of order and receipt in the factory and same is applicable in case of coal. In case of cement industry the basic raw material i.e. lime stone is not purchased from the market but form one’s own queries which are within 10 to 15 Km distance from factory and only in few cases distance is more up to 50 Km. It is transported to cursing mills by trucks, rail or overhead ropeways to the factory. The only uncertainty is with regard to problem of quarrying in quarries, which may be affected due to labor problem, problem in supplies of electricity or explosives. But in spite of these factors industry feels that 3-4 days of stock of raw material is enough. This, from any standard is on the high side when self-produced raw material is used. Actually for ideal situation there should be stock for a few hours, requirement and at the most for one day need. The industry is keeping larger stocks of limestone because of uncertainties in quarrying and transportation.

**2.3 INVENTORY CONTROL**

Inventory control is concerned with the acquisition, storage, handling and use of inventories so as to ensure the availability of inventory whenever needed, providing adequate provision for contingencies, deriving maximum economy and minimizing wastage and losses. Hence Inventory control refers to a system, which ensures the supply of required quantity and quality of inventory at the required time and at the same time prevent unnecessary investment in inventories. It is one of the most vital phase of material management. Reducing inventories without impairing operating efficiency frees working capital that can be effectively employed elsewhere. Inventory control can make or break a company. This explains the usual saying that “inventories” are the graveyard of a business. Designing a sound inventory control system is in a large measure for balancing operations. It is the focal point of many seemingly conflicting interests and considerations both short range and long range. The aim of a sound inventory control system is to secure the best balance between “too much and too little.” Too much inventory carries financial rises and too little reacts adversely on continuity of productions and competitive dynamics. The real problem is not the reduction of the size of the inventory as a whole but to secure a scientifically determined balance between several items that make up the inventory. The efficiency of inventory control affects the flexibility of the firm. Insufficient procedures may result in an unbalanced inventory. Some items out of stock, other overstocked, necessitating excessive investment. These inefficiencies ultimately will have adverse effects upon profits. Turning the situation round, difference in the efficiency of the inventory control for a given level of flexibility affects the level of investment required in inventory. The less efficient is the inventory control, the greater is the investment required. Excessive investment in inventories increase cost and reduce profits, thus, the effects of inventory control of flexibility and on level of investment required in inventories represent two sides of the same coin. Control of inventory is exercised by introducing various measures of inventory control, such as ABC analysis fixation of norms of inventory holdings and reorder point and a close watch on the movements of inventories.

**2.4 INVENTORIES CONTROL TECHNIQUES**

**2.4.1 ABC ANALYSIS OF INVENTORIES**

The ABC inventory control technique is based on the principle that a small portion of the items may typically represent the bulk of money value of the total inventory used in the production process, while a relatively large number of items may from a small part of the money value of stores. The money value is ascertained by multiplying the quantity of material of each item by its unit price. According to this approach to inventory control high value items are more closely controlled than low value items. Each item of inventory is given A, B or C denomination depending upon the amount spent for that particular item. “A” or the highest value items should be under the tight control and under responsibility of the most experienced personnel, while “C” or the lowest value may be under simple physical control. It may also be clear with the help of the following examples:

“A” Category – 5% to 10% of the items represent 70% to 75% of the money value

“B” Category – 15% to 20% of the items represent 15% to 20% of the money.

“C” Category – The remaining number of the items represent 5% to 10% of the money value.

The relative position of these items show that items of category A should be under the maximum control, items of category B may not be given that much attention and item C may be under a loose control.

**2.4.2 ADVANTAGES OF ABC ANALYSIS**

1. It ensures a closer and a more strict control over such items, which are having a sizable investment in there.

 2. It releases working capital, which would otherwise have been locked up for a more profitable channel of investment.

 3. It reduces inventory-carrying cost.

 4. It enables the relaxation of control for the ‘C’ items and thus makes it possible for a sufficient buffer stock to be created.

 5. It enables the maintenance of high inventory turnover rate.

**2.4.3 FIXATION OF NORMS OF INVENTORY HOLDINGS**

Either by the top management or by the materials department could set the norms for inventories. The top management usually sets monitory limits for investment in inventories. The materials department has to allocate this investment to the various items and ensure the smooth operation of the concern. It would be worthwhile if norms of inventories were set by the management by objectives, concept. This concept expects the top management to set the inventory norms (limit) after consultation with the materials department. A number of factors enter into consideration in the determination of stock levels for individual items for the purpose of control and economy. Some of them are:

1. Lead time for deliveries.

 2. The rate of consumption.

3. Requirements of funds.

 4. Keeping qualities, deterioration, evaporation etc.

5. Storage cost.

6. Availability of space.

7. Price fluctuations.

 8. Insurance cost.

 9. Obsolescence price.

 10. Seasonal consideration of price and availability.

11. EOQ (Economic Order Quantity), and

12. Government and other statuary restriction.

Any decision involving procurement storage and uses of item will have to be based on an overall appreciation of the influence of the critical ones among them. Material control necessitates the maintenance of inventory of every item of material as low as possible ensuring at the same time, its availability as and when required for production. These twin objectives are achieved only by a proper planning of inventory levels. It the level of inventory is not properly planned, the results may either be overstocking or under stocking. If a large stock of any item is carried it will unnecessarily lock up a huge amount of working capital and consequently there is a loss of interest. Further, a higher quantity than what is legitimate would also result in deterioration. Besides there is also the risk of obsolescence if the end product for which the inventory is required goes out of fashion. Again, a large stock necessarily involves an increased cost of carrying such as insurance, rent handling charges. Under stocking which is other extreme, is equally undesirable as it results in stock outs and the consequent production holds ups. Stoppage of production in turn, cause idle facility cost. Further, failure to keep up delivery schedules results in the loss of customers and goodwill. These two extreme can be avoided by a proper fixation of two important inventory level viz, the maximum level and the minimum level. The fixation of inventory levels is also known as the demand and supply method of inventory control. Carrying too much or too little of the inventories is detrimental to the company. If too little inventories are maintained, company will have to encounter frequent stock outs and incur heavy ordering costs. Very large inventories subjects the company to heavy inventory carrying cost in addition to unnecessary ties up of capital. An efficient inventory management, therefore, requires the company to maintain inventories at an optimum level where inventory costs are minimum and at the same time there is no stock out which may result in loss of sale or stoppage of production. This necessitates the determination of the minimum and maximum level of inventories.

**Minimum Level**

The minimum level reorder level may be determined on the following bases:

 1 Consumption during lead-time.

1. Consumption during lead-time plus safety stock.
2. Stock out costs.
3. Customer’s irritation and loss of goodwill and production hold costs.

To continue production during Lead Time it is essential to maintain some inventories. Lead Time has been defined as the interval between the placing of an order (with a supplier) and the time at which the goods are available to meet the consumer needs. There are sometimes fluctuations in the lead-time and or in the consumption rate. If no provision is made for these. Variations, stock out may take place-causing disruption in the production schedule of the company. The stock, which takes care to the fluctuation in demand, varies in lead-time and consumption rate is known as safety stock. Safety stock may be defined as the minimum additional inventory, which serves as a safety margin or buffer or cushion to meet an unanticipated increase in usage resulting from an unusually high demand and or an uncontrollable late receipt of incoming inventory. It can be determined on the basis of the consumption rate, plus other relevant factor such as transport bottleneck, strikes or shutdowns. In the case of uncertainly, the probabilistic approach may be applied to determine the safety margin. To avoid stock out arising out of such eventualities, companies always carry some minimum level of inventories including safety stock. Safety stock may not be static for all the times. A change in the circumstances and in the nature of industry demand, necessitates are adjusted in its level. In this study an effort has been made to examine how the current companies determine their minimum level for re-order inventories, safety stock, whether a level of study is maintained throughout the year or not. For each type of inventory a maximum level is set that demand presumably will not exceed as well as a minimum level representative a margin of safety required to prevent out of stock condition. The minimum level also governs the ordering point. An order to sufficient size is placed to bring inventory to the maximum point when the minimum level is reached.

**Maximum Level**

The upper limit beyond which the quantity of any item is not normally allowed to rise is known as the “Maximum Level”. It is the sum total of the minimum quantity, and ECQ. The fixation of the maximum level depends upon a number of factors, such as, the storage space available, the nature of the material i.e. chances of deterioration and obsolescence, capital outlay, the time necessary to obtain fresh supplies, the ECQ, the cost of storage and government restriction.

**Re-Order Level**

Also known as the ‘ordering level’ the reorder level is that level of stock at which a purchase requisition is initiated by the storekeeper for replenishing the stock. This level is set between the maximum and the minimum level in such a way that before the material ordered for is received into the stores, there is sufficient quantity on hand to cover both normal and abnormal circumstances. The fixation of ordering level depends upon two important factors viz, the maximum delivery period and the maximum rate of consumption.

**Re-Order Quantity**

The quantity, which is ordered when the stock of an item falls to the reorder level, is know as the reorder quantity or the EOQ or the economic lot size. Although it is not a stock level as such, the reorder quantity has a direct bearing upon the stock level in as much as it is necessary to consider the maximum and minimum stock level in determining the quantity to be ordered. The re-order quantity should be such that, when it is added to the minimum quantity, the maximum level is not exceeded. the re-order quantity depends upon two important factors viz, order costs and inventory carrying costs. It is, however, necessary to remember that the ordering cost and inventory carrying cost are opposed to each other. Frequent purchases in small quantities, no doubt reduce carrying cost, but the ordering costs such as the cost inviting tenders of placing order and of receiving and inspection, goes up. If on the other hand purchases are made in large quantities, carrying costs, such as, the interest on capital, rent, insurance, handling charges and losses and wastage, will be more than the ordering costs.

**Economy Order Quantity**

The EOQ refers to the order size that will result in the lowest total of order and carrying costs for an item of inventory. If a firm place unnecessary orders it will incur unneeded order costs. If a firm places too few order, it must maintain large stocks of goods and will have excessive carrying cost. By calculating an economic order quantity, the firm identifies the number of units to order that result in the lowest total of these two costs.

The constraints and assumption followed:

 1. Demand is known-- Using past data and future plans a reasonably accurate prediction of demand can often be made. This is expressed in unit sold in a year.

 2. Sales occur at a constant rate-- This model may be used for goods that are sold in relatively constant amount throughout the year. A more complicated model is needed for firms whose sales fluctuate in response to their seasonal cyclical factors.

3. Cost of running of goods is ignored-- Cost associated with storage, delays or lost sales are not considered. These costs are considered in the determination of safety level in the re-order point subsystem.

4. Safety stock level is not considered-- The safety stock level is the minimum level of inventory that the firm wishes to hold as a protection against running out. Since the firm must always be above this level the EOQ need not be considered the safety stock level.

Total Ordering Cost (TOC) = (A/Q)\*O

 Average Inventory=Q/2

 Total Carrying Cost (TCC) = (Q/2)\*C

Total Inventory Cost=TOC+TCC

Total Cost=(AO/2)+(QC/2)

 Where A=total annual demand

 Q=Quantity order in units

O=Order cost per order

 C=Carrying cost per unit

The basic formula is EOQ = 2(U)/(OC) CC%PP

Where 2=mathematical factor that occurs during the deriving of the formula, U-Units sold per year, a forecast provided by the marketing department. OC=Cost of placing each order for more inventory provided by cost accounting. CC% = Inventory carrying cost expressed as a percentage of the average value of the inventory, an estimate usually provided by cost accounting. PP = Purchase price per each unit of inventory supplied by the purchasing department.

**Trial and error approach**

Select a number of possible lot (Order) sizes to purchase, and then determine the total cost for each lot size chosen; now select the ordering quantity that minimizes the total cost.

**2.5 Quantity Discount and Order Quantity**

The standard EOQ analysis is based on the assumption that the price per unit remains constant irrespective of the order size. When quantity discount are available which is often the case, price per unit is influenced by the ordered quantity. This violates the applicability of the EOQ formulas. However the EOQ framework can still be used as a starting point for analyzing the problem. To determine the optimal order size when quantity discount is available, the following procedures may be followed:

1. Determine the order quantity using the standard EOQ formula assuming no quantity discount.

2. If Q enables the firm to get quantity discount then it represents the optimal order size.

 3. If Q is less than the minimum order size required for quantity discount (call it-G2) compute to change in profit as a result of increasing the order quantity from O1 to O2 as follows.

=AD+ [A/Q1-A/Q2] O-[Q2((P-D)/2-(Q1PC/2)

 = Change in profit, A = total demand, D = discount per unit when quantity discount in available, Q1 = EOR assuming no discount, Q2 = minimum order size required for quantity discount, O = order cost, P = Purchase price without discount, C = carrying cost

 4. If change in profit is positive = Q2 If change in profit is positive = Q1

**2.6 PERPETUAL INVENTORY SYSTEM**

Another method of inventory control is the maintenance of inventory control on a continuous basis. After the material are received into the stores, the storekeeper will arrange for the storing of each item in the allotted rack, bin, shelf or other receptacles and attach a card to each bin for the purpose of making entries there-in, relating to the receipts, issues and balance. The bin card or the locker card, this becomes a perpetual inventory record for each item of stores. If the stores balance is recorded on continuous basis after every receipt and issue, the record is said to be one of perpetual inventory and the method of recording is called the perpetual inventory system. Thus the perpetual inventory is a method of recording store balance after every receipt and issue to facilitate regular checking and to obviate closing down for stock locking As a perpetual inventory record, the bin card records the receipt, issues and the balance of every item of stores only in physical quantities, and not in value. This feature of the bin card is in accordance with the accepted principle that the storekeeper true to his designation, should be responsible for the safe keeping of the items of stores entrusted to him, and his accounting for stores should always be in physical quantities and not in value. The perpetual inventory system includes continues stock taking also. Stocktaking or stock verification is done mainly with a view to finding out whether the book balances as revealed by the stock records agree with the physical or the ground balance. Although, therefore, stock verification is one of the tools of inventory control, and is done for exercising control over the stock of every item, is an integral part of material control for the purpose of preparing the B/S, the physical verification of stock must be done at the end of year. Such verification at the end of the year is known as the periodical stock taking as against the continuous stocktaking, which is done throughout the year. The periodic stock taking method usually adopted by concerns which cannot maintain perpetual inventory records due to the nature of the items which are usually stored in open yards and not in bins and as a such, bin cards cannot be employed for them, or do not want to maintain such records and employ stock verification staff to do the work of stock checking throughout the year. Under this method of stocktaking, the verification of the whole of the stock and its valuation are accomplished only once at the close of the financial year and difference in stock is adjusted only once. As such, the stock in hand would tend to be accurate for the balance sheet purposes. It is also possible to find out slow moving items. Nevertheless, the periodic inventory has its own disadvantage. In the first place, it becomes necessary to close down the factory on the day of stock taking. Secondly, discrepancies in stock cannot be corrected by an executive action immediately as and when they occur. Thirdly, since all the items are checked only once in a particular day, a surprise verification will not be possible. Lastly, reason for the discrepancies cannot be found out because of the long interval between two consecutive verifications. These disadvantages of the periodical inventory system are overcome in the case of the perpetual inventory system. Under this method of continuous stock verification the purpose of verification is carried on throughout the year by a specially trained staff. This duty is to verify a few selected items in details so that each item is checked up a number of times during the year. The day and time of checking not being known to the staff, they are taken by a surprise. As such, not only secrecy of the items to be verified cannot maintain, a manipulation of every type can be prevented. Discrepancies are located, reasons are ascertained, the necessary adjustment is made in the accounting records, and correlative action is taken then and there to prevent their recurrence. The advantages of a continuous stocktaking where perpetual inventory records are maintained may thus be summarized as follows:

1. The elaborate and costly work involved in periodic stock taking can be avoided.
2. The stock verification can be done without the necessity of closing down the factory.
3. The preparation of interim financial statement becomes possible.
4. Discrepancies are easily located and corrected immediately.
5. It ensure a reliable check on the stores.
6. It exercises a moral influence on the stores staff.
7. Fast and slow moving items can be distinguished and the fixation of proper stock levels prevents not only over-stocking, but under-stocking also.
8. A perpetual inventory record of the nature of the bin cards enables the storekeeper to keep an eye on the stock levels, and replenish the stock of every item whenever the limit falls to the reorder level.
9. It provides reliable information to the management of the number of units, and the value of every item of stores.
10. It ensures secrecy of the items that are verified.

**2.7 FACTORS INFLUENCE THE LEVEL OF EACH COMPONENT OF INVENTORY RAW MATERIAL INVENTORY:**

1. The volume of safety stock against material shortages that interrupt production.

2. Considerations of economy in purchase.

3. The outlook for future movements in the price of materials.

 4. Anticipated volume of usage and consumption.

 5. The efficiency of procurement and inventory control function.

6. The operating costs of carrying the stocks.

7. The costs and availability of funds for investment in inventory.

 8. Storage capacity.

 9. Re-component cycle.

 10. Indigenous or foreign.

 11. The lead-time of supply.

 12. Formalities for importing.

**2.8 Work-in-process Inventory:**

1. The length of the complete production process.

 2. Management policies affecting length of process time.

 3. Length of process in runs.

4. Action that speed up the production process, e.g. adding second or third production shifts.

 5. Management’s skills in production scheduling and control.

 6. Volume of production.

7. Sales expectations.

 8. Level of sales and new orders.

 9. Price level of raw materials used, wages and other items that enter production cost and the value added in production.

10. Customer requirements.

 11. Usual period of aging

**2.9 Finished Goods Inventory:**

1. The policy of the management to gear the production to meet the firm order in hand.

2. The policy to produce for anticipated orders and stock keeping.

 3. Goods required or the purpose of minimum and safety stocks.

 4. Sales policies of the firm.

 5. Need for maintaining stability in production.

6. Price fluctuations for the product.

 7. Durability, spoilage and obsolescence.

 8. Distribution system.

 9. Ability to fill orders immediately.

10. Availability of raw material on seasonal basis while customer’s demand spread throughout the year.

 11. Storage capacity.

**2.10 Stores and Spares Inventory**

1. Nature of the product to be manufactured and its lead-time of manufacture.

2. State of technology involved.

3. Consumption’s patterns.

 4. Lead time of supply.

 5. Indigenous or foreign.

 6. Minimum and safety stock and ordering quantities.

7. Capacity utilization.

8. Importing formalities.

**Measure of Effectiveness of Inventory Management**

1. Size of Inventory = Total inventory/Total Current assets

2. Size of Raw material Inventory = Raw material inventory/Total inventory 3. Size of Work in Process Inventory = Work in process Inventory/Total Inventory

4. Size of Stores and Spares parts Inventory = Stores and Spares parts inventory/Total Inventory

 5. Size of Finished Goods Inventory = Finished goods inventory/Total inventory

 6. Overall inventory turnover ratio = Cost of goods sold/average total inventories at cost

7. Raw material inventory turnover ratio = Annual consumption of Raw material / Average Raw material inventory

8. Work-in-process inventory turnover ratio = Cost of manufacture/average work-in-process inventory at cost

9. Finished Goods inventory turnover ratio = Cost of goods sold / Average finished stock

10. Stores and spare parts inventory turnover ratio = Stores and Spares consumed/Average stock of stores and spares

11. Age of Finished Goods inventory = 365/Finished Goods inventory turnover ratio.

12. Average age of raw material inventory = 365/Raw material inventory turnover ratio

13. Average age of Work-in-Process inventory = 365/Working-Process inventory turnover ratio

 14. Age of Stores and spare parts inventory = 365/Stores and spare parts inventory turnover ratio

 15. Inventory holding period = 365/Inventory turnover ratio.

**CHAPTER THREE**

**RESEARCH METHODOLOGY**

* 1. **Research design**

The researcher used descriptive research survey design in building up this project work the choice of this research design was considered appropriate because of its advantages of identifying attributes of a large population from a group of individuals. The design was suitable for the study as the study sought to investigate the efficacy of inventory management and control in manufacturing organization.

* 1. **Sources of data collection**

Data were collected from two main sources namely:

(i)Primary source and

(ii)Secondary source

**Primary source:**

These are materials of statistical investigation which were collected by the research for a particular purpose. They can be obtained through a survey, observation questionnaire or as experiment; the researcher has adopted the questionnaire method for this study.

**Secondary source:**

These are data from textbook Journal handset etc. they arise as byproducts of the same other purposes. Example administration, various other unpublished works and write ups were also used.

* 1. **Population of the study**

Population of a study is a group of persons or aggregate items, things the researcher is interested in getting information on the study inventory management and control in manufacturing organization. 200 of selected textile industry. were selected randomly by the researcher as the population of the study.

* 1. **Sample and sampling procedure**

Sample is the set people or items which constitute part of a given population sampling. Due to large size of the target population, the researcher used the Taro Yamani formula to arrive at the sample population of the study.

n= N

 1+N (e) 2

n= 200

1+200(0.05)2

= 200

1+200(0.0025)

= 200 200

1+0.5 = 1.5 = 133.

**3.5 Instrument for data collection**

The major research instrument used is the questionnaires. This was appropriately moderated. The secretaries were administered with the questionnaires to complete, with or without disclosing their identities. The questionnaire was designed to obtain sufficient and relevant information from the respondents. The primary data contained information extracted from the questionnaires in which the respondents were required to give specific answer to a question by ticking in front of an appropriate answer and administered the same on staff of the two organizations: The questionnaires contained structured questions which were divided into sections A and B.

* 1. **Validation of the research instrument**

The questionnaire used as the research instrument was subjected to face its validation. This research instrument (questionnaire) adopted was adequately checked and validated by the supervisor his contributions and corrections were included into the final draft of the research instrument used.

* 1. **Method of data analysis**

The data collected was not an end in itself but it served as a means to an end. The end being the use of the required data to understand the various situations it is with a view to making valuable recommendations and contributions. To this end, the data collected has to be analysis for any meaningful interpretation to come out with some results. It is for this reason that the following methods were adopted in the research project for the analysis of the data collected. For a comprehensive analysis of data collected, emphasis was laid on the use of absolute numbers frequencies of responses and percentages. Answers to the research questions were provided through the comparison of the percentage of workers response to each statement in the questionnaire related to any specified question being considered.

Frequency in this study refers to the arrangement of responses in order of magnitude or occurrence while percentage refers to the arrangements of the responses in order of their proportion. The simple percentage method is believed to be straight forward easy to interpret and understand method.

The researcher therefore chooses the simple percentage as the method to use.

The formula for percentage is shown as.

% = f/N x 100/1

Where f = frequency of respondents response

N = Total Number of response of the sample

100 = Consistency in the percentage of respondents for each item contained in questions.

**CHAPTER FOUR**

**PRESENTATION ANALYSIS INTERPRETATION OF DATA**

**4.1 Introduction**

Efforts will be made at this stage to present, analyze and interpret the data collected during the field survey. This presentation will be based on the responses from the completed questionnaires. The result of this exercise will be summarized in tabular forms for easy references and analysis. It will also show answers to questions relating to the research questions for this research study. The researcher employed simple percentage in the analysis.

**DATA ANALYSIS**

The data collected from the respondents were analyzed in tabular form with simple percentage for easy understanding.

A total of 133(one hundred and thirty three) questionnaires were distributed and 133 questionnaires were returned.

Question 1

Gender distribution of the respondents.

TABLE I

|  |
| --- |
| **Gender distribution of the respondents** |
| Response | Frequency | Percent | Valid Percent | Cumulative Percent |
| Valid | Male | 77 | 57.9 | 57.9 | 57.9 |
| Female | 56 | 42.1 | 42.1 | 100.0 |
| Total | 133 | 100.0 | 100.0 |  |

From the above table it shows that 57.9% of the respondents were male while 42.1% of the respondents were female.

Question 2

The positions held by respondents

TABLE II

|  |
| --- |
| **The positions held by respondents** |
| Response | Frequency | Percent | Valid Percent | Cumulative Percent |
| **Valid** | Managers | 37 | 27.8 | 27.8 | 27.8 |
| Accountants  | 50 | 37.6 | 37.6 | 65.4 |
| Human resource managers | 23 | 17.3 | 17.3 | 82.7 |
| Store keepers  | 23 | 17.3 | 17.3 | 100.0 |
| Total | 133 | 100.0 | 100.0 |  |

 The above tables shown that 37 respondents which represents27.8% of the respondents are managers, 50 respondents which represents 37.6 % are accountants, 23 respondents which represents 17.3% of the respondents are human resource managers, while 23 respondents which represent 17.3% of the respondents are store keepers

**TEST OF HYPOTHESES**

The inventory control of the received stock items in the industry is not effective.

**Table III**

|  |
| --- |
| **The inventory control of the received stock items in the industry is not effective.**  |
| Response  | Observed N | Expected N | Residual |
| Agreed | 40 | 33.3 | 6.8 |
| strongly agreed | 50 | 33.3 | 16.8 |
| Disagreed | 26 | 33.3 | -7.3 |
| strongly disagreed | 17 | 33.3 | -16.3 |
| Total | 133 |  |  |

|  |
| --- |
| **Test Statistics** |
|  | The inventory control of the received stock items in the industry is not effective.  |
| Chi-Square | 19.331a |
| Df | 3 |
| Asymp. Sig. | .000 |
| a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 33.3. |

Decision rule:

There researcher therefore reject the null hypothesis that state that the inventory control of the received stock items in the industry is not effective. as the calculated value of 19.331 is greater than the critical value of 7.82

Therefore the alternate hypothesis is accepted that state that the inventory controls of the received stock item in the industry is effective.

**TEST OF HYPOTHESIS TWO**

The inventory control has no significant impact on purchasing performance in Akaraka Industries

Table V

|  |
| --- |
| **The inventory control has no significant impact on purchasing performance in Akaraka Industries** |
| Response  | Observed N | Expected N | Residual |
| Yes | 73 | 44.3 | 28.7 |
| No | 33 | 44.3 | -11.3 |
| Undecided | 27 | 44.3 | -17.3 |
| Total | 133 |  |  |

|  |
| --- |
| **Test Statistics** |
|  | The inventory control has no significant impact on purchasing performance in Akaraka Industries |
| Chi-Square | 28.211a |
| Df | 2 |
| Asymp. Sig. | .000 |
| a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 44.3. |

Decision rule:

There researcher therefore reject the null hypothesis that state that the inventory control has no significant impact on purchasing performance in Akaraka Industries as the calculated value of 28.211 is greater than the critical value of 5.99

Therefore the alternate hypothesis is accepted that state that the inventory control has significant impact on purchasing performance in Akaraka Industries.

**CHAPTER FIVE**

**SUMMARY, CONCLUSION AND RECOMMENDATION**

**5.1 Introduction**

It is important to ascertain that the objective of this study was to ascertain the efficacy of inventory management and control in a manufacturing organization

In the preceding chapter, the relevant data collected for this study were presented, critically analyzed and appropriate interpretation given. In this chapter, certain recommendations made which in the opinion of the researcher will be of benefits in addressing the challenges of inventory management and control in a manufacturing organization

* 1. **Summary**

The optimal management of companies’ inventories is a fundamental problem and its solution would have a direct influence on the efficiency of business and the position of a company in a market. The fundamental aim of solving this problem is a continuous and complete satisfying of demand on the one hand, with minimum opportunity costs of carrying inventory and holding costs on the other. We analyzed inventory levels expressed in terms of financial ratios along with dependence between inventory levels and profitability and we also analyzed changes in inventory policy as an important activity in management of inventory. An optimization model has been designed on the basis of the analysis results of this activity. An optimal inventory level should be based on consideration of incremental profitability resulting from increased merchandise with the opportunity cost of carrying higher inventory balances.

* 1. **Conclusion**

 The researcher conclude that the use of product availability policies within manufacturing industries logistics in order to effectively and efficiently meet customers’ levels of expectation: the more product availability policies that are used, the more customers’ level of expectation is met. Inventory managers were directly involved in stock problem solving and in the increase of product quality.

* 1. **Recommendations**

Because of the changing business environment, a periodical customer survey has to be implemented within manufacturing industries logistics in the purpose of responding to customers’ needs or requirements. This customer survey is to be attached to customers’ slip or receipts at the products’ delivery times on one side and will enable manufacturing industries logistics to know what customers are expecting from them and how to satisfy them to the other side.

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**QUESTIONNAIRE**

**INSTRUCTION**

Please tick or fill in where necessary as the case may be.

Section A

1. Gender of respondent

A male { }

B female { }

1. Age distribution of respondents
2. 15-20 { }
3. 21-30 { }
4. 31-40 { }
5. 41-50 { }
6. 51 and above { }
7. Marital status of respondents?
8. married [ ]
9. single [ ]
10. divorce [ ]
11. Educational qualification off respondents
12. SSCE/OND { }
13. HND/BSC { }
14. PGD/MSC { }
15. PHD { }

Others……………………………….

1. How long have you been in fabric industry?
2. 0-2 years { }
3. 3-5 years { }
4. 6-11 years { }
5. 11 years and above……….
6. Position held by the respondent in the firm?
7. Manager { }
8. Supervisor { }
9. senior staff { }
10. Junior staff { }
11. How long have you been working as a store keeper?
12. 0-2 years { }
13. 3-5 years { }
14. 6-11 years { }
15. 11 years and above……….

SECTION B

1. Is inventory well managed in the organization?
2. Agrees { }
3. Strongly agreed { }
4. Disagreed { }
5. Strongly disagreed { }
6. Is there any role and place of stores department in the organization?

(a) Agrees { }

(b) Strongly agreed { }

(c) Disagreed { }

(d) Strongly disagreed { }

1. Are professionals employed to handle stores?
2. Agreed { }
3. Strongly agreed { }
4. Disagreed { }
5. Strongly disagreed { }
6. What are the receiving and issue procedure employed in the organization or store?
7. Agreed { }
8. Strongly agreed { }
9. Disagreed { }
10. Strongly disagreed { }
11. What system of inventory or stock control is adopted?
12. Agreed { }
13. Strongly agreed { }
14. Disagreed { }
15. Strongly disagreed { }
16. How are scraps, waste, obsolete and redundant materials managed?
17. Agreed { }
18. Strongly agreed { }
19. Disagreed { }
20. Strongly disagreed { }
21. The inventory control of the received stock items in the industry is not effective?
22. Agreed { }
23. Strongly agreed { }
24. Disagreed { }
25. Strongly disagreed { }
26. The inventory control has significant impact on purchasing performance in Akaraka Industries?
27. Agreed { }
28. Strongly agreed { }
29. Disagreed { }
30. Strongly disagreed { }
31. The inventory control has no significant impact on purchasing performance in Akaraka Industries?
32. Agreed { }
33. Strongly agreed { }
34. Disagreed { }
35. Strongly disagreed { }