

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study:

Industrialization is considered as an essential for the economic development of the country. Industrialization is an important factor for achieving basic objective of a country's economic and social progress. It facilitates on effective mobilization of resource such as capital and skill, which might otherwise remain unutilized. It also acts as a vehicle for fostering innovation and technological improvement for industrial development, thus, has a multiplier effect on the economy.

For the sense of inventory management, there are different types of concept. In traditional sense, inventory comprises only finished goods or stock in trade owned for sale to customers in normal course of business. In modern concept, inventory management can be traced with acting independently, developed an economic lot size equation which minimized the sum of carrying or holding cost for where the demand was known and constant. Inventory management is an integral part of financial management. It is primarily concerned with minimizing; investment in inventory maintaining designed levels of inventory should be effectively managed. The real task for top management lies in formulating policies that will lead to optional inventory investment for a attainment of designed objectives. Inventory management is determining how much inventory there should be on hand to serve the purpose of the business most economically.

Thus, management should pay adequate attention to the inventory management to reduce the cost of production (manufacturing) Sales (non-manufacturing) and working capital requirements. Inventory should be maintained in appropriate quantity so as to avoid both under stock and overstock situation. For this purpose, inventory management is necessary it is because the aim of inventory maintains optimum level of inventory for the smooth production and

sales operation. Therefore inventory management means to maintain desired level of inventory and minimizing total cost of inventory investment for the plans and policies that will lead to optimal inventory investment for attainment of desired objective.

Industrialization is a comparatively new phenomenon in Nepal. Industrial development in Nepal however started getting regular attention of the government since the development plans was started. Several industries were established under the public sector with the technical assistance of foreign countries were seen in existence in the public sector also. But the financial position is not growing as the growth of the numbers.

Manufacturing means any industries that make product from raw material by the use of labour or machinery, which is usually carried out systematically with a division of labour. BNTL is one of the manufacturing and processing companies of soft drinks, which supplies sufficient quantity of quality products at the right time at reasonable price. In the context of globalization, companies are free to enter the market of any nation. If the finished products are not sufficient to meet the demands of the costumers regularly, the customers may shift to the other close substitutes resulting into permanent loss to the firm. So to solve the great problem of demand and supply of raw material and finished product the company should use the scientific techniques of inventory management.

The growing number of companies in Nepal is facing problem of inventory management. Due to lack of proper inventory policies, there are many corporations where large amount of capital has been blocked up and very little measures have been taken to manage the inventory decisions. Models and techniques have so far developed (Shrestha, 1980, p-142). The area of inventory management covers the following individual phases: determining the size of inventory table carried establishing time schedules. Procedure and a lot of sizes for new order, determining minimum safety levels and co-ordination of sale production and inventory policies for providing proper storage facilities

arranging the receipt, disbursement and procurement of materials, developing the forms of recording these transaction, assigning responsibilities for carrying out the inventory control function and providing the reports necessary for supervising these overall activity (Kuchal, 1979, p-227).

1.1.1 Introduction of Bottlers Nepal (Terai) Limited (BNTL)

Bottlers Nepal (Terai) Limited is one of the manufacturing company which is manufacturing the soft drinks under the brand name of Coca Cola. It is the subsidiary company of Bottlers Nepal Limited, Balaju, Kathmandu. BNTL was established in 1987 under the Company Act 1964. BNTL is one of the leading figures of Nepalese industrial sector. The company is located in Gondrang of Bharatpur Municipality in Chitwan district, Nepal, occupying the area of 1,65,600 sq feet with the altitude of 1500 ft above mean sea level. It represents the first large-scale multinational manufacturing company of Chitwan, Nepal.

The company has authorized share capital of Rs 121,000,000 and paid up value per share is Rs. 100. The issued paid up capital is Rs. 121,000,000. Initially local management till 1993 A. D. ran the company. Frase and Neave, Singapore took responsibility of the company management from 1993 to 2000 A. D. During the year 2000-2004 the company was run by the Coca Cola, Atlanta. At present South Africa Bottling Company, South Africa is taking the responsibility of company management.

The company prepares flavor of the product. They are brought from countries like Singapore, India and Germany. All the spare parts are imported from Germany, Thailand, Switzerland and India also. BNTL covers more than 75% market in Terai region when compared with other brands of the similar product. The company has been able to win the heart of the customers without increasing the price of product since two or three years ago.

The company employing 158 persons has a plant with the capacity of producing 350 bottles per minute. Coke, Sprite, Fanta, Slice (orange, lemon,

and soda) are the major product of the company, packed in 2000ml, 1500ml, 1000ml, and 500ml non returnable plastic bottles and 750ml, 250ml, and 175ml returnable glass bottles. The products are marketed all over the country except in Bagmati Zone.

BNTL has continuously increased the production target. The machine operates 3 shifts in peak season and according to the demand of stock season 90% of the operation is carried in full season and 10% of the operation is done in off - season.

For the production of these product certain inputs are pre-requisite i.e. concentrate, crown cock, closure and sugar which are not produced in the country. Therefore these inputs are imported from other countries like Singapore, Iran, Pakistan, Indonesia, German and India.

The company had given prime importance to its quality product for which it had established well-equipped laboratory to assess the quality of raw materials as well as finished product. Similarly the company had also shown its concern to guarantee the safer environment by establishing Effluence Treatment Plant (ETP) in 1999 to refine the wastewater generated in the production process.

1.2 Statement of the Problem:

Industrialization in Nepal is not satisfactory, as it needs to be. Manufacturing enterprises' functions are also not in satisfactory level. Few manufacturing company are established and they are trying to cover whole function in market, which is impossible. Few of them are trying to distribute its products in the market. So, the inventory management is the key root for their success. Proper inventory management helps for efficient operation of resources.

1.3 Objectives of the Study:

The major objective of this study is to evaluate the current practice of inventory management and its effectiveness in Nepalese manufacturing enterprise. The other specific objectives are as follows:

- To study the inventory management system followed by BNTL
- To analyze the inventory level maintained by BNTL.
- To study the practice of procurement and sales of inventory.
- To analyze the different inventory management techniques followed by BNTL.

1.4 Research Question

Most of the Nepalese companies have been suffering from the problem of poor performance in terms of productivity and profitability. The present Study tries to find out the causes and reasons of following problems.

- What inventory management techniques does this company deploy?
- Whether the level of inventory and sales trends are related to each other in BNTL?
- What are the major problems related to inventory management of BNTL?
- Does the inventory control techniques impact on financial factors like profitability liquidity etc. of BNTL?
- Whether the company has adopted any techniques to control the inventory cost?
- Whether the inventory control techniques have any impact upon the minimization and control of inventory cost?

1.5 Focus of the Study:

Inventory management is one of the important functions in any organization. Without effective and efficient inventory management, no organization can achieve its goal. Proper inventory management helps to maximize the profit of the firm. The slight change in the cost of materials or work-in-progress will

bring a great change in the firm's profitability. Reduction in material cost may result high sales and high profitability and vice versa. To earn high profit, it is necessary to run the company more efficiently as well as economically. BNTL supplies the quality product at right time at reasonable price.

BNTL is a manufacturing enterprise, that's why investment and cost of carrying inventory is required to reduce the total operating cost. The main objective of inventory management is to put the inventory at an appropriate level so that inventory cost can be minimized. This study is focused in the inventory management of BNTL. The study can provide the guidelines and help to make the plan, policies and program for the effective management of BNTL.

1.6 Significance of the Study:

Inventory is the major element of manufacturing organization. Without effective and efficient inventory management, no organization can achieve its goals. A firm cannot achieve its goals unless inventories are controlled effectively and capital is allocated properly. Proper inventory management helps to increase the profit of an organization. A slight change in the cost of inventories will bring a great change in the firm's profitability. Reduction in the material cost may result in high profit.

Most of Nepalese manufacturing organizations are suffering from poor inventory management. Nepal, an under industrialized country, is still using traditional technique in purchasing of inventory. To have a sound achievement the company should apply modern tools and techniques.

This study is needed for effective inventory management in BNTL and to see the impact in profitability and find out how much money should be invested in inventory. And this study tries to point out the major shortcoming of the inventory management system of BNTL that are hindering the efficiency of

production system in BNTL and provide the suggestions in order to cope up with the shortcomings, So that the company will run with more efficiently.

1.7 Limitations of the Study:

This study is being conducted for partial fulfillment of the requirement for Masters Degree in Business Studies. There are following limitations of the study:

- This study is concentrated on the area of inventory management of BNTL.
- The study considers only BNTL and is based upon annual available reports of the BNTL i.e. based on secondary source of data.
- Time and resource for the study are the major constraints.
- This study concerns with the company and ignored other managerial functions.
- This study covers only a period of seven years (2004/05 to 2010/11)
- The conclusion derived from the study doesn't ensure wider applicability in all types of manufacturing companies.

1.8 Organization of the Study:

This study has been spread altogether into five chapters, the introduction and Framework and review of literature, research methodology, presentation and analysis of data and interpretation with the major findings and summary of the study, conclusions and recommendations. A brief outline of each of these chapters has been given as follows.

The first chapter includes the introduction of subjects. The chapter focuses on the statement of problem. The first chapter also briefs about objectives of study, why it should be carried out and the significance of study. Also it gives the limitation of the study.

The second chapter includes “Framework and Review of Literatures” and is further divided into two parts. The first part is concerned with review of the concepts, theory of inventory management and framework from various books, journals and articles. The second part reviews previous related studies on inventory management.

The third chapter discusses the research methodology used in this study. It comprises research design, population and sampling procedure, sources of data and their collection methods and also the procedure and statistical tools applied.

The fourth chapter fulfills the objectives of the study by presenting the data and analyzing them with the help of various financial and statistical tools followed by methodology. At the last part of this chapter, an explanation of the interview and the major findings of the whole study have been presented.

At the end i.e. the last chapter, the summary of the study has been presented, and is followed by the basic conclusions of the study based on facts and analysis presented in the fourth chapter. On the basis of their conclusions a number of recommendations have also been presented for consideration.

CHAPTER TWO

REVIEW OF LITERATURE

Review of literature means taking knowledge from different sources. In this chapter, the researcher should have reviewed various published & unpublished materials. Similarly past researchers thesis are reviewed and also books, articles, newspapers are reviewed. The previous study should be reviewed because they provide the foundation to the present study. The review of literature provides the foundation for developing a comprehensive theoretical framework from which hypothesis can be developed for testing. “The purpose of reviewing the literature is to develop some expertise in ones area, to see what new contributions can be made, and to receive some ideas for developing a research design”. (Wolff and Pant, 1999 p.30).

There are many researches made in the field of Nepalese manufacturing enterprise. Only limited numbers of studies have been conducted in the field of inventory management. In this chapter, attempts have been made to present the review of literature regarding inventory management. This chapter is divided into two-sub section. Conceptual Framework (theoretical concept of inventory management) is presented in first section and review of related studies has been presented in the second section.

2.1 Conceptual Framework:

2.1.1 Inventory Management:

The term inventory refers to the stockpile of the product which is being offered for sale and the components that make up the product. In other words, “Inventory is composed of assets that will be sold in future in the normal course of business operation”. (Khan& Jain, 2006:20.3). Inventory may be defined as the goods held for eventual resale by the firm. As such inventories are vital elements in the efforts, of the firm to achieve desired level of sales.

The dictionary meaning of inventory is stock of goods or a list of goods. Inventory is an idle resource, which is useable and has value. The idle resource may be man, money, materials, plan requirement (Ahuja, K. 1993. p. 310). Of course inventory is an item of current assets, which is the most important for the successful run of any enterprise whether it is commercial or manufacturing. Mainly raw materials, semi-finished goods, finished products, and parts and supplies are the forms of inventory.

Inventory of Raw materials provides flexibility in the purchasing of raw materials. Without it, a company must deal on a hand-to-mouth basis, the unscientific one. It is necessary to buy raw materials in line with its production schedule. Conversely, raw materials inventory may be bloated temporarily because the purchasing department may take the advantage of quality discounts. The level of raw materials inventories are influenced by anticipated production, seasonality of production reliability of sources of supply and the efficiency of scheduling purchase and production operations. Example is raw materials in flour for Bread Company and milk for Dairy industries etc.

The inventory management is assumed to be required to maintain an adequate supply of correct materials at the lower totals cost. A manufacturing company must maintain a certain amount of inventory during the production, the inventory of work-in-process is materials that have been partly fabricated but are not yet completed. Inventory of Work-in-process is strongly influenced by the length of the production period, which is the time between placing the raw materials in production process and obtaining the finished product. Decreasing the production period can increase inventory turnover. One means to accomplishing this is a new technique such as just-in-time inventory management. Another means is to buy items rather than to make them.

Finished goods inventory allows the firm flexibility in its production scheduling and its marketing. The level of finished goods inventory is a matter of co-ordination of production and sales. The financial manager can stimulate sales by changing credit terms or by granting credit to marginal risks. But

whether the goods remains on the books as inventories or as receivables, the financial manager has to finance them.

Inventory of parts and supplies includes spare parts such as bolt, knot, oil, lubricants, grease etc, these materials do not enter directly to the production but are most necessary for the production. Usually, these parts and supplies are small part of the inventory and do not involve significant investment.

Any sort of item that a firm kept in meeting the future requirement of production and sale is call inventory (Jain and Narang 1994. p 109). The basic reason for holding inventory is to keep up the production activities unhampered. It is neither physically possible nor economically justifiable to wait for the stocks to arrive at the time when they are actually required. Therefore, keeping of inventory is must for the efficient working of business unit.

The term “Inventory Management” is composed of two different words “inventory and management”. Inventory is the stock of materials hold by a firm to meet its future requirement of production and sale. In other word, inventory refers to any stock hold by a company for smooth running of production and market operation. It is a kind of current assets in which huge part of working capital is invested. Therefore, inventory is essential for smooth running of manufacturing as well as trading firms. Lack of inventory affects not only the continuous production of goods but also affects smooth supply of finished goods. A manufacturing company generally holds four kinds of inventories namely, raw materials, work-in-process, finished goods and spare parts and supplies. The need of inventories is for the transaction motive, precautionary motive and speculative motive.

Management is an art, which is devoted for planning, directing, co-ordination and controlling the different activities to achieve the predetermined goal. Thus, inventory management can be defined as ‘the planning, directing, co-ordination

and controlling of various activities which are concerned with inventory management.

Capital investment is required for the holding of different kinds of inventories. Excessive inventory increase the capital investment and inadequate inventory causes the obstacle in smooth running of production and market operation. So, excessive and inadequate inventory is not desirable. Inventory should be maintained in appropriate level so as to avoid both under and over stock situation. Thus, main aim of inventory management is to avoid excessive and inadequate level of inventories and to maintain optimum level of inventory for the smooth production and sales operation.

Therefore, inventory management is mainly concerned with minimizing investment on inventory on one hand and minimizing cost of inventory management on other hand. Both physical as well as financial dimensions of inventory should be managed effectively. The main duty of top-level management is formulating plan and policies that will be helpful to maintain optimum level of inventory for achievement of desired goal (Bose De, L. J., P 350).

Generally inventory management covers the function of:

- i. Purchasing
- ii. Store keeping
- iii. Issuing and pricing

2.1.1.1 Purchasing:

Without purchasing function, no one manufacturing company can do their further activities. So, purchasing plays important role in manufacturing company because it has its own bearing on every vital factor concerning to the manufacturing i.e. quality, quantity, efficiency, economy, prompt delivery, volume of production etc. It is the scientific purchasing that can save much money, time and efforts of the management.

In manufacturing organization, purchasing is the procuring of materials, supplies, machines, tools and services required for the equipment maintenance and operation of the business. Purchasing must be of the right quality in proper quantity delivering at the right time at the most favorable price from outside organization.

In the words of industrial matter purchasing is the procurement by purchase of Alfred and Beauty. Principles of industrial the proper materials, machinery, equipment and supplies of stores used in the manufacture of a product adopted to marketing in proper quantity and quality at the proper time and the lowest price consistently with the quality desired.

In simple words the task of purchasing is related to going the open market finding the desired materials at the lowest possible price and selecting the supplier who offers it at that price taking the quality of the materials in mind.

A) Objectives of Purchasing:

The major objectives of scientific purchasing may be stated as follows.

- i. Procurement of required quality and quantity of materials at the best price not necessarily at the lowest price.
- ii. Procurement of materials, which best suit the product and the purposes for which they are intended.
- iii. Maintaining continuous supply to ensure production schedule at a minimum investment.
- iv. Buying the quality, which is neither too much that involves belonging of the capital nor too little that holds up the regular supply for production.
- v. Purchasing for time utility by schedule, sufficiently in advance of the demands of the production department so that the production work shall not suffer due to lack of raw materials.

- vi. Avoidance of duplication of materials, leading to waste of materials and equipment.
- vii. Improvement of the product with reference to quality and distribution by means of selection of adequate materials.
- viii. Developing fullest co-operation and co-ordination maintaining internal relationship among various departments of the company.
- ix. Creation of goodwill for the company through dealings with suppliers.
- x. Maintenance of company's competitive position in the market by having company's quality standards in accordance with the demands of the consumers.

B) Purchasing Procedures:

The main steps in purchasing procedure may be listed as follows.

- i. **Purchase Requisition:** The initiation of purchase begins with the formal request from the various sections or departments to the purchase department or order goods. The request is made in purchase requisition slips to the purchase department by the departments needing the goods authorizing the purchase department for purchasing the goods as per specification given in the slip by mentioning date on it.
- ii. **Decision of Purchase:** On receipt of the purchase requisition, the purchase department then decides what and how much to buy taking into consideration of various limitations and constraints in purchasing the goods. As far as possible the raw materials should be purchased in sufficient quantity, neither less nor more, to continue the flow of production. For purchasing other materials or plant and equipment, the necessary permission should be taken from the authority concerned and the finance department to release the fund.
- iii. **Study of Market Condition and Sources of Supply:** Having taking the decision for the purchase of materials, the purchasing agent should study the market condition on the basis of market reports as to when and what goods should be purchased. An intensive study should also be purchased. An intensive study should also be made in regard to the

source of supply from where the goods can be procured with the help of catalogues, directories, old records, pricelists of vendors and purchase records etc.

- iv. Selection of Vendors: On the basis of the studies of market conditions and sources of supplier the purchasing agent selects the vendor keeping in mind the reliability, his price movement history, his delivery record and other service required and his past co-operation. Sometimes supplier is selected out of the list of suppliers registered with the company for the supply of goods or sometimes quotations or price bids or tenders are invited from the prospective suppliers. Through the study of the supply and the quality and quantity of goods, a vendor is selected out of.
- v. Purchase Order: After selecting the vendor or supplier, a purchase order is prepared in the prescribed form by the purchase department and sent to the vendor authorizing him to supply specified quantity and quality of materials at the stipulated terms at the time and place mentioned there in. It forms a formal contract between the purchaser and the vendor.
- vi. Receiving Materials: When goods arrive they are taken delivery and the receiving clerk checks material with the order placed by the purchasing department to the vendor. After proper checking goods should be delivered to the store department or to other department that requisitioned them. On checking if any discrepancy is found as regards to quality and quantity, it should immediately be referred to the purchasing department so that discrepancy may be adjusted.

2.1.1.2 Storekeeping:

Materials are a high percentage of the cost of production of product. It is therefore necessary to have a close which in the proper use of the materials. The best method of maintaining materials properly is storekeeping. Storekeeping is a service function in a manufacturing concern, which deals with the physical storage of goods under the custodian of well-trained and experienced person termed as storekeeper. Raw materials are usually known as stores and the place here such stores are kept is known as storeroom. Storekeeping is that aspect of inventory management, which is concerned, with the physical storage of goods. The responsibility of storekeeping management are to receives materials to protect them in storage from the materials in the right quantities at the right time to the right place and provide these services promptly and at the least cost.

The importance of storekeeping has not been properly recognized by the manufacturing organization so far. Storekeeping should be given due place in the organization otherwise the manhandling will add to the cost of production. Many organizations spend lavishly on machines and wages while storekeeping is ignored and stores are housed in camped quarters, ill-equipped and ill-ventilated. Storekeepers are also ill paid in comparison to others in similar status. All these caused are responsible for wrong or short issue. Loss of stock of raw materials, unexpectedly running out of stock and preparation or incorrect vouchers all these lead to theft and pilferage of stock and delay in production.

In the light of the above explanations, storekeeping can be described as the keeping of materials in stores in a scientific and systematic way.

Objectives of Storekeeping:

- i. Minimizing the inventory holding cost and investment on inventories.
- ii. Receiving, handling and issuing goods economically and efficiently.
- iii. Using the storage available space and labour effectively

- iv. Maintaining regular supply of raw materials at all times when properly authorized.
- v. Protection of all goods in stores against all losses from fires, thefts and obsolescence.
- vi. Facilitating ordering of required materials.
- vii. To achieve the above said objectives a firm generally uses different types of controlling devices

i) Store Ledger: This ledger is kept in the costing department and is identical with bin card except that receipts issues and balances are shown along with their money values. This contains an account for every item of stores and makes a record of the receipts, issues and the balances, both in quantity and value. Thus, this ledger provides the information for the pricing of materials issued and the money value of any time of each item of stores (Jain and Narang : 1999 p 237-239).

ii) Bin Cards: A bin card makes a record of the receipts and issue of materials and is kept for each item of stores carried. The storekeepers maintain these cards and he himself is responsible for any difference between the physical stock and the balance shown in the bin card. These cards are used not only for recording receipts and issues of stores but also assist the storekeeper to control the stock.

For each item of store, minimum quantity, maximum quantity and ordering quantity are stated on the card. By seeing the bin card the storekeeper can send the material requisition for the purchase of material in time.

2.1.1.3 Issuing and Pricing:

Material should be issued against material requisition slip. The prices of the issues can be determined on the basis of cost price or market price.

2.1.2 Types of Inventory:

Manufacturing firms generally hold four types of inventories (Van Horne, 1984, p 112), which are as follows.

i) Raw Materials:

Raw materials are those basic inputs that are converted into finished product through the manufacturing process. These are goods that have yet committed to production in manufacturing firm. “Raw materials inventories are those units which have been purchased and stored for future production (Western & Copeland; 1992 p 814). The level of raw materials inventories is influenced by anticipation production, seasonality of production, reliability of sources of supply and the efficiency of scheduling purchase and production operation.

It consists of item that firm purchases for use in its production process. It may consist of basic materials and manufactured goods. Maintaining adequate raw materials inventories provides a firm with advantage in both purchasing and production. Chemicals and glasses are the main raw materials used by the company i.e. BNTL.

Materials used in a factory are classified as direct material and indirect material. Direct materials are generally classified to include all materials and parts that are integral part of finished product and their contribution can be directly identified. Indirect materials are generally defined as materials used in manufacturing process as supported materials.

ii) Work-in-Process:

These categories include those materials that have been committed to the production process but have not been completed. “Goods in process include such items as components and sub assembles that are not yet ready to be sold (Hampton, 1990 p 241)”. Work- in –process inventories are semi-

manufacturing products. They represent products that need more work before they become finished product for sale.

Work-in-process is neither a finished product nor raw materials. It is the product in the middle of raw materials and finished product. WIP inventories are strongly influenced by the length of production, which is the time between placing raw materials in production and completing the finished product. It is very difficult to separate which materials are WIP and which are not. The same materials may be a WIP as well as finished goods in order industry. It depends upon nature of production.

iii) Finished Product:

Finished goods inventories are those completely manufactured products, which are ready for sale. In a manufacturing firm, they are the final output of the production process. Manufacturing and non-manufacturing company stock of finished goods for market operation holds (Hampton 1930. p 228).

Bottlers Nepal (Terai) Limited has been producing different types of soft drinks and holds inventory of different types of soft drinks for smooth market operation.

iv) Spare Parts and Supplies Inventories:

Spare parts are those materials, which are used in maintenance, and repairing functions and supplies are those materials, which are used in operating functions. Bolts, wheels oil, lubricant, grease etc, represent the spare parts and supplies.

2.1.3 Motives of Holding Inventories:

The question of managing inventories arises only when the company holds inventories. Manufacturing inventories involved trying of the company funds and incurrence of storage and holding cost, if it is expensive to maintain

inventories, why do companies hold inventories? There are three motives for holding inventories (Marti & Miller, 1962 p 256).

a) Transaction Motives:

Its emphasis needs to maintain inventories to facilitate smooth production and sales operation. A company should maintain adequate stock of materials for supply to the factory for continuous production. It is not possible for a company to procure raw materials however it is needed. A time lag exists between demand for materials and its supply. There also exists uncertainty in processing in time at many occasions. The procurement of raw materials may be delayed because of such factor as strike, transportation disruption or short supply. Therefore, the firm should maintain sufficient stock of raw materials at a given time to stream live production.

b) Precautionary Motive:

In necessitates holding of inventories to guard against the risk of unpredictable change in demand and supply forces and other factors. Stock of finished goods has to be holding because production and sales are not instantaneous. A firm cannot produce immediately when customers demand goods. Therefore, to supply finished goods on a regular basis their stock has to be maintained. Stock of finished goods has also to be maintained for sudden demand from customers. In case the firm's sales are seasonal in nature substantial finished good inventories should be kept to meet the peak demand. Failure to supply products to Customers, when demanded would mean loss of the firm's sales to competition. "The level of finished goods, inventories would depend upon the coordination between sales and production as well as on production time (Pandey, 2005 p 984). WIP inventory builds up because of production cycle is the time span between introduction of raw materials into production and emergence of finished product at completion of production cycle. Full production cycle complete stock of WIP has to be maintained. Efficient firms constantly try to make production cycle smaller by improving their production techniques.

c) Speculative Motive:

It influences the decision to increase or reduce inventory levels to take advantage of price fluctuations. Different factors which may necessitate, purchasing and holding of raw materials inventories quantity discount and anticipated price rise. The firm may purchase large quantities of raw materials that needed for desired production and sales level to obtain quality discount of bulk purchasing.

2.1.4 Need and Importance of Inventory Management:

Inventory in any organizations are of pivotal role. If the organization is not paying attention to inventory management, it will affect the efficiency and profitability of the organizations. Buffa observes “Inventories serve the vital function of developing. The various operation in sequence beginning with the materials extending through all the manufacturing operations and into finished goods. Storage is continuing to ware house and retail stores (Buffa, 1994, p-474)”.

Importance of inventory management can be written as follows.

- i. Inventory helps in smooth and efficient running of business.
- ii. Inventory provide service to the customers immediately or at a short notice.
- iii. Due to absence of stock, the company may have to pay high prices because of piecewise purchasing maintaining of inventory may earn price discount because of bulk purchasing.
- iv. Inventory also acts as buffer stock when raw materials are received late and so many sales others are likely to be rejected.
- v. Inventory also reduced product cost because there is an additional advantage of batching and long smooth running production runs.
- vi. Inventory helps in maintaining the economy by absorbing some of the fluctuations when the demand for an item fluctuates or is seasonal.

- vii. Pipeline stocks (also called process and movement inventories) are also necessary where the significant amount of time is consumed in transshipment of items from one locality to another (Nair, Banerjee and Agrawal, 1998, p-218).

2.1.5 Objectives of the Inventory Management:

Inventory is the most important to all manufacturing organization in today's industrial world. So, it is necessary to manage it properly because both situations of inventories i.e. either excessive or inadequate are not desirable to the industry. The excessive level of inventories consumer's funds of the firm that cannot be used for another purpose and thus it involve an opportunity cost. The carrying cost such as the cost of storage, handling, insurance, recording and inspection also increase in proportion of volume of inventory. These costs impair the firm's profitability further.

On the other hand maintaining an inadequate level of inventory is also dangerous. Inadequate level of inventory means under investment of Industry inadequate raw materials and work-in-process inventories will result in frequent production interruption. Similarly, if finished goods inventories are not sufficient to meet the demand of consumer regularly, consumers may shift to competitors, which will amount to permanent loss to the firm.

Therefore, to maintain the proper inventory or optimal level of inventory in industry is quite significant. But, it is difficult task to the management because the optimal level of inventory always between two points of excessive and inadequate inventories. An inventory management should be (Pandey, 1999, p-887).

- i) Ensure a continuous supply of raw material to facilitate uninterrupted production.
- ii) Maintain sufficient stocks of raw materials in period of short supply and anticipated price changes.

- iii) Maintain sufficient finished goods inventory for smooth sales operation and efficient customer service.
- iv) Minimize the carrying cost and time, and
- v) Control investment in inventories and keep in at optimum level.

The objective of inventory management should be to determine and maintain optimal level of inventory. The optimum level of inventory will lie between two points of excessive and inadequate inventories.

Firm should always avoid over investment or under investment in the inventories. Due to over investment, unnecessary tie- up amount cannot invest in other purpose. Excessive carrying costs will impair the firm's profitability further. Due to over inventories, it may not be possible to sell them in time and at full value. Similarly, work-in-progress is far more difficult to sell. In the same way finished goods inventory should sold at low prices due to falling the prices in market and the seasonal factors so more investment in inventories in harmful to producer/company. It should be cut down.

Under investment inventories are also not good for company. It carries some problems such as production hold-up, frequent production and interruptions. If finished goods are not sufficient, we don't meet the customers demand and out goodwill also lost. Thus, the objective of inventory management should be neither excessive nor inadequate level of inventories but maintaining sufficient inventories level for the smooth production and sales operations. An optimum level of inventory should be determined on the basis of the trade off between costs and benefits. The various objectives of inventory management can be summarized up as follows (Goyal, 1997, p-69).

- i. Availability of all items of inventory
- ii. No excessive investment in inventory
- iii. Reasonable Price: When we purchase the raw materials, there should be strict on the pricing of the raw materials. It should be reasonably low price, but we don't ignore. The quantity by keeping lower prices

materials. Firm should be adjusted between price of raw material and its quantity.

- iv. **Minimum Wastage:** There should be minimum wastage of material while storing in the godowns by the workers. Wastage should be allowed up to a certain level known as normal level of wastage and it should not exceed that level. Storekeepers and workers should be trained to handle the material in a scientific way to avoid wastage.
- v. **Risks of spoilage and obsolescence of inventory must be avoided for this purpose;** a maximum quantity of each item of inventory is determined and proper method of issuing the inventory is followed. LIFO and FIFO method is used to issue the inventory.
- vi. **Information about availability of stock should be made continuously available to the management.** So the planning of production may be done. The storekeeper can supply this information because he keeps an up-to-date record of every item of stocks under a proper system of inventory control.

2.1.6 Cost Associated with Inventory:

The goal of the inventory management is to provide the inventories for sustaining operation at the lowest possible cost. The first step in inventory management is to identify all the costs involved purchasing and maintaining inventories. Typical costs associated with the inventories are described below.

2.1.6.1 Carrying Cost or Holding Costs:

Total carrying generally increases in direct production to the average amount of inventory carried in turn depended upon the frequency with which orders are placed. The cost associated with having inventories which includes storage cost, insurance cost of tying up fund, depreciation cost and so on. These costs generally increase in production to the average amount of inventory held.

Carrying cost varies with inventory size. This behavior is contrary to that ordering cost which decline with increase in inventory size. The carrying cost includes the cost incurred in the following activities.

- a. Capital or opportunity cost
- b. Insurance and taxes
- c. Warehousing cost
- d. Handling cost
- e. Clerical and staff and
- f. Deterioration and obsolescence

Carrying cost is the first category management cost which is generally associated proportionally with the average value of inventory (Solemen Ezra. 1989, p 181). The total carrying cost is calculated as follows.

$$\text{Total Carrying cost (TCC)} = (C \%) \times (P) \times (AI)$$

Here,

C% = Percentage of cost of carrying inventory which is calculated by adding the cost of capital tied up, storage, insurance and taxes etc and dividing it by the average inventory value.

P = Price per unit of inventory

AI = Average inventory in units i.e. order quantity (EOQ/Q) divided by two plus safety stock (S) if any, assuming a constant rate of consumption of inventory

$$AI = Q/2 + S$$

2.1.6.2 Ordering Cost:

Ordering cost consist of order costs, set up costs or both ordering cost could include preparing and processing the order request, selecting a supplier, checking the stock, preparing the payment and receiving inventory levels. Set up costs refers to modifying the manufacturing process to make different goods. They include personal costs as well as capital equipment costs. Many firms use blanket orders to reduce order costs (Bloomberg & Hanna, 2005 p161).

The term ordering cost is used in case of raw materials (or supplies) and includes the entire cost of raw materials. They include cost incurred in the following activities.

- Requisitioning
- Order placing
- Transportation
- Receiving, inspecting and storing
- Clerical and staff

Ordering cost increase in proportion to the numbers of orders placed. The clerical and staff costs, however do not have to vary in proportion to the numbers of ordered placed and one view is that so long as they are committed costs, they need not be reckoned in computing ordering cost. Alternatively, it may be argued that, as the number of the number of orders is increase. The clerical and staffed costs tend to increase. If the number of orders are drastically reduced, the clerical and staff force released now can be used in other departments. Thus, these costs may be included in the ordering costs. It is more appropriate to include clerical and staff costs on a pro-rata basis. Ordering cost increase with the number of orders; thus the more frequently inventory is acquired, the higher the firms ordering costs. On the other hand, “if the firm maintains large inventory levels, there will be few orders placed and ordering cost will be relatively small. Thus, ordering cost decrease with increasing size of inventory (Pandey, 1994: 894)”.

Furthermore, ordering cost is the cost involved in placing & receiving an order or purchased items. The expenses involved in this cost are:

- a) Cost of placing an order
- b) Requisitioning cost
- c) Transportation/shipping cost
- d) Receiving, inspecting and storage cost
- e) Sales tax, customs etc
- f) Clearing and forwarding cost
- g) Insurance of raw-materials
- h) Stationery cost
- i) Bank commission/LC charges etc
- j) Telephone/Fax/Postage expenses to follow up
- k) Cost incurred when raw materials are in transit.

Ordering cost increases with the number of orders, thus more frequency in Inventory acquired, higher the firms ordering cost. On the other hands, if the firm maintains large inventories level, there will be a few orders placed and ordering cost will be relatively small. Thus ordering costs decrease with the inventory size of inventory. The fixed costs associated with ordering inventories as 'O' and we placed 'n'.

Ordering per year, the total ordering cost is given as

$$\begin{aligned}\text{Total ordering cost (TOC)} &= (O) \times (N) \\ &= (O) \times (R/Q)\end{aligned}$$

Where,

- TOC = Total ordering cost
O = Fixed cost per order
N = Number of orders placed per year
Q = Inventory quantity for each order

2.1.6.3 Stock out Costs:

Stock out cost is associated with demanded. The depletion in stock results in loss in sales or back order costs. When the sales are lost due to stock out, the firm loses both the profit margin on unmade sales and the firm's goodwill. If the customer uses another business else where, future profit margin may also be lost and back order cost is needed to convince customers to use again after inventories have been replenished. Both order cost includes loss of goodwill money paid to re-order goods and notification to customers when goods arrived (Adams and Ebert, 1993, p 142).

Stock out cost computed from following formula:

$$\text{Stock out cost} = \text{Inventory cycles per year} - \text{Output units} \times \text{Probability of possible stock out} \times \text{unit stock out cost}$$

$$\text{Inventory cycles per year} = \frac{\text{Annual Usages}}{\text{Quantity Order Size}}$$

2.1.7 Techniques of Inventory Management (Control):

Adequate inventories facilities smooth production activities and help to provide off shelf delivery to customers. On the other hand excessive inventory is idle resource of the firm and can prove costly because it ties up working capital unnecessarily which could have been better used had it been utilized for some other purpose. According to Alton N. Smith "Inventory is (money) on which a company pays interest rather than collect interest. It is money always in danger of deviation. Non controlled inventory is an industrial danger". The major problem of inventory management is mention here. It should be to arrive at an optimum balance between too much inventory and too little inventory. So that there may be no stock out problem and cost of inventory should be minimum. Following are the inventory control technique in below.

2.1.7.1 Economic Order Quantity (EOQ):

These techniques attempt to establish the more economic balance between the acquisition cost and carrying cost by determining quantities which to be ordered. The most economic quantity is ascertained at this point.

In 1915, F. W. Harris, developed the famous economic order quantity (EOQ) formula. Later, through the consultant named Wilson, this formula gained wide use in industrial area. Later on Harris developed this formula. The EOQ is still widely used in inventory for independent demand. The EOQ model is an inventory management technique used to find the optimal order included order quantity that minimizes the total cost which includes ordered and carrying cost.

“The order size that will result in the lowest total of order and carrying costs for items of inventory. If a firm places unnecessary orders it will insure unneeded order costs if it places too few orders, it must maintain large stock of goods and will have excessive carrying costs by calculating an economic order quantity, the firm identifies the number of units to order that results in the lowest total of these costs (Hampton, 1989, p-223).

It refers to the order size that will result in the lowest total cost (total ordering cost + total carrying cost) for an item of inventory. If a firm places many orders it will insure unneeded ordering costs. If it places too few orders, it will have excessive carrying cost. By EOQ model we can identify the number of units to order that results in the lowest total costs. EOQ seeks that how much units of inventory should purchase at an order, which minimizes the total cost. When we are going to calculate EOQ one thing should keep in mind. To calculate the cost involve in the carrying and ordering. A fairly large error, say 21% in determine the carrying and ordering costs will introduce a much smaller error (10%) in the determination of EOQ (Buchan, 1970, p-362).

EOQ can be computed with the help of forecasting usage, ordering and carrying costs, in EOQ calculating we must use marginal cost only, don't include, fixed costs.

$$EOQ = \sqrt{\frac{2AO}{C}}$$

Where,

- A = Annual Demand
- O = Ordering Cost per Order
- C = Carrying Cost per Unit

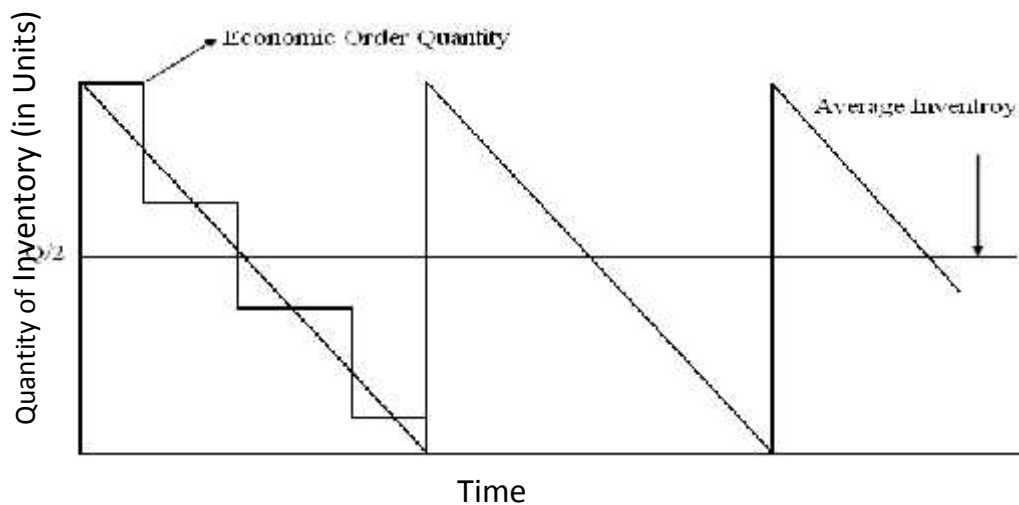
Carrying cost per period 'C' represent the cost of inventory storage, handling and insurance together with the required rate of return on the investment in inventory. These costs are assumed to be constant per unit of inventory of a time. Thus, the total carrying cost for a period is the average number of units of inventory multiplies by the carrying cost per unit.

If the usage of an inventory item is perfectly steady over a period of time question of safety stock does not arise. Average inventory (in units) can be expressed as

$$\text{Average inventory} = \frac{Q}{2} \dots\dots\dots (1.1)$$

Where, Q is the quantity (in units) ordered and is assumed to be constant for the period as illustrated in figure 2.1

Figure 2.1
Economic Order



Assumption of Economic Order Quantity

The concept of EOQ is based on the following assumptions:

- i. The demand rate is constant recurring and known for example, demand (or usage) is 100 units a day with no random variation and demand is assumed to continue into the indefinite future.
- ii. The lead-time is constant and known. The lead-time for order placement to order delivery is therefore always a fixed number of days, no stock outs are allowed. Since demand and lead-time are constant one can determine exactly when to order material to avoid stock out.
- iii. Material is ordered or produced in a lot or batch and lot is placed into inventory all at one time.
- iv. A specific cost structure is used as followed the unit cost is constant and no discounts are given for large purchase. The carrying costs depend linearly on the average inventory level; there is a fixed ordering or set up costs of each lot which is independent of the number of items in the lots.
- v. The item is a single product there is no interaction with other products.

Approaches to set EOQ

The EOQ model can be illustrate by

- a) Mathematical (short- cut) formula method
- b) The long analytical approach to tabulation method or trail and error approach
- c) Graphical approach

They are explained below,

a) Mathematical (short cut)/ Formula Method:

Mathematical models are also available to calculate economic order quantity. There are numbers models exist, as the field of inventory management and can be studies in college programs such as operation research and production management. Even many mathematical model exists the main objective of these model is to reduce minimizes the inventory cost / Total costs.

Without getting into highly refined decision models the concepts of EOQ can be illustrated with a basis mathematical model. EOQ can be calculated by using the following formula.

$$EOQ = \sqrt{\frac{2AO}{C}}$$

b) The Long Analytical Approach or Trial and Error Approach:

This is another method to calculate economic order quantity. A firm has different alternative purchase policy of its inventory. It can purchase its entire requirement own one single lot. Alternatively, the firm can purchase its inventory is small lots periodically say weekly, monthly, six monthly, and so as its means more than one time the firm can place an order to purchases inventory. The smaller the lot sizes the lower average inventory and vice-versa. Low inventory holding are associated with high ordering cost and low carrying

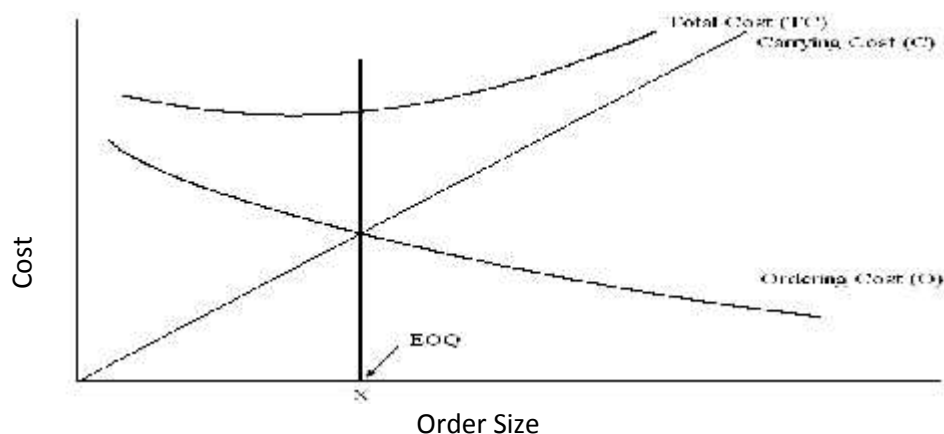
cost. This approach for the determination of EOQ uses different permutations and combination of total costs.

In the other words, according to this approach the carrying cost and ordering cost for a different sizes of order to purchases inventories computed and the order size with the lowest total cost /ordering plus carrying of inventory is the economic order quantity.

c) The Graphic Approach:

The Economic Order Quantity can also be found graphically. The following figure illustrates the EOQ functions.

Figure 2.2



Graphical Presentation of EOQ

In the figure, carrying, ordering and total costs are plotted on vertical horizontal axis, horizontal axis used to represent the order sizes. Total carrying cost increases as the order size increase because on an average a large inventory level will be maintained and ordering cost decline with increase in order size. The behavior of total cost line is noticeable since it is a sum of two types of costs that behave differently with order size. The total cost decline in the first stage but they start rising when the decrease in average ordering cost is more than offset by the increase in carrying cost. The economic order quantity occurs at the point 'Q' where the total cost is minimum, if the order size increases

carrying cost exceeds ordering cost that are saved. Thus, the firm operation profit is maximized at 'Q'.

2.1.7.2 ABC Analysis:

ABC analysis is the application of stock holding of Pareto's law, which shows that the majority of inventory value will be represented by relatively few items.

The first step in the inventory control process is classification of different types of inventories to determine the type and degree of control required for each. The ABC system is widely used classification technique to identify various items of inventory for the purpose of inventory control. This technique is based on the assumption that a firm should not exercise the same degree of control on all items of inventory. "It should rather keep a more rigorous control on items that are the most costly and/or the slowest turning, while items that are less expensive should be given less control effort" (Khan & Jain, 1994:112).

It is very difficult to monitor and control the enormous number of stock items. As such manufacturing organizations find it useful to divide inventories into three categories for the purpose of exercising selective control on inventories. ABC analysis is a control technique that divides items into sub-classification and uses different control systems for each group of inventories. Under these techniques of inventory control, inventories are listed in A, B and C groups in descending order based on money value of consumption as follows:

- i. High priced inventories A
- ii. Medium price inventories B
- iii. Low price inventories C

The items included in-group 'A' involve the largest investment and would be under the tightest control by management. Therefore, inventory control should be most rigorous and intensive. The most sophisticated inventory control techniques should be applied for these items. The 'C' group consists of items of

inventory, which involve relatively small investment although the number of items fairly large. These items deserve minimum attention. The lowest level of managers may be given authority to exercise control over these items. The 'B' group stands mid way. It deserves less attention than 'A' but more than 'C'. The 'B' items fall in between these two categories and the responsibility to control these inventories may be given to middle level managers. Employing less sophisticated techniques can control it. The typical break down of inventory item is as shown given table below.

Table No. 2.1

ABC Analysis

Classify	Item	Unit	%	Total	Cumulative	U.Price	TC	%	Total	Cumulative
A	1	10000	10	15	15	30.4	304000	38	70	70
	2	5000	5			51.4	256000	32		
B	3	16000	16	30	45	5.5	88000	11	20	90
	4	14000	14			5.14	72000	9		
C	5	30000	30	55	100	1.7	51000	6.4	10	100
	6	15000	15			1.5	22500	2.8		
	7	10000	10			0.65	6500	0.8		
Total		100000	100	100	100		800000	100	100	100

Source: I. M. Pandey. Financial Management, Vikas Publishing House Pvt. Ltd. P 407

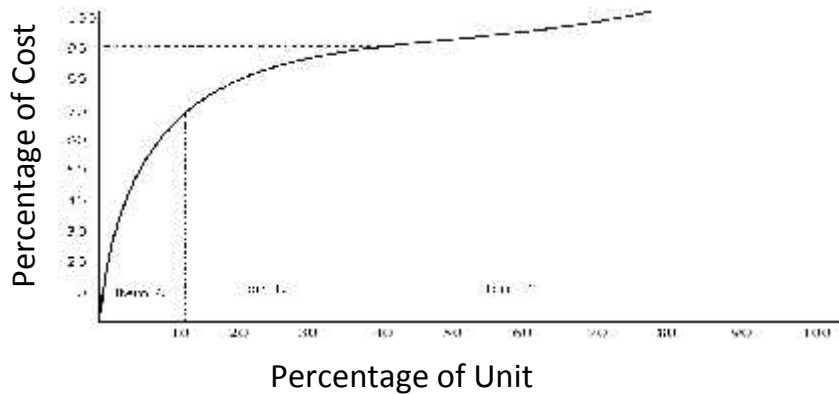
The tabular and graphical presentation indicate that item 'A' forms a minimum proportion 15% of total units of all items, but represents the highest value 70%. On the other hand item 'C' represents 55% of the total units and only 10% of the total value. Item 'B' occupies the middle place. Item 'A' and 'B' jointly represent 45% of the total units and item 90% of the investment. More than half of the total units are item 'C' representing merely 10% of the investment.

The significance of this analysis is that a very close control is exercised over the items of 'A' group which account for a high percentage (70%) of cost while

less stringent control is adequate for category 'B' and very little control would sufficient for category 'C' items.

Figure 2.3

Graphic Presentation of ABC Analysis



Some point stand out table given about while group 'A' is the least important in terms of the number of items, it is by far the most important in terms of the investment involved. With only 15 percent of the number, it account for as much as 70 percent of total value of inventory. The firm should direct most of its control efforts to the items included in this group. The items comprising B group account for 20% investment in inventory, they deserve less attention than 'A' but more than 'C', which involves only 10% of the total value although number-wise its share is as high as 55 percent.

Advantages of ABC Analysis

- i. A strict control is exercised on the items, which represent a high percentage of the material costs. Managerial time is spent on 'A' items where as 'C' items and sometimes 'B' items can be handled by clerical staff with least managerial supervision. Equal attention to all the items of stores is not desirable because it is expensive.
- ii. Investment in inventory is reduced to the minimum possible level because a reasonable quantity of 'A' items representing a significant portion of the material costs is purchased to reduce investment in materials, close control of 'A' items contribute much more than close control of 'C' items.

- iii. Storage cost is reduced as a reasonable quantity of materials, which account for high percentage of value of consumption, will be maintained in the stores. (Jain and Narang, 1995, P: 243-244)

2.1.7.3 Stock Level Sub-system:

Carrying of too much and too little of inventories is deterring mental to the firms. If the inventory is too little, the firm will face frequent stock outs involving high reordering cost and if the inventory level is too high, it will be necessaries of capital. Therefore, an efficient inventory management requires that a firm should maintain the optimum level of inventory where inventory costs are the minimum and at the same time there is no stock out which may result in loss of sale or stoppage of production. Various stock levels are (Nair, Banerjee, Agrawal, 1998, p-220).

a) Minimum Level:

It represents the minimum quantity of inventory, which must be maintained in hand at any time. This quantity is fixed so that production as sales may not be held up due to shortage of inventory. In this level, the following factors are taken into consideration.

- i. Lead-time i.e. time lag between in denting and receiving of the inventory.
- ii. Rate of consumption of the inventory during the lead-time.
- iii. Nature of inventory, minimum level is not requires in case of special inventory, which is required against customer specific orders.

Formula of Minimum Level = Re-ordering Level - (Normal Consumption × Normal Re-order Period)

b) Maximum Level:

Maximum level represents the maximum quantity of item of inventory that can be hold in stock any time that stock should not exceed this quantity. The quantity is fixed so that there may be no over stocking. The maximum stock level is fixed by taking into account the following factors.

- i. Amount of capital available for maintaining stores.
- ii. Golden space available.
- iii. Maximum requirement of the stores for production purpose at any point of time.
- iv. Rate of consumption of the material during the lead-time.
- v. The time lag between indenting and receiving of the inventory.
- vi. Possibility of loss in stores by deteriorations, evaporation etc.
- vii. Fluctuation in price.
- viii. The seasonal nature of supply of inventory of some items of inventory goods are available only during specific periods of the year, so these have to be stocked heavily during these periods.
- ix. Restriction imposed by Government of local authority in required to material in which there are inherent risks, e. g, fire and explosion.
- x. Possibility of change in fashion and habit, which will necessitate change in requirements of materials.

Formula of Maximum Stock Level = Re-order Level + Re-ordering Quantity -
(Minimum consumption × Minimum Re-ordering Period)

c) Re-ordering Level:

An important question in any inventory management system is “when should be an order for the purchase of an item placed, so that the concern does not run out of goods”. The re-order level provides the answer to this question.

It is the point at which if stock to material in store approaches the stock- keeper should initiate the purchases requisition for fresh supplier of material. This level is fixed some where between the maximum and minimum level in such a way that the different of quantity of the materials between the re-ordering level and the maximum level will be sufficient to meet the requirement of production up to the time the fresh supply to the materials received. “Re-order point sub

system answers the important question in an organizations inventory management”. The question is “When an order should be placed so that the firm does not run out of stock”.

“The re-order point is the level of inventory at which the firm places an order in the amount of the economic order quantity. If the firm places the order when the inventory reaches the re-order point, the new goods will arrive before the firm runs out of goods to sell”. To determine the re-order point under certainty, there are three information/assumptions needed.

i) Usage Rate

This is the rate per day at which the item is consumed in production. It is expressed in units.

ii) Lead Time:

It refers the time normally between placing an order and receiving the delivery of inventory. Lead time covers the time span from the point when a decision to places an order for the procurement of inventory is made to the actual receipt of the inventory by the firm. It is also called procurement time of inventory. It is expressed in days, weeks, and months.

iii) Safety Stock Level:

The minimum level of inventory may be expressed in days this level can be computed by multiplying the usage rate times and the numbers of days that the firms want to hold as a protection against shortage.

$$\text{Re-order level} = \text{Maximum consumption} \times \text{Maximum Re-order Point}$$

d) Average Stock Level:

Average stock is calculated as

$$\text{Average Stock Level} = \text{Minimum stock level} + \frac{1}{2} \text{ of Re-order Quantity}$$

e) Danger Level:

This is a level of which normal issue of the material are stopped and issued are made only made specific instructions. The firms will make special arrangement to get the material, which reach at their danger levels so that the production may not stop due to shortage of materials.

$$\text{Danger Level} = \text{Average Consumption} \times \text{Maximum Re-order Period}$$

2.1.8 Inventory Valuation:

In any firm different goods are purchased at different time at different price rate. But the problem to assign value to those goods, emerged to identify the position of current assets of the firm. Balance sheets of the firm should show true and fair view of the financial position of the firm. For these purpose assets including inventory should be properly valued to exhibit a true and fair view. True profits cannot be calculated unless assets are properly values.

The false valuation of the inventory directly affects the profit. If inventory is values at a lower then actual, the profit will decrease and as result shareholders would get less divided. On the other hand, if inventory is valued more than actual value, the profit would be increased be increased and the shareholders will receive more dividends, a port of which would than be paid out of capital to be insolvent. Moreover under or over valuation of inventory will not only affect the appearing result and financial position but will also affect these for the next period because closing stock of the current period will become opening the next period.

Valuation of inventories affects profit of the year. Therefore, method of valuation of inventory should not be changed year-to-year enable comparison of profit of different years.

Various method of valuation of the inventory is as follows:

2.1.8.1 Specific Identification Method:

The specific identification method requires that each unit in inventory be identified with the particular time it was purchased. In these methods, the items have serial numbers or are distinguishable by model, colors or size to identify the particular items but specific items separate at first & recorded in stock book. This method is more suitable to low volume, high cost item such as automobiles. It is not very practical when the firm purchase large quantities of identical units of various times and prices.

2.1.8.2 Weighted Average Cost of Capital Method (WACC):

This method assumes that goods are removed from the beginning inventory and purchase group in proportion to the number of units in these groups. This method is widely used by organization that holds items in inventory for long period of time. The price is obtained by the total quantity of item in hand.

2.1.8.3 First-In-First Out (FIFO) Method:

FIFO method assumes that the oldest items on hand are sold first. Each sale is made out of the oldest goods in stock, the ending inventory therefore consist of the most recently acquired goods. During the period of rising prices, these methods will result in an inventory then would be assigned under the average cost method. FIFO is the most commonly used method for valuing inventory. It is simple to use and appear to coincide with established merchandising principle of selling the oldest items first.

2.1.8.4 Last-In-First Out (LIFO) Method:

This method assumes cost flow is exactly the opposite of FIFO method. The title of this method assumed that the recent items purchased. Consequently, the ending inventory consists of the oldest unit in hand cost of the latest purchased materials will be the cost assigned to the first material issued, until they are exhausted then the price of the proceeding lot is used and so on. Materials are issued at cost approximating current market prices but inventories trend to be

valued at the oldest lots on hand giving price, which is out of date with current invoice prices.

This method has become popular since the procedure becomes an acceptable method for use in determining the income taxes. Unlike weighted average in the inventory is less than the beginning inventory. In such a case, the firm must be able to identify the oldest remaining items for inventory valuation purposes.

2.1.8.5 Higher in First out Method (HIFO):

This method is based on the assumption that closing stock of items always remains at the minimum value. So lots of the higher cost of materials purchased or goods manufactured are exhausted first. As this method always under values the stock it is not popular. It is used in the monopoly products and cost plus product as well.

2.1.8.6 Market Price Method:

Market price either is the replacement price or the realizable price. The replacement price is used in case of items that are held in stock for use in production while.

2.1.9 Just-In-Time Inventory:

JIT is disciplined approach to improve manufacturing quality, flexibility and productivity through the elimination of waste and the total improvement of people. JIT is not simply reducing inventory rather its overall objective is increased quality.

There are three components to JIT. First is JIT purchasing which ensures that the materials arrive so that production can immediately use them? Next is JIT manufacturing which production finished good for immediate shipment, sub assemblies for immediate assembly, and fabricate parts for immediate use in sub assemblies? Last is JIT delivery which transports goods to meet the tighter

transit times and reliability standards of JIT operations. All the JIT components must work together for a company to benefit from them.

JIT reduces costs primarily through the application of experience curve and economic of scale. Economics of scale mean making more of the same product with same sources. This reduces per unit cost by spreading fixed cost over more units.

According to Shigeo Shingo, a JIT authoring and engineer at Toyota Motor Company identifies seven wastes, as target of continuous improvement in product process. The seven wastes are,

- Waste of over production
- Waste of waiting
- Waste of transportation
- Waste of processing itself
- Waste of stocks
- Waste of motions
- Waste of making defective products

2. 2 Related Studies on Inventory Management:

2.2.1 Review of Journals:

As the output of the study conducted by Bajracharya (1983) on management problems in public sector manufacture enterprises in Nepal, he concluded that inventory management suffer from lack of planning, high carrying cost, poor recording and stores management and virtual absence of controlling system (Bajracharya, P. CEDA. 1983).

Agrawal(1980), management expert of Nepal, claims that inventory management in Nepal is probably the weakest aspect of management. The tool and techniques for controlling inventory has not been applies in Nepalese

enterprises for controlling their physical as financial dimensions (Agrawal, G. R. 1980).

Rao and Rao (1981) recommended the need for tackling human element in the third world country like Nepal to manage the inventory efficiency. They had suggested the need of orientation on the altitude of the staffs towards materials cost because of lack of knowledge and carelessness, which were the important factors responsible for inventory management (Rao, K. G. and N.V. S. Rao. 1981). Similarly, Janam Jaya Banjade identified the lack of quality and adequate materials as well as structural deficiency and dishonesty of the management as the main problem of Nepalese enterprises that were adversely affecting Nepalese corporation (Banajade, J. J).

The study conducted by CEDA in 1973 related to the various aspects on Nepal Transportation Corporation come out with the conclusion that stocking of spare parts had hampered the smooth operation of the enterprises even though the inventory management was simple (CEDA. 1973. T. U. Kirtipur).

2.2.2 Review of Past Dissertations:

Some studies have been made in the subject of inventory management, few among which are reviewed for this study in this chapter.

Yadav (1990) from his study on material management of Bansbari Leather and Shoe Factory listed the following findings:

- i. Factory had not produced the materials on the basis of economic order quantity.
- ii. There were no mechanized systems for handling materials.
- iii. The inventories of shoes and upper leather were so high which had tied up huge amounts.
- iv. The inventory turnover ratio was satisfactory.
- v. Whole inventory position of the factory was in increasing order.

Balika (1996) found that Hetauda Cement Factory Limited was suffering the problem of overstocking of raw materials and work in process. She suggested this might be due to the inefficient management system of inventories. Recording this fact she concluded that the production and sales plan of the factory was not practicable and realistic.

A study had conducted by Risal (1997) regarding inventory of Agriculture Input Corporation (AIC). He recorded that inventory management was not based on scientific methods. Use of scientific method of inventory management in this organization seemed difficult due to the non- uniform inventory consumption pattern frequent fluctuations in the exchange rate of imported inventory components.

Surendra Shrestha conducted a case study on inventory management of Gorkhapatra Corporation. Based on his findings he concluded that Gorkhapatra had not applied any sort of available inventory management technique to manage the inventory. Unavailability of certain data was made it impossible to apply the inventory management techniques in the corporation.

Overstocking of raw materials as well as finished goods in Janakpur Cigarette Factory was creating the problem. The overstocking of inventory raised the problem of working capital leads to the conclusion that it was due to the lack of proper sales planning on the one hand and defective procurement and production policy on other hand .

From above finding, he concluded that increasing inventory of Bansbari Leather and Shoe Factory was due to better co-ordination between production and sales.

Singha Raj Basnet (1998) in his degree thesis expressed his view that, in reality Himal Cement Company Limited (HCCL) is not applying the different method or techniques of inventory management. To manage its inventory effectively, a

firm should use different tools and techniques like EOQ, ABC analysis, reorder level etc. in inventory management, which minimizes the inventory, cost consequently will result into positive profitability. There is no proper and up to date improvement in inventory management system in HCCL. So it is better to pay attention by top-level management to overall management of purchasing, production, sales and financial dimensions by which HCCL, will run in profit in future.

Pandey (2000) expressed the need of good inventory system to maintain a suitable level of inventory in order to meet corporation's requirement on time. Time rules for maintaining proper stock of inputs are necessary to know the answer about how much to buy and when to buy. The models, examples and formulas are necessary for every business to reduce unnecessary cost incurred on ordering and carrying cost of the inventory. Moreover, the unnecessary costs involved in ordering and carrying can be reduced to a certain level by the use of models, formulas etc.

Sigdel (2005) reported the Agriculture Input Corporation (AIC) procures through inviting global tender, negotiations, aid/assistance from donor agencies and countries, and negotiation/agreement between two governments. However, AIC prefers procurement through inviting global tender as other procedures are less reliable and costly compared to this. AIC is not applying the scientific models of inventory management. They are ordering chemical fertilizers in lots of 1000 to 2000 M. Ton without considering EOQ that ease the supply. There is also no evidence of taking trade discount by AIC, lead time was also not calculated properly taking generally 3 to 6 months to receive an order after the order placement, reorder point was also not fixed. Regarding buffer stock, although the AIC have capacious warehouses throughout the country, it remains out of stock in season and over stock in off-season. AIC was also not using ABC analysis.

The main objective of AIC is to increase production and productivity in agriculture sector by providing quality agricultural inputs at reasonable price at right time at right quantity to the farmers. However, due to stark poverty on the part of majority of farmers, they were not able to apply high cost inputs like fertilizer and improved seeds. Realizing this Government has been providing subsidy in price and transportation cost to encourage farmers to use chemical fertilizer. Consequently, the demand of chemical fertilizers has been increasing in Nepal since 1960.

The concept of inventory management is almost avoiding in AIC. They were not applying the scientific techniques of inventory management, which are the short sightedness, unskilled, inexperience, inability and negligence of inventory management aspect. Certainly there are external and internal obstacles to adopt these techniques but the situation is not absolute making unconditional to use the techniques for the efficient management of agricultural inputs. Again Rawal in his study suggested that AIC should attempt to use the scientific models like EOQ, reorder point, ABC analysis etc. So that inventory problems whether it is overstock, under stock, out of stock will be solved. As a result AIC can deliver the regular supply of chemical fertilizers at the right quantity at reasonable price at the right time (Kshetry, R. B. 1998).

In addition Vijaya Sharma reported large variation between target and actual sales of cereal seed supply in AIC, Rupandehi during his study on inventory management of AIC. In spite of large capacity, AIC Rupandehi was dealing with only fraction of potential seed requirement. This is due to poor marketing activities, unawareness about the benefits of good processed seed on the part of farmers and lack of easy availability there by causing very low rate of market penetration. The inventory turn over ratio, indication of efficient management was also very low signifying inefficient inventory management system.

Sanuja Shrestha (2005) had studied about the Inventory Management of Bottlers Nepal (Terai) Limited (BNTL) to find the present Inventory Position and Problem in managing Inventory. After her studies she revealed that there is no proper system of material purchase in the Factory. And the Price and Quantity of collected materials are fluctuating from year to year. The Company is not adopted appropriate EOQ Model in purchasing decision.

2.3 Research Gap:

Many researches have been performed in the topic of inventory management of manufacturing companies. Inventory management of BNTL for the years of 2004/05-2010/11 has not been performed yet. This research has been done to find out the inventory management of BNTL for 2004/05-2010/11.

2.4 Concluding Remarks

From the above literature review, the following conclusion can be remarked.

- The scientific methods of inventory management have not been followed.
- Most of the manufacturing companies have a problem of overstocking.

CHAPTER THREE

RESEARCH METHODOLOGY

Research methodology is the process of arriving at the solution of a problem through a planned and systematic dealing with the collection, analysis and interpretation of the facts and figures. The objectives of this study are to analyze the inventory management of Bottlers Nepal (Terai) Limited.

This chapter presents research methodology adopted in achieving the objectives stated in the earlier chapter. This chapter contains research design, population & sample, nature of data, data gathering procedure and presentation and analysis techniques.

3.1 Research Design:

The research design is plan structure and, the strategy for investigation research design for this study will be more analyzing in the sense that it will concentrate on analyzing the management of inventory item-wise separately, to precise its causes and effects in other areas. In other words, the research design is the plan structure and strategy for investigation of the facts in order to arrive at conclusion. The plan is the overall scheme of program of research. It includes and outlines of what the investigation will do from writing the hypothesis and their operational implication to the financial analysis of data (Wolf and Pant, Page No.113).

The study focuses on the quantitative aspects of effectiveness of inventory management and theoretical prescriptions are elaborated, whenever necessary. In this respect, the present study has followed the descriptive as well as analytical, approach to achieve the objectives.

This study entitles ‘Inventory Management of BNTL’ deals with procurement, sales and distribution procedure, trends of inventory management of BNTL, which were the variables under the study, so the analytical and descriptive research have been applied as research design.

3.2 Population and Sample:

There are large numbers of manufacturing companies in Nepal but only one company BNTL has been selected for this study.

3.3 Nature and Sources of Data:

Information is the lifeblood of any research. Both primary and secondary information have been used to achieve the objectives of this study. Primary data are based on questionnaire, informal interview as well as unstructured dialogues and discussions with staffs of BNTL. While secondary data were collected from the following sources.

- Studying and analyzing the annual reports of BNTL
- Books, articles, magazine and official records of BNTL
- Published and unpublished documents related to BNTL

3.4 Data Gathering Procedures:

Data gathering is very difficult activity of the whole research process but it is most important part of the research. Data gathering consists of obtaining information from somebody’s hand. The secondary data are directly obtained from various sources mentioned above for the purpose of data analysis are taken from official records, published and unpublished and unpublished documents, books, articles, magazines. The researcher has to make frequent visits to BNTL office in order to collect the required data from officials.

For primary information, with a view of collecting the additional information, informal interviews with the officials have been taken.

3.5 Period of Study:

The study covers the period of seven year i.e. 2004/05- 2010/11 A.D.

3.6 Methods of Analysis:

Inventory management involves determining how many inventories to hold? When to place order? How many units to order at a time? In order to achieve the organizations goal there is a need of effective inventory management system. In this study, data collected from various sources were managed, analyzed and presented in proper way including tables, figures and graphs with proper interpretation and explanation. The inventory management techniques applied in this study is Economics Order Quantity (EOQ), Re- order level, Inventory turnover ratio and ABC analysis that are the part of financial analysis. However the statistical techniques included in the study are mean, standard deviation, co-efficient of variation, Karl- Pearson's coefficient of correlation and trend analysis.

3.6.1 Descriptive Analysis:

Descriptive analysis consists of the purchase practice, store control device and process of issuing materials in BNTL.

3.6.2 Inventory Management Tools:

Inventory management tools are used to analyze the inventory management aspects of BNTL. The inventory management tools applied in the study are as follows.

3.6.2.1 Economic Order Quantity (EOQ):

An EOQ technique is the most important of inventory management. It attempts to establish the most economic balance between the carrying costs and ordering costs determining the quantities to be ordered. The economic order quantity is that inventory level, which minimizes the total of ordering and carrying costs. The relationship between the ordering costs and carrying costs are called cost

factor. EOQ is calculated in Rupees due to the unavailability of data in quantity.

EOQ can be determined by following way.

i. Formula Method:

$$EOQ = \sqrt{\frac{2AO}{C}}$$

Where,

EOQ = Economic Order Quantity

A = Annual requirement

O = Ordering cost

C = Carrying cost

Thus, EOQ mainly depends on two types of costs.

a) Ordering Cost:

Ordering costs are also termed as preparation costs. These are those types costs, which are incurred in connection with ordering and procurement. They are primarily fixed cost relating to the starting of production or the writing of an order for purchase and don't vary with the number of items in the lot. In BNTL ordering costs included.

- Set up cost of machine and finished goods inventory
- Clerical costs
- LC charge

b) Carrying Cost:

Inventory carrying costs are also known as stock holding costs or what is called as inventory holding costs. These costs vary directly with the number of items involved. BNTL carrying costs are:

- Interest on capital investment
- Clerical and staffs

- Insurance
- Loss due to oil

ii. Table Method:

$$\text{Order size} = \frac{\text{Annual requirement}}{\text{Number of order}}$$

$$\text{Average inventory} = \frac{\text{Order Size}}{2}$$

$$\text{Total Carrying cost} = \text{Carrying cost per unit} \times \text{Average inventory}$$

$$\text{Total Ordering cost} = \text{Total cost of an order} \times \text{Number of order}$$

3.6.2.2 Inventory to Total Assets (ITA):

This ratio indicates the percentage of total assets invested in the form of inventories. It is calculated as

$$\text{ITA} = \frac{\text{Inventories}}{\text{Total Assets}} \times 100$$

The increase in the ratio indicates liberal inventory policy of blocking of materials in stock.

3.6.2.3 Inventory Conversion Period (ICP):

The inventory conversion period is calculated by dividing inventory by the cost of goods sold per day. It is computed as

$$\text{ICP} = \frac{\text{Inventory}}{\frac{\text{Cost of Goods Sold}}{360}}$$

The inventory conversion period is the average length of time required to convert materials into finished goods and then to sell these goods? It is the

amount of time the product remains in inventory in various stages of completion.

3.6.2.4 Payable Deferred Period (PDP):

It is calculated by dividing account payable by the daily credit purchase. Mathematically it can be expressed as

$$\text{PDP} = \frac{\text{Account Payable}}{\frac{\text{Cost of Goods Sold}}{360}}$$

The payable deferred period is the average length of time between purchase of raw materials and labor and the payment of cash for them.

3.6.2.5 Inventory Turnover (IT):

Inventory turnover is calculated to show the rate of turnover of stock. This will show how many times the stock has turned over, when the figure of number of times is going on increasing, indicating a trend that the stock is fast moving from reference point of view. This ratio should be 7 to 18 times. This ratio is worked out by dividing the COGS with the average inventory. We can write this as

$$\text{Inventory Turnover} = \frac{\text{COGS}}{\text{Average Inventory}}$$

This measures the efficiency on inventory management and how quickly inventory can be sold. It indicates the relationship between the cost of goods and the inventory level.

As we know that higher 'ITR' is better than low ratio. High turnover ratio indicates that a firm has good inventory management system and it is able to earn profit selling quickly over a period of time. Likewise, low turnover ratio indicates that a firm has poor inventory management system and firm has more stock of finished goods for sales.

3.6.2.6 Inventory to Current Assets (ICA):

This ratio shows the percentage of inventories to current asset and it is calculated as,

$$\text{ICA} = \frac{\text{Inventories}}{\text{Current Assets}} \times 100\%$$

The increase in the ratio is an indication of liberal inventory policy followed by the company.

3.6.3 Statistical Tools:

Some important statistical tools are used to achieve the objective of this study. In this study, statistical tools such as standard deviation, coefficient of variation, Karl Pearson's Correlation Coefficient, Time series/Trend analysis and Probable error. The brief descriptions of each of these are made below.

3.6.3.1 Standard Deviation (S.D.)

The standard deviation measures the absolute dispersion (or variability) of distribution. The greater the amount of dispersion (or variability) the greater the standard deviation, and the greater will be magnitude of deviations of the values from their mean. A small standard deviation means a high degree of uniformity of the observation as well as homogeneity of a series; standard deviation means just the opposite. Standard deviation is extremely useful in judging the representatives of the mean. In this study standard deviation of ratios of both the public Enterprises has been calculated to analyze the dispersion of BNTL Standard deviation (S.D.) is defined as the positive square root of the mean of the square of the deviations taken from the arithmetic mean. It is denoted by † .

$$\text{S.D. } \dagger = \frac{\sqrt{\sum (\text{X} - \bar{\text{X}})^2}}{\text{N} - 1}$$

Where,

X = Value of observation.

$\bar{\text{X}}$ = Mean of observations

N = No. of observations

3.6.3.2 Coefficient of Variation (C.V.)

The standard deviation as stated above is an absolute measure of dispersion; the corresponding relative measure is known as the coefficient of variation. It is used in such problems where we want to compare the variability of two or more two series. The series for which the coefficient of variation is greater is said to be more variable or conversely less consistent, less uniform, less stable or less homogeneous and vice versa. Since the present study is related with the two series of ratios of corresponding manufacturing public enterprises, coefficient of variation has been calculated to compare the variability of the series of ratios. The formula used for determining the coefficient of variation is as follows:

$$\begin{aligned}\text{Coefficient of Variation (C.V.)} &= \frac{\mathbf{S.D.}}{\mathbf{Mean}} \times 100 \% \\ &= \frac{\dagger}{\bar{X}}\end{aligned}$$

Where,

† = Standard deviation of the observations.

\bar{X} = Mean of observations.

It is independent of unit. So, two distributions can bitterly be compared with the help of C.V., more will be uniformity, consistency etc and vice versa.

3.6.3.3 Karl Pearson's Correlation Coefficient:

This method popularly known as Pearson's coefficient of correlation is widely in practice. This is a mathematical method of measuring the degree of association between two variables say x and y. In this study, the correlation analysis is used to test the relationship between the following variables.

- Annual required and annual purchase
- Sales and closing stock
- Purchase and closing stock
- Sales and purchase

According to the Karl Pearson, correlation coefficient is calculated as follows.

$$r = \frac{\sum xy}{\sqrt{\sum x^2} \sqrt{\sum y^2}}$$

Where,

$$x = X - \bar{X}$$

$$y = Y - \bar{Y}$$

X = the first variable

Y = the second variable

3.6.3.4 Time Series (Trend Analysis):

The trend lines describe the average relationship between the two series. In fact, there is no difference between the lines of best fit and the regression lines. The term line of the best fit is generally used, when X-series related to time and Y-series related to the value of the variable. If both X and Y series are variables, the line of best fit is known as line of regression. The equation describing the regression lines is called regression equation

$$Y = b_0 + b_1t$$

Where,

Y = the variable

b₀ = intercept of the trend line i.e. y-intercept

b₁ = slope of trend lines/ rate of change

t = Time variable

N = No. of observation

$$b_0 = \frac{\sum Y}{N}$$

$$b_1 = \frac{\sum tY}{\sum t^2}$$

Here, the trend analysis of purchase, sales, inventory, raw materials, work-in-process, finished goods, purchase of raw materials, cost of goods sold and net profit are calculated to find out the future trend by the past data.

3.6.3.5 Probable Error (P.E.):

Probable error is an old measure of ascertaining the reliability of the value of Pearson's coefficient of correlations. If 'r' is the calculated correlation coefficient in a sample of 'n' pairs of observations then its standard error usually denoted by S.E. (r) is given by

$$\text{S. E. (r)} = \frac{1-r^2}{\sqrt{n}}$$

Probable error of the coefficient of correlation can also be calculated from S.E. of the coefficient of correlation by the following formula.

$$\begin{aligned} \text{P.E. (r)} &= 0.6745 \times \text{S. E (r)} \\ &= 0.6745 \times \frac{1-r^2}{\sqrt{n}} \end{aligned}$$

Significance of r is measured by the value obtained from 6 X PE (r). When the value Karl Pearson's Correlation Coefficient (r) is much greater than the value of obtained from 6 X PE (r) value of 'r' is highly significant.

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF DATA

The basic objectives of this study are to analysis present practice of inventory management system in BNTL. The inventory management aspects have been discussed in the review of literature. In the research methodology, necessary analytical tools and techniques have been employed for the accomplishment of prescribed objectives. To fulfill the said objectives, collected information is analyzed in this section. To achieve the fruitful result, it is tried to divide the analysis part in two sections as the first part is analysis of inventory management and second part is analysis of its effect on the present position of inventory management by using different statistical, mathematical tools. The available data are presented in table and graph.

4.1 Descriptive Analysis:

Purchasing procedure, store control device and issuing materials of BNTL are the descriptive analysis made in this study.

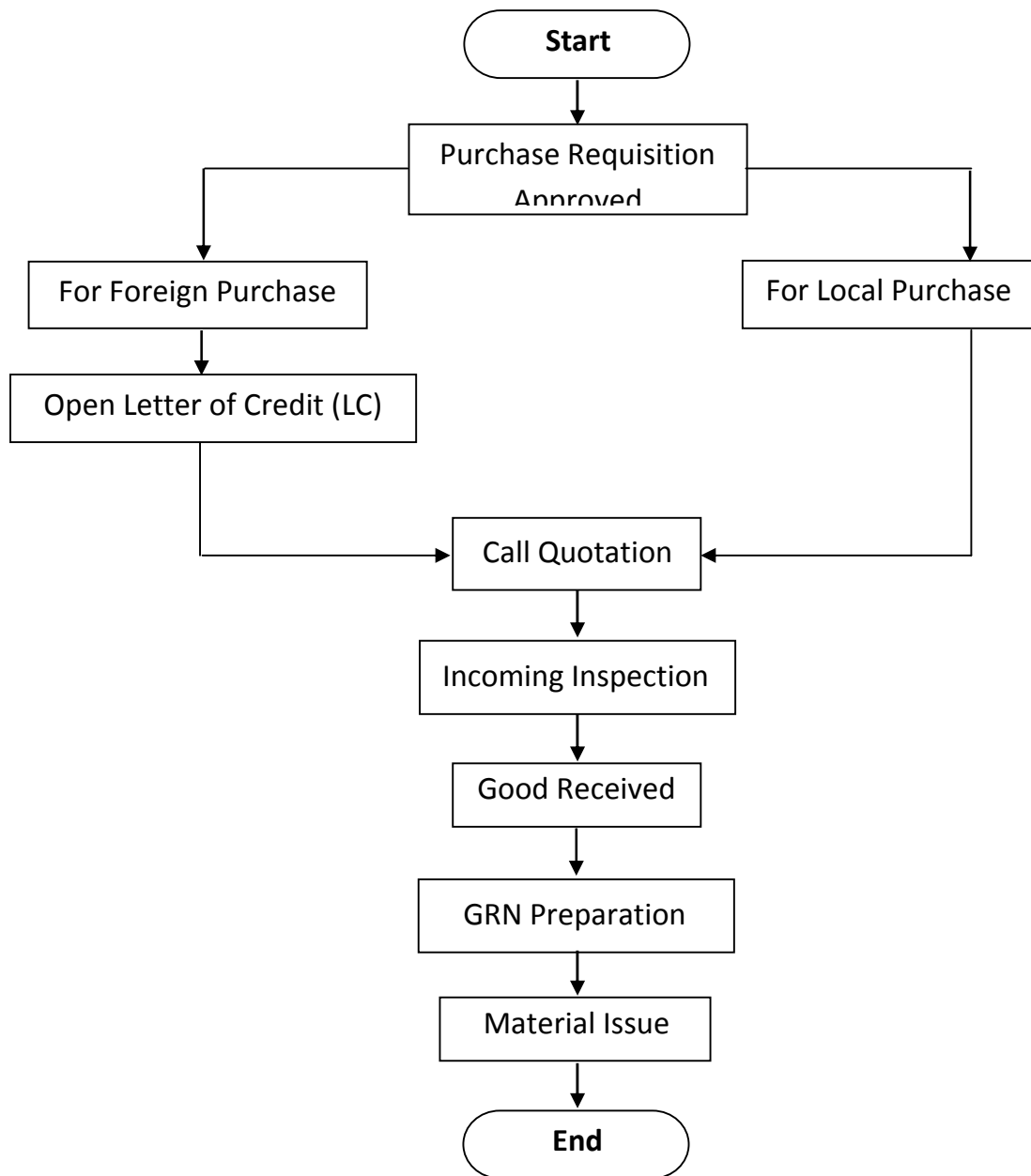
4.1.1 Purchasing Procedure in BNTL:

BNTL is a manufacturing company so; purchasing is the first important function of inventory management. Manufacturing company requires different types of raw materials such as concentrate, crown cock, closure, sugar etc. for the production of different types of soft drinks.

BNTL needs regular supply of different types of raw materials for the continuous production operation.

In purchasing procedure, a purchasing manager does different types of activities, which are important in production. By using specified purchasing procedure required raw materials for the factory are purchased (Figure 4.1).

Figure 4.1
Purchasing Procedure of Essentials in BNTL



Each of the steps in the purchasing procedure also follows the strict systematic sequence, which is described briefly hereunder.

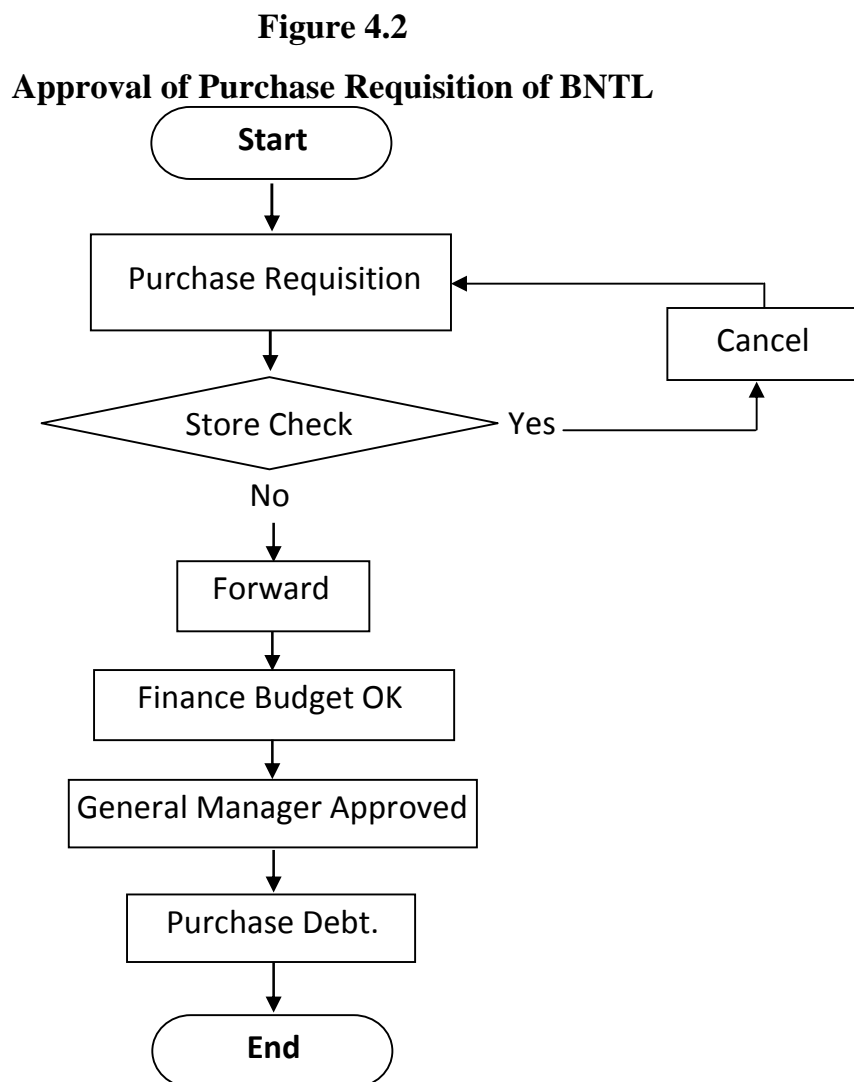
4.1.1.1 Collection of Purchase Requisition:

Purchasing procedure starts immediately with the collection of purchase requisition from the respective department for the supply of essentials.

4.1.1.2 Approval of Purchase Requisition:

When the purchase requisition is received by the purchasing department, then purchasing manager decides what, when and how much to buy.

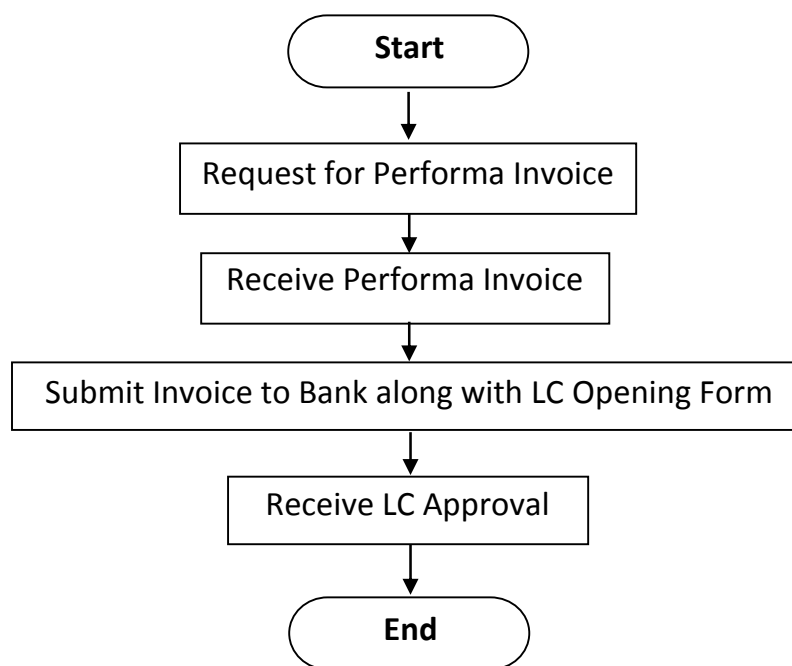
Once the concerned department experiences the deficit of raw materials, it fills the purchase requisition form. Store department checks the availability of that raw material in store. If it is available in sufficient quantity at the store then the process is cancelled at this stage. But if not it will be further proceed to finance department and then to general manager for its approval. Finally purchase department will be prepared for purchase of the goods. Flow of the process is presented in figure 4.2.



4.1.1.3 Opening of Letter of Credit (LC):

It is generally applicable for import of materials from foreign countries. Opening of LC starts with the request for Performa invoice to the bank. After receiving such Performa invoice, it will be submitted to concern bank along with LC opening form. At the end the bank provides LC approval. Figure 4.3 shows the steps of opening LC.

Figure 4.3
Opening of Letter of Credit (LC) of BNTL



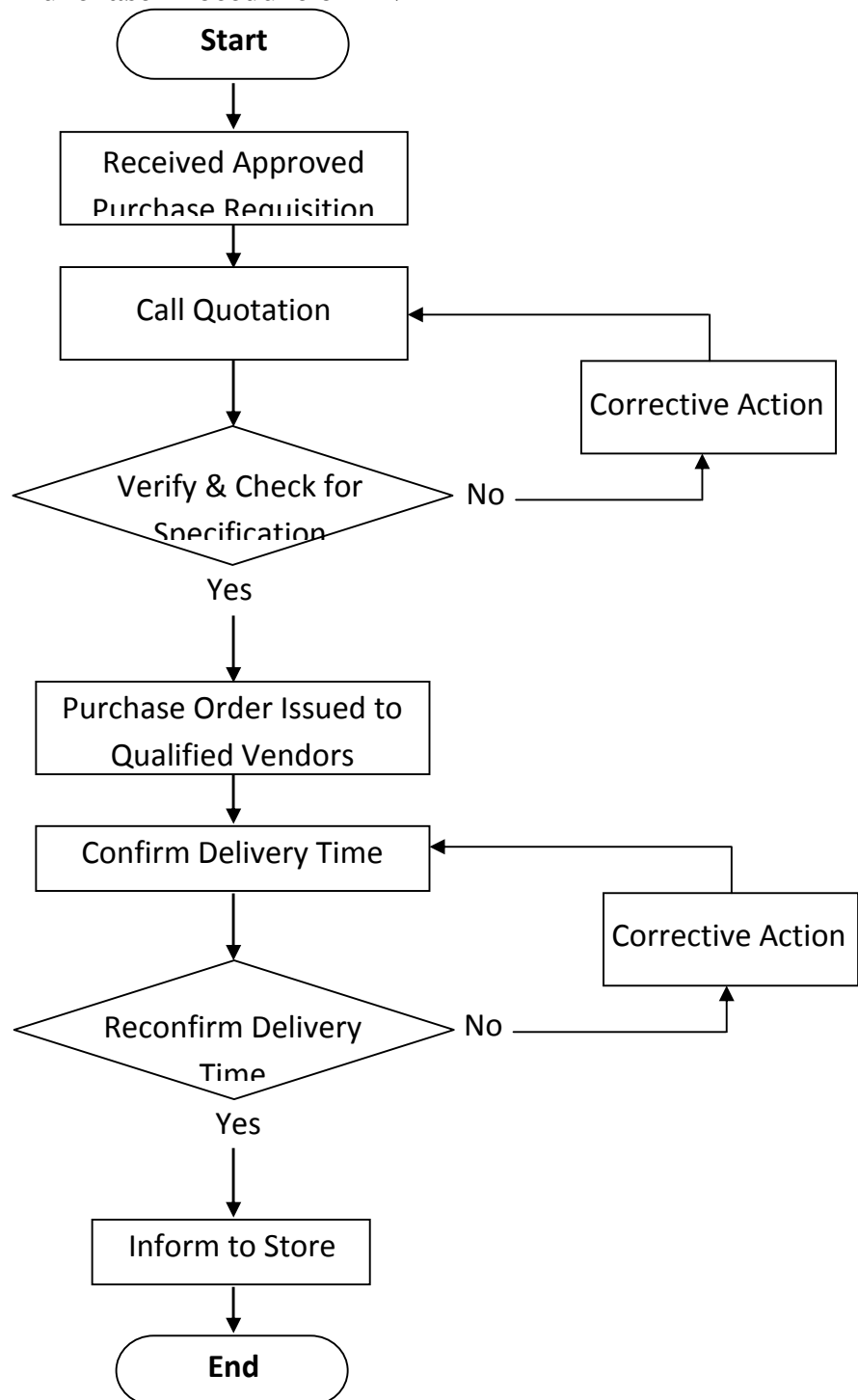
4.1.1.4 Purchase Procedure:

Purchasing is the first important function of inventory management in any manufacturing company. So, BNTL also requires different types of raw materials such as concentrate, crown cock, closure, sugar etc for the production.

BNTL needs regular supply of different types of raw materials and WIP materials for the continuous production operation. Approval of purchase requisition now leads to call for quotation so that the given quality and quantity

of materials could be supplied at the minimum possible cost. If any dissatisfaction arises during verifying and checking for specification of goods quotation will be re-called otherwise purchase order will be issued to qualified suppliers specifying the delivery time and then store will be informed for date and quantity of goods arrival. Figure 4.4 shows the sequential of the purchase procedure.

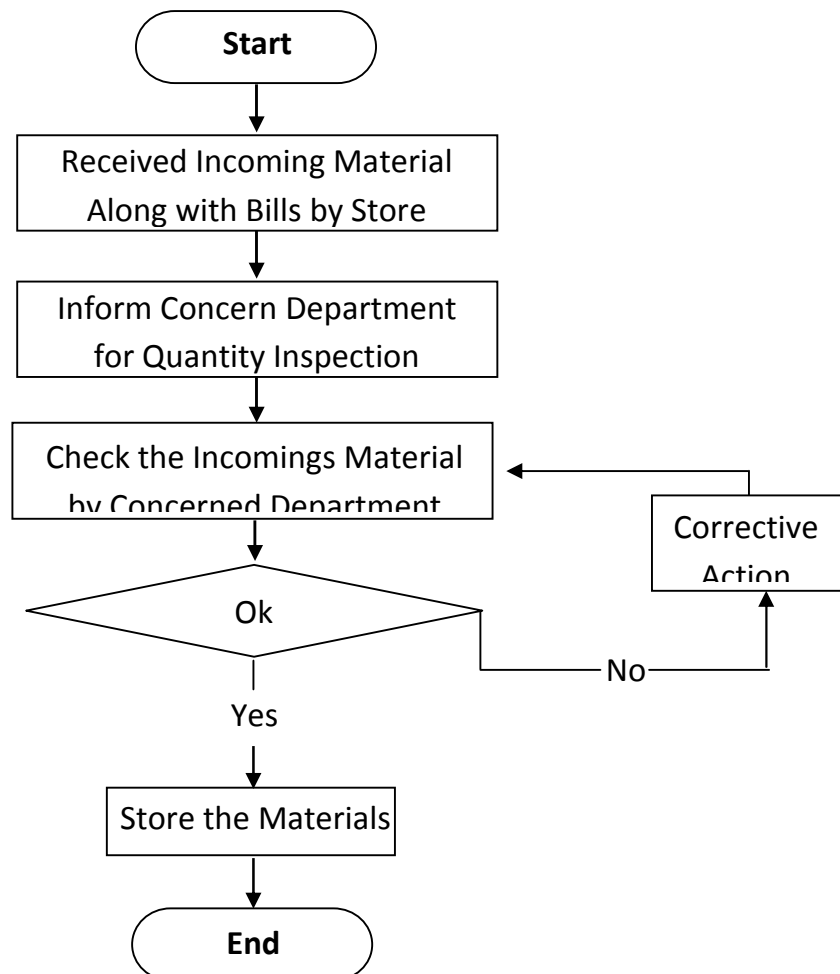
Figure 4.4
Purchase Procedure of BNTL



4.1.1.5 Incoming Inspection:

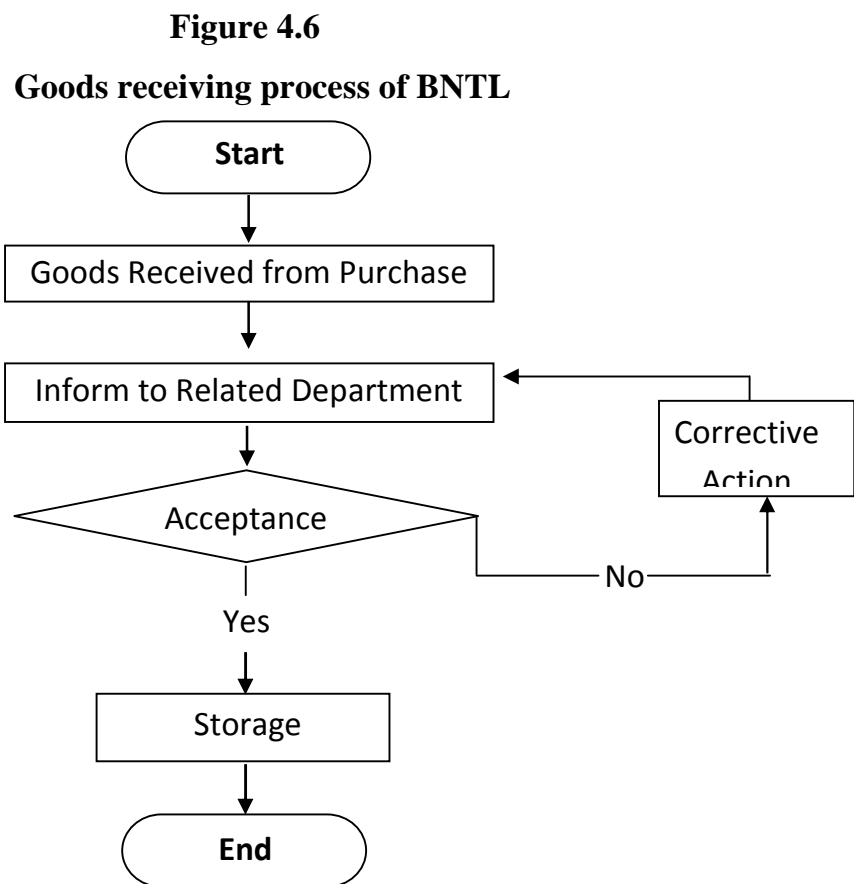
Once the incoming material is received along with the bills by the store, the concerned department has to be informed for quantity inspection. The responsibility of verifying the weight, count or measurement is that of the receiving department, but the responsibility to see whether that goods have been received according to purchase order specifications, is that of the inspection department. Therefore, the concerned department then checks the incoming materials, which must be taken to ensure the correct material of specified quality at correct amount. The flow of action of incoming inspection is presented in figure 4.5.

Figure 4.5
Incoming Inspection of BNTL



4.1.1.6 Goods Receiving Process:

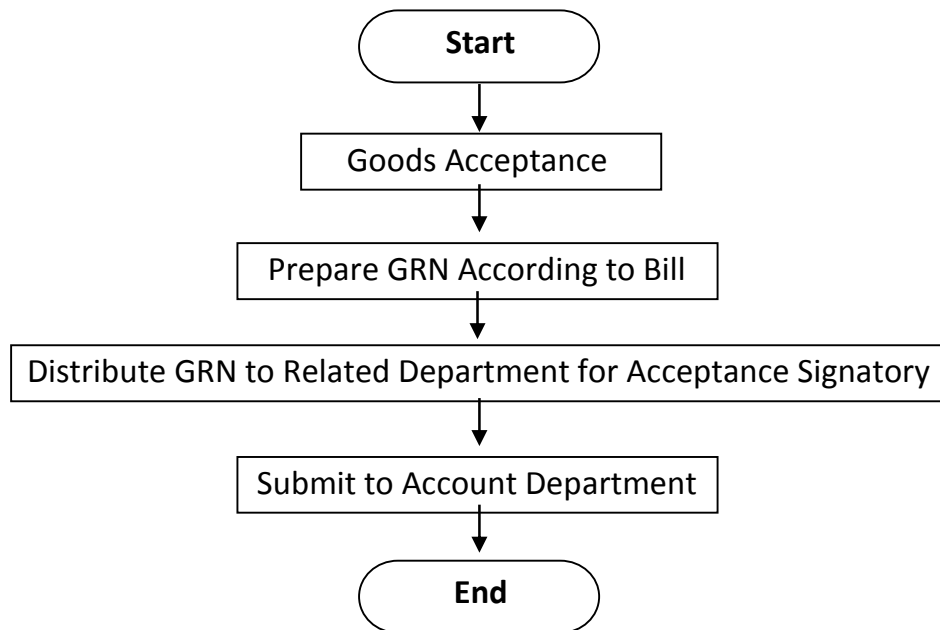
Once the incoming goods are accepted after inspection for its quality and quantity, they are received. After receiving the goods from purchase the related departments have to be informed for its acceptance. Then it finally will go to storage from where the concerned department acquire as per its needs. Figure 4.6 shows the picture of the goods receiving process.



4.1.1.7 GRN Preparation:

GRN should be prepared after the goods are accepted. This GRN will further distribution to related department for acceptance signatory. Then finally it has to be submitted to account department. Process of GRN preparation is presented in Figure 4.7.

Figure 4.7
GRN preparation on BNTL



4.1.2 Store Control Device Practice:

Store keeping function includes the function of keeping the materials in the store and keeping their movements. The cost of materials holding in the store directly affects the total cost associated with holding inventories. To minimize the cost of holding material in the store, all company generally use different types of controlling device. Some of the store control device adopted by BNTL is Bin cards, Store Ledger and ABC analysis. The brief descriptions of these are presented as follows.

4.1.2.1 Bin Cards:

A bin card makes a record of the receipts and issue of materials and is kept for each items of stores carried. The storekeepers maintain these cards and he himself is responsible for any difference between the physical stock and the balance shown in the bin card. These cards are used not only for recording receipts and issues of stores but also assist the storekeeper to control the stock. Bottlers Nepal Terai Limited (BNTL) is using the bin cards in the form of loose

sheets to keep the complete records of the receipts and issues of each item of material in terms of quantity as well as balance quality.

For each item of store, minimum quantity, maximum quantity and ordering quantity are stated on the card. By seeing the bin card the storekeeper can send the material requisition for the purchase of material in time. Sample of bin card of BNTL has been presented in Appendix 2.

4.1.2.2 Store Ledger:

This ledger is kept in the costing department and is identical with the bin card except that receipts issues and balanced are shown along with their money values. This contains an account for every item of stores and makes a record of the receipts, issues and the balances, both in quality and value. Thus, this ledger provides the information for the pricing of materials issued and the money value of any time of each item of stores (Jain & Narang, 1991, p337-339). Appendix 3 presents the outline of store ledger of BNTL.

4.1.2.3 ABC Analysis:

ABC analysis is a widely used classification technique to identify various items of inventory for the purchase of inventory control. This analysis is important that a firm shouldn't exercise the small degree of control on all types of inventory. We have to classify of all types of raw materials on the basis of nature and involve the investment and importance of it. Manufacturing organization finds it useful to divide materials into three categories for the purpose of exercising selective control on materials. ABC analysis measures the cost significance of each item of materials may contribute to a larger percentage of the value of consumption and on the other hand a large percentage of items may represent a smaller percentage of the value items consumed. Between these two extremes will fall those items the percentage is more or less equal to their value of consumption. Thus, items falling in the first

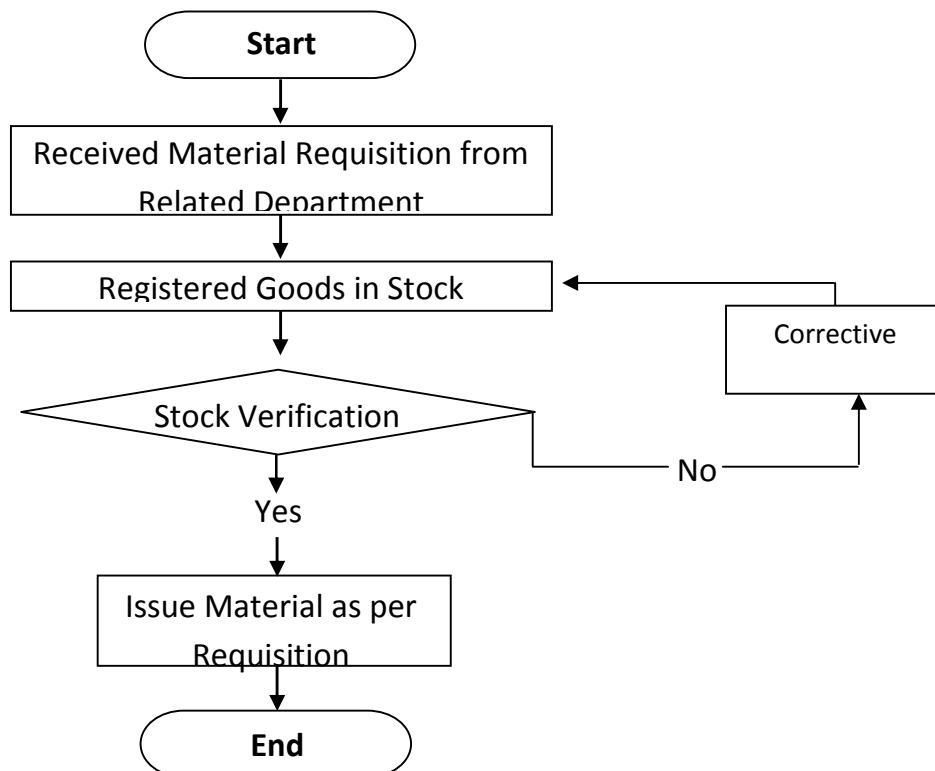
category are treated as 'A' second category as 'B' and third category is taken as 'C'. Such analysis of material is known as ABC analysis.

BNTL has not classified the material in different groups for control purpose. It is seen that company has given equal attention to high value and critical materials as well as less value and non-critical materials. This altitude leads to increase the holding cost of inventory and investment on inventory.

4.1.3 Issuing Material:

After receiving material requisition from the related department store check the registered goods in stock. Then the stock verification will be made. If it goes negatively; corrective action has to be taken. Otherwise, material will be issued to the related department as per requisition. Material issuing process is presented in Figure 4.8.

Figure 4.8
Issuing Material from Store in BNTL



4.2 Inventory Management Analysis:

Under this section different analytical tools of inventory management and other statistical method of analysis are used as that are stated in the previous chapter under methodology.

4.2.1 Annual Requirement and Annual Purchase of Raw Materials:

Table 4.1 shows the annual requirement and annual actual purchase of raw materials made by the company on different years. Here, there is an erratic rise and fall in both annual requirement and annual purchase of raw materials for the given year. The annual requirements of raw materials of whole seven years show that there is high fluctuation. Similarly annual purchase of raw material made by the company has shown at first increasing trend than after we can see decreasing order. The high purchase made in 2004/05 and 2005/06.

Table 4.1

Annual Requirement and Annual Purchase of Raw Material (Rs in Million)

Year	Annual Requirement (AR)	Annual Purchase (AP)	% Change
2004/05	212.11	236.48	-11.48
2005/06	187.07	228.28	-22.03
2006/07	188.05	112.93	39.94
2007/08	199.02	174.55	12.30
2008/09	205.11	180.90	11.80
2009/10	145.02	136.40	6.43
2010/11	208.42	191.63	8.06
Average	192.22	180.17	
Standard Deviation	22.62	44.82	
Coefficient of Variation (CV)	11.77%	24.88%	

Source: Appendix 5

Above table, we compared between annual requirement of raw materials and annual purchase of raw materials, we can see annual requirement of raw material always exceeded than annual purchase of raw material over the period except for the FY 2004/05 and 2005/06. In FY 2004/05 and 2005/06, annual

purchase of raw material exceed annual requirement by 11.48% and 22.03% respectively. After than annual purchase of raw material was always less than annual requirement of raw material. In FY 2006/07, 2007/08, 2008/09, 2009/10 and 2010/11 annual requirements of raw material are exceeded 39.94%, 12.3%, and 11.8% 6.43% and 8.06% respectively.

Mean, standard deviation and coefficient of variation are calculated to analyze the nature of variability of annual requirement and annual purchase. The average annual requirement of BNTL for seven years was 192.22 and other annual purchase was 180.17, which is less compare between requirement and purchase. Standard deviation for annual requirement and annual requirement and annual purchase of raw material was found 22.62 and 44.82 respectively. This signifies that annual requirement is more consistent compared to annual purchase. This conclusion was further supplemented by the value of C.V, which was 0.1177 for annual purchase was 0.2488 for annual requirement. In short we concluded that annual requirement is more reliable than annual purchases. In other word, annual inconsistent purchases are the symbol of poor estimation of annual requirement.

4.2.2 Actual and Economic Order Size:

BNTL has not maintained the economic order size in purchasing the raw materials required for the different periods. The table 4.2 indicates the order size per order as practiced in BNTL and the economics order size for the different periods.

Table 4.2
Actual and Economic Order Size

Year	Actual order Size per order	Number of order	Economic order size per order	Number of order
2004/05	59.12	4	30.30	7
2005/06	57.07	4	34.18	6
2006/07	28.23	4	31.34	6
2007/08	43.64	4	33.17	6
2008/09	45.22	4	29.30	6
2009/10	36.45	4	29.16	5
2010/11	52.11	4	34.74	6
Average	45.38		30.91	
Standard deviation	10.88		2.66	
Coefficient of variation (C.V)	23.98%		8.61%	

Source: Appendix 5

From table 4.2, BNTL purchased the raw materials every three months. So, the numbers of order in a year is four times. But by the economic order size the average number of order per year should be six times. In average the actual order size per order is greater than the economic order size. By the value of standard deviation it can be concluded that the actual order size per order for the different periods is more fluctuated than the economic order size. So, the company should maintain the economic order size as presented in table 4.2. The company doesn't purchase the raw materials based on the economic order quantity but here the EOQ for the different periods are calculated for the comparison.

4.2.3 Inventory Costs:

Generally total inventory costs comprises of the total ordering cost and total carrying cost. The company doesn't purchase the raw materials based on the economic order quantity. Table 4.3 presents the actual and economic inventory costs.

Table 4.3

Actual and Economic Inventory Cost (Rs. in Million)		
Year	Actual inventory cost	Economic inventory cost
2004/05	7.91	6.53
2005/06	7.71	6.12
2006/07	4.82	6.13
2007/08	6.36	6.32
2008/09	6.52	5.93
2009/10	5.41	5.75
2010/11	6.79	6.47
Average	6.50	6.18
Standard Deviation	1.12	0.28
Coefficient of Variation (CV)	17.23%	4.53%

Source: Appendix 5

The economic inventory costs for different periods are calculated and presented in the above table no. 4.3. The table shows the actual inventory costs and economic inventory costs for different periods. The average actual inventory cost per year is higher than the economic inventory costs. The actual inventory cost for different period are calculated based on the actual purchase size of inventory but the economic inventory cost is calculated based on the actual consumption of inventory. The average actual inventory cost is greater than that of the economic inventory cost. Thus, the lot size should be made economic order size to minimize the inventory cost.

4.2.4 Relationship between Actual Sales and Closing Stock:

The table 4.4 shows the relationship between actual sales and closing stock. The table gives the picture of actual sales and closing stock from FY 2004/05 and 2010/11.

Table 4.4 shows that actual sales which was increased over the period but closing stock was not that trend. It was increased for three years than decrease slightly but in FY 2008/09, closing stock was 151.11 than after again decreases. However, change in both variables is not well defined; there is intermittent rise and fall in both variables during the seven years. The table also

depicted that the increased sales resulted into increase in closing stock. This may be due to lower purchase to meet the lower projected demand.

Table 4.4

Relationship between Actual Sales and Closing Stock (Rs in Million)

Year	Actual sales	Closing stock
2004/05	532.95	150.86
2005/06	461.49	177.74
2006/07	465.44	134.40
2007/08	431.94	114.29
2008/09	401.32	151.11
2009/10	354.10	108.42
2010/11	484.99	100.10
Average	447.46	133.85
Standard Deviation	58.20	27.94
Coefficient of Variation (CV)	13.00%	22.87%
Correlation coefficient	0.28	
Probable error	0.23	

Source: Annual Report of BNTL and Appendix 4

Mean, standard deviation and coefficient of variation are calculated to analyze the nature of variability of sales and closing stock. The average actual sale of BNTL for given seven years was Rs 447.46 millions. Deviation of annual sales from average sale calculated as standard deviation was 58.2 and 27.94 for annual sale and closing stock respectively. This signifies that closing stock more consistent compared to actual sales. But C.V indicates that closing stock fluctuates more than the actual sales.

Coefficient of correlation for these two variables was +0.28. Here positive sign indicates the positive relation between actual sales and closing stock. We know that if the value lying between 0.25 to 0.50 prove a low degree of positive correlation. Calculation of probable error and comparing it with correlation coefficient value shows the significance of correlation coefficient value. This analysis shows the significant value of correlation coefficient due to value of correlation coefficient (0.28). Table 4.4 also presents the calculation of mean,

standard deviation, coefficient of variation, coefficient of correlation and probable error of actual sales and closing stock.

4.2.5 Relationship between Actual Purchase and Closing Stock:

In manufacturing organization, purchasing is the procurement of materials, supplies machines, tools and services required for the equipment maintenance and operation of the business. Purchasing must be of right quantity in proper quality for delivery at the correct time at the most favorable price from outside the organization. BNTL has purchased all types of raw materials from other countries. Similarly, closing stock means inventory at the end of the month or year. The following table 4.5 shows the data of purchase and closing stock of BNTL for the entire study period of 2004/05 and 2010/11.

Though the table 4.5 shows the overall increase in actual purchase for the period, there is erratic rise and fall for the given periods. Similar was case for closing stock. It was found that closing stock, determining the purchasing, higher closing stock resulted into decreased actual purchase.

In addition to find out the nature of variability of actual purchase and closing stock of different years, standard deviation and coefficient of variation along with mean was calculated. Together with measure of dispersion, correlation coefficient was also calculated to analyze the relationship between actual purchase and closing stock.

Table 4.5**Relationship between Actual Purchase and Total Closing Stock (Rs in Million)**

Year	Actual purchase	Closing stock
2004/05	589.54	150.86
2005/06	488.37	177.74
2006/07	422.10	134.40
2007/08	455.53	114.29
2008/09	501.03	151.11
2009/10	435.98	108.42
2010/11	546.19	100.10
Average	491.25	133.85
Standard Deviation	60.41	27.94
Coefficient of Variation (CV)	12.30	20.87%
Correlation coefficient	0.19	
Probable error	0.25	

Source: Annual Report of BNTL and Appendix 4

Average actual purchase was Rs 491.25 million with standard deviation of 60.41 signifying the higher deviation of annual purchase from average purchase. Similarly, average closing stock was Rs 133.85 million with standard deviation of 27.94, relatively less deviated compared to actual purchase. Relating to the uniformity or stability actual purchase was found relatively stable compared to closing stock, which is shown by the lower value of coefficient of variation for actual purchase i.e. 12.30% compared to that of closing stock i.e. 20.87%.

In other hand, correlation coefficient was calculated to analyze the relationship between actual purchase and closing stock. The positive value of correlation coefficient between actual purchase and closing stock justifies the positive relationship between these two variables. This means that movement of both

variables in same direction i.e. increase in actual purchase resulted into increase in closing stock and similarly decrease in actual purchase resulted into decrease in closing stock. In addition to this, the value of +0.19 shows the very low degree of positive relationship between these two variables.

Probable error was also measured to ascertain the reliability of the value of Pearson's coefficient of correlation and conclude whether simple correlation coefficient is significant or not. Here $r < P.E.$ shows that coefficient of correlation is not significant. Calculation of mean, standard deviation, coefficient of variation, correlation coefficient and probable error of actual purchase and closing stock has been presented in table 4.5.

4.2.6 Relationship Between Actual Sales and Actual Purchase:

The table 4.6 shows the actual total sales and actual total purchase of BNTL for the study period of 2004/05 to 2010/11.

The table 4.6 indicates that there is overall increase in both actual sales and actual purchase, however the increase was erratic. That means there is continuous rise and fall in both variables during the given periods.

In other to find out the nature of variability, correlation and other statistical measures, calculation of mean, standard deviation, coefficient of variation and coefficient of correlation from the available data were made. The average actual sale of BNTL for the periods of 2004/05 to 2010/11 was Rs 447.46 million and that of purchase was Rs 491.25 millions. Lower coefficient of variation for actual purchase indicates the consistency of actual purchase compared to actual sales.

Table 4.6

Relationship between Actual Total Sales and Actual Total Purchase (Rs in Million)

Year	Actual sales	Actual purchase
2004/05	532.95	589.54
2005/06	461.49	488.37
2006/07	465.44	422.10
2007/08	431.94	455.53
2008/09	401.32	501.03
2009/10	354.10	435.98
2010/11	484.99	546.98
Average	447.46	491.25
Standard Deviation	58.20	60.41
Coefficient of Variation (CV)	13.00%	12.30%
Correlation coefficient	0.68	
Probable error	0.14	

Source: Annual Report of BNTL and Appendix 4

4.2.7 Investment in Inventories in Relation to Total Assets:

The inventory indicates the stock of raw materials. Inventory of raw materials is very important for the manufacturing company like BNTL. The shortage of inventory causes either stoppage of production resulting into failure to meet the demand of consumers. In other hand the excess investment in inventory causes the unnecessary holding of capital. It increases the inventory holding cost. The following table 4.7 shows the proportion of inventory to total assets.

Table 4.7**Inventory to Total Assets of Bottlers Nepal (Terai) Limited (BNTL)**

Year	Ratio (%)	Change
2004/05	24.6	38.48
2005/06	25.8	4.83
2006/07	20.1	-22.09
2007/08	20.0	-0.5
2008/09	21.6	8.00
2009/10	25.9	19.19
2010/11	17.6	-32.05
Average	22.23	
S.D.	3.24	
C.V.	14.57%	

Source: Annual Report of BNTL and Appendix 4

The above table 4.7 shows the percentage of inventory with respect to its total assets in FY 2004/05 to 2010/11. In FY 2004/05 it was 24.6% of total assets and increased by 4.83% and reached to 25.8% for the year 2005/06. Again there was decline in ratio by 22.09% for the year 2006/07 and the ratio was 20.1% for that year. For the successive year 2007/08 and 2008/09 there was slight decrease in the ratio by 0.5% and increase the ratio by 8% reaching 20.0 and 21.6 respectively. Again for the year 2009/10, there was increase in ratio by 19.19% resulting into the ratio of 25.9. In 2010/11, the ratio slightly declines to 17.60. The average inventory ratio for the period was 22.23%. With the standard deviation and C.V are 3.24 and 14.57% respectively.

4.2.8 Inventory Conversion Period:

The inventory conversion period measures the length of time required to convert materials into finished goods and then to sell those goods. It is the amount of time the product remains in inventory in various stages of

production. The table 4.8 shows the inventory conversion period of BNTL for the study period of seven years (2004/05-2010/11).

The table 4.8 shows the inventory conversion period on days. The inventory conversion period of the company in FY 2004/05 is 249 days it was increased to 270 days for the year 2005/06. Again, there is fall in inventory conversion period for the year 2006/07 resulted into the conversion period of 203 days. Similarly, inventory conversion period fluctuates from the FY 2007/08 to 2010/11. The highest conversion days recorded for the entire study period was for the year 2008/09 with 283 days. In FY 2009/10 it was declined to 208 days. In an average conversion period for the study period was 221 days.

Table 4.8
Inventory Conversion Period of BNTL

Year	Inventory	COGS	Days	Inventory
Conversion	(Rs in Millions)	(Rs in Millions)	in year	Period (in days)
2004/05	150.86	217.83	360	249
2005/06	177.74	237.11	360	270
2006/07	134.40	238.59	360	203
2007/08	114.29	207.99	360	198
2008/09	151.11	191.96	360	283
2009/10	108.42	187.72	360	208
2010/11	100.10	259.93	360	139
Average				221.43
S.D.				49.62
C.V.				22.41%

Source: Annual Report of BNTL and Appendix 4

Inventory conversion period found fluctuating from the average over the study periods. The inventory conversion period for a year was obtained by dividing

the total days in a year (i.e. 360) by the inventory conversion period. The average inventory conversion period for the study period is 221.43 days. It means that average length of time required converting materials into finished goods and then to sell those goods required 221 days.

4.2.9 Payable Deferral Period:

The payable deferral period shows the length of time between the purchase of raw material and labour and payment of cash for them. The following table 4.9 shows the payment deferral period during the study period.

Table 4.9
Payable Deferral Period of BNTL

Year	A/P	COGS	Days in	Payable deferral	Payment
made	(Rs in Millions)	(Rs in Millions)	Year	period (in days)	per year
2004/05	132.38	217.83	360	219	1.64
2005/06	162.30	237.11	360	246	1.46
2006/07	117.39	238.59	360	177	2.03
2007/08	106.73	207.99	360	185	1.95
2008/09	150.82	191.96	360	283	1.27
2009/10	109.04	187.72	360	209	1.72
2010/11	162.07	259.93	360	224	1.61
Average				220.43	1.67
S.D.				36.18	0.26
C.V.				16.41%	15.57%

Source: Annual Report of BNTL and Appendix 4

The table 4.9 gives the payable deferral period in days. In FY 2004/05 payable deferral period is 219 days. In FY 2005/06 the period was rise to 246 days, which was decreased to 177 days for the year 2006/07, which was least payable deferral period during the study period. Further the payable deferral period was increased to 185 and 283 days for the year 2007/08 and 2008/09 respectively.

In FY 2008/09, the payable deferral period is 283 days, which is the highest payable deferral period during the study period. It was however decreased for the FY 2009/10 and reached to 209. In FY 2010/11 it was 224 days. From the fluctuated payable deferral period for the study period, it can be said that the company was not adopting the fixed policy to make payment for the labour and raw materials purchase. The average payable deferral period for the study period was 220 days and payment is made 1.67 times in year for purchase and labour.

4.2.10 Inventory Turnover:

Inventory turnover measures the activity or liquidity of firm's inventory. The company should maintain optimum level of inventory for the production and sales activity. A high inventory turnover is indication of good inventory management. A low inventory turnover implies excessive inventory levels than warranted by production and sales activities or slow moving or obsolete inventory.

Table 4.10
Inventory Turnover of BNTL

Year	Ratio (times)	Change (%)
2004/05	1.78	-7.77
2005/06	1.44	-19.1
2006/07	1.53	6.25
2007/08	1.67	9.15
2008/09	1.45	-13.17
2009/10	1.45	00.00
2010/11	2.49	71.72
Average	1.69	
S.D.	0.38	
C.V.	22.49%	

Source: Annual Report of BNTL and Appendix 4

Table 4.10 shows the inventory turnover ratio of BNTL for the study period. In FY 2004/05 the ratio was 1.78 times and decreased to 1.44 times for the FY 2005/06. In FY 2006/07, 2007/08 and 2008/09 the ratio was continuously increasing and reported to be 1.53 1.67 and 1.45 respectively. The ratio was recorded the lowest for the year 2006. In FY 2008/09 and 2009/10 the ratio of both FY is same which was 1.45 times. In 2010/11, the ratio is 2.49 times, which is the highest one for the entire study period. In average, inventory turnover ratio was 1.69 times.

4.2.11 Proportion of Inventory to Current Assets

The company should maintain the adequate level of inventory to meet the demand. The inventory of raw material and finished goods is also major sources of current assets.

Table 4.11
Proportion of Inventory to Current Assets of BNTL

Year	Ratio (%)	Change (%)
2004/05	30.8	32.7
2005/06	31.66	2.79
2006/07	25.91	-18.16
2007/08	25.79	-0.46
2008/09	31.54	22.3
2009/10	48.15	52.66
2010/11	30.46	-36.74
Average	32.04	
S.D.	7.53	
C.V.	23.5%	

Source: Annual Report of BNTL and Appendix 4

The above table 4.11 shows the percentage of inventory with respect to its current assets. In FY 2004/05 it was 30.8 and there after the ratio was increased next year 2005/06 and reached to 31.66%. There was increased in ratio by 2.79%. After that for next two years, we can find remaining constant at around

26%, which was 25.91 and 25.79; in FY 2008/09 and 2009/10 with the ratio of 31.54% and 48.15% respectively. In the year 2009/10 the ratio was reached at 48.15%, which was highest ratio for the study period. In FY 2010/11 it was 30.46%. In overall the average ratio was 32.04 for the given duration the highest 48.15% in the year 2009/10 and the lowest 25.79% in the year 2007/08. In average 32.04% of total current assets is covered by the inventories but ratio is slightly fluctuating over the periods.

4.2.12 Trend Analysis:

Trend analysis was made in order to analyze the growth rate of various aspects related to inventory management. This was basically done with the help of the past data and used to forecast the future. Different aspects of inventory management for which trend analysis were made are presented as follows.

4.2.12.1 Trend Analysis of Purchase:

Purchase is the process of acquiring something necessary to run the firm. Purchase includes the acquisition of essential inputs as well as other stationeries and goods for the efficient functioning of management. This also includes the acquisition of spares and parts of plants.

Table 4.12

Trend Analysis of Purchase

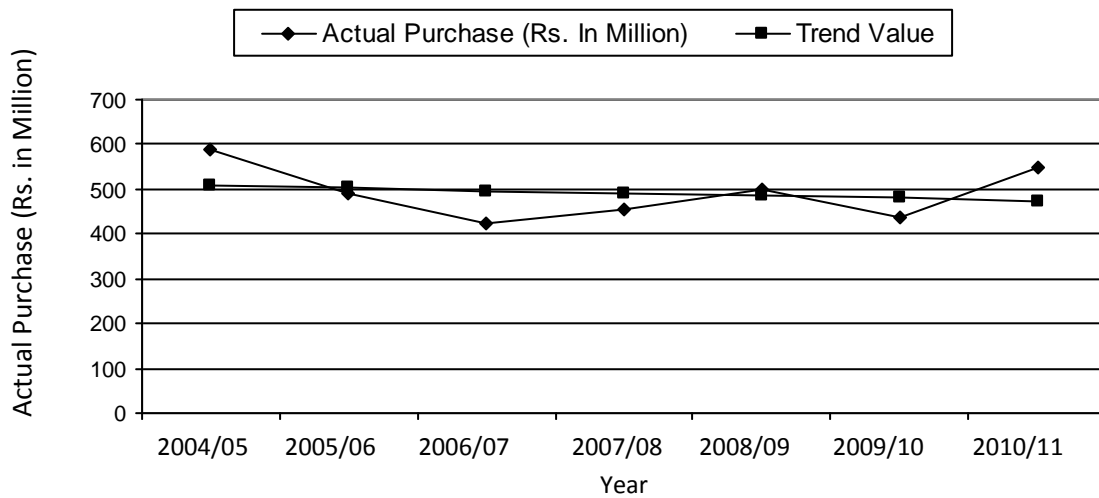
Fiscal Year (X)	Actual Purchase (Rs in Million)	Trend value
2004/05	589.54	507.71
2005/06	488.37	502.14
2006/07	422.10	496.57
2007/08	455.53	491.25
2008/09	501.03	485.43
2009/10	435.98	479.86
2010/11	546.19	474.29

Source: Annual Report of BNTL and Appendix 4

Above table, we can see the actual purchase is fluctuating order. The value was taken the FY 2004/05 to 2010/11.

Figure 4.9

Trend Analysis of Actual Purchase



Source: Table 4.12

Trend values for the study period show the steady decrease of actual purchase throughout the study period. But the actual value of purchase was deviated from the trend value. The huge gap between the trend and actual value was recorded in year 2004/05, 2006/07, 2007/08 and 2010/11. Interestingly trend value and actual values were closer for each alternative year of 2005/06 and 2008/09. Trend analysis of purchase is presented in table 4.12 and figure 4.9.

4.2.12.2 Trend Analysis of Sales:

Ultimate goal of any manufacturing industry is to produce the product and make it available in market for sale. Thus, sales are always associated with the manufacturing industries, which ensure the inflow of money to industry.

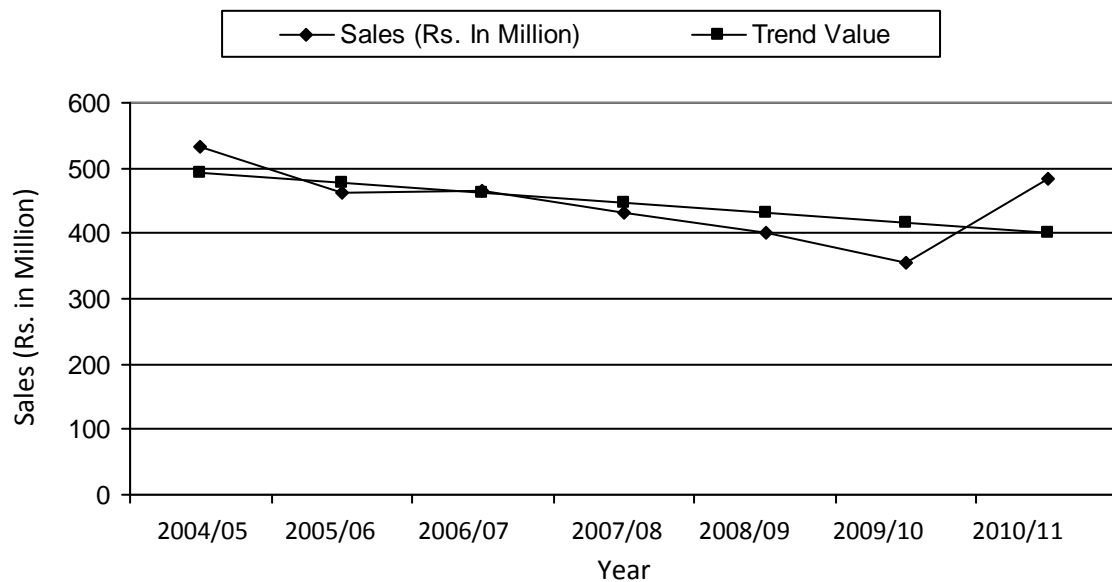
Table 4.13
Trend Analysis of Sales

Fiscal Year (X)	Sales (Rs in Million)	Trend value
2004/05	532.94	492.76
2005/06	461.49	477.66
2006/07	465.44	462.56
2007/08	431.94	447.46
2008/09	401.32	432.36
2009/10	354.10	417.26
2010/11	484.99	402.16

Source: Annual reports of BNTL and Appendix 4

The trend shows the decreasing trend of sales. In FY 2004/05, 2006/07 and 2010/11 the actual value is above the trend value. In FY 2005/06, 2007/08, 2008/09 and 2009/10 the actual value is lower than the trend value.

Figure 4.10
Trend Analysis of Sales



Source: Table 4.13

4.2.12.3 Trend Analysis of Purchase of Raw Materials:

Raw material is the fundamental and basic requirement for any processing industry to run it smoothly. Even though the seven years data shown the declining trend in purchase of raw material, rise and fall in purchase was observed for given period.

Table 4.14

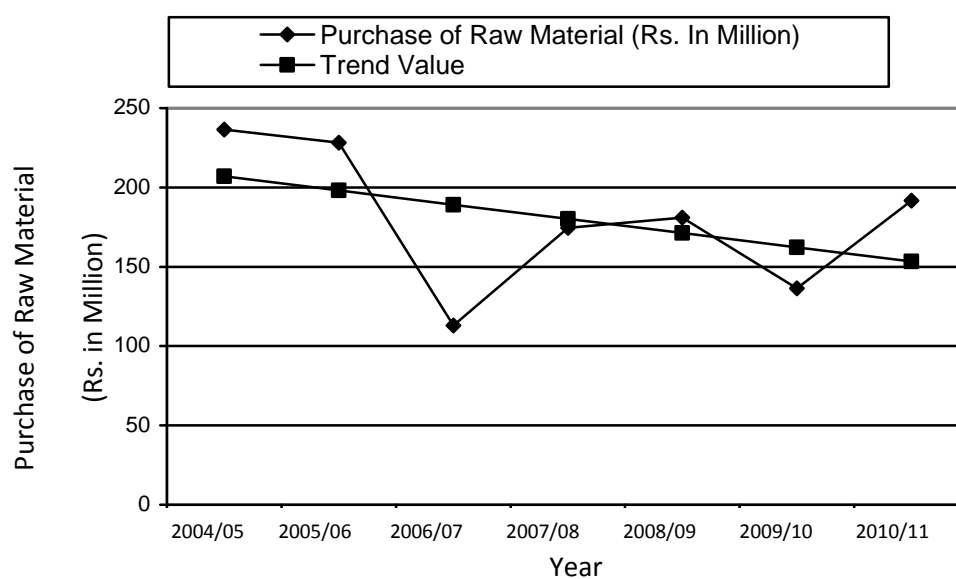
Trend Analysis of Raw Materials Purchase

Fiscal Year (X)	Purchase of raw material (Rs in Million)	Trend value
2004/05	236.48	206.99
2005/06	228.48	198.05
2006/07	112.93	189.11
2007/08	174.55	180.17
2008/09	180.90	171.23
2009/10	136.40	162.29
2010/11	191.63	153.35

Source: Annual reports of BNTL and Appendix 4

Figure 4.11

Trend Analysis of Raw Material Purchase



Source: Table 4.14

The trend value shows in decreasing order. In the beginning of two years the trend value is below the actual purchase then after next two years actual purchase was below than trend value, which is 2006/07 and 2007/08. Then the actual purchase is above the trend value in three years. In overall we can compare between trend value and actual purchase, there was high fluctuation between them. The whole picture can be seen from table 4.14 and figure 4.11.

4.2.12.4 Trend Analysis of Inventory:

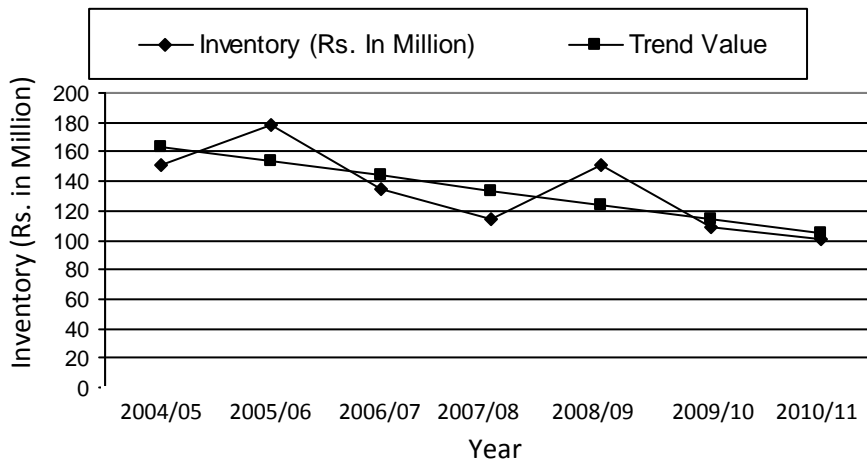
Inventory is all the possession of industry. Inventory constitutes the important part of current assets. Thus, the shortage of required inventory may result into irregular production, high manufacturing cost and unfavorable labour variation. Therefore, the inventory must be at optimum level.

Table 4.15
Trend Analysis of Inventory

Fiscal Year (X)	Inventory (Rs in Million)	Trend value
2004/05	150.85	163.22
2005/06	177.73	153.43
2006/07	134.40	143.64
2007/08	114.29	133.85
2008/09	151.11	124.06
2009/10	108.42	114.27
2010/11	100.10	104.48

Source: Annual Reports of BNTL

Figure 4.12
Trend Analysis of Inventory



Source: Table 4.15

Inventory of BNTL has been increased from 150.86 million during 2004/05 to 151.11 millions during 2008/09 signifying the increasing trend. In the other hand Trend value shows decreasing order. However, actual data shows fluctuation during the entire study period. The table 4.15 and figure 4.12 shows the trend value and actual value of inventory for the study period.

4.2.12.5 Trend Analysis of Raw Material:

Raw materials in this case signifies the stock of raw materials in go down to meet the unforeseen future demand, so that the industry never faces the raw material shortage in the period of adverse natural and man made circumstances.

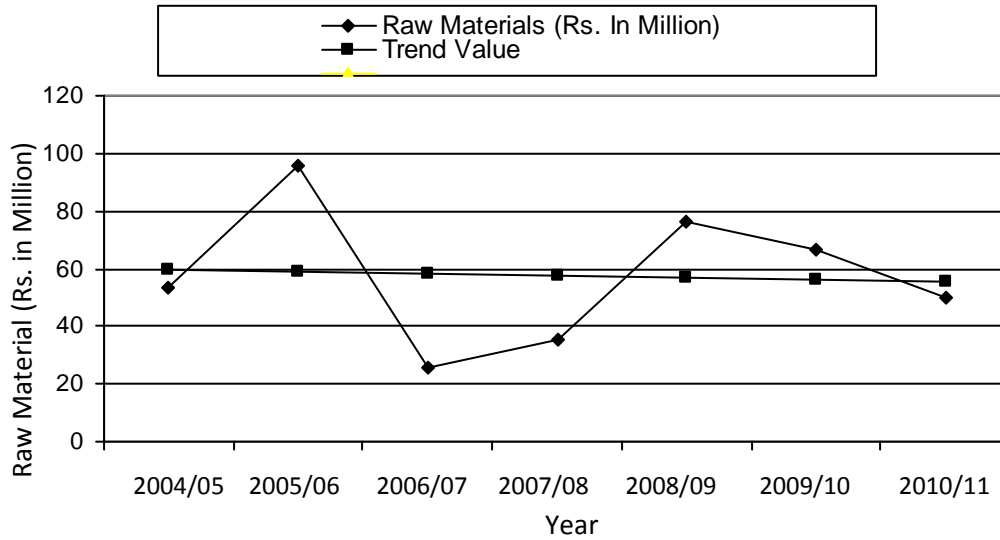
Table 4.16
Trend Analysis of Raw Materials

Fiscal Year (X)	Raw Materials (Rs in Million)	Trend Value
2004/05	53.27	59.55
2005/06	96.00	58.93
2006/07	25.95	58.31
2007/08	35.27	57.69
2008/09	76.28	57.07
2009/10	66.91	56.45
2010/11	50.13	55.83

Source: Annual reports of BNTL

Figure 4.13

Trend Analysis of Raw Materials



Source: Table 4.16

The trend line shows the decreasing trend in raw materials. The actual raw material is below the trend value in 2004/05, 2007/08 and 2010/11. Again the trend values are below than that of raw material in FY 2005/06, 2008/09 and 2009/10.

4.2.12.6 Trend Analysis of Work-in-Process:

Work-in-process simply constitutes the product at various stages of processing before the finished goods. It serves as indicator for need of capital for company.

Table 4.17

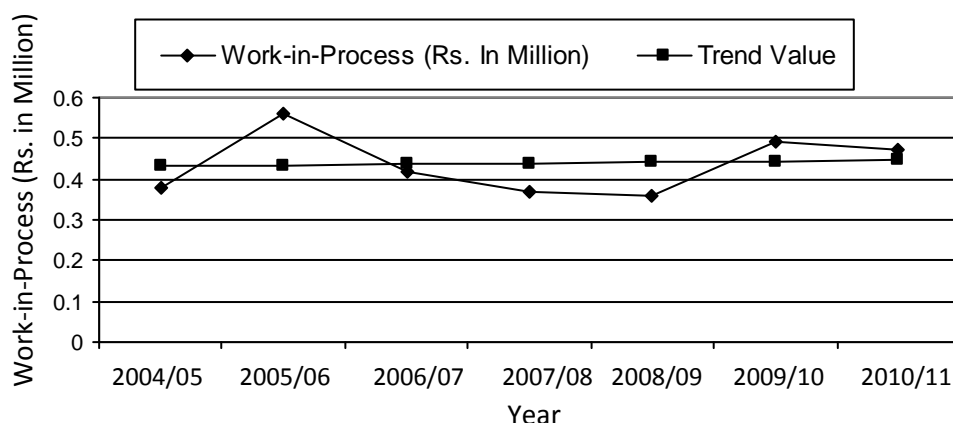
Trend Analysis of Work-in-Process

Fiscal Year (X)	Work-in-process (Rs in Million)	Trend Value
2004/05	0.38	0.433
2005/06	0.56	0.435
2006/07	0.42	0.438
2007/08	0.37	0.440
2008/09	0.36	0.443
2009/10	0.49	0.445
2010/11	0.47	0.448

Source: Annual reports of BNTL

Figure 4.14

Trend Analysis of Work-in-Process



Source: Table 4.17

There is significant stable in work-in-process for the given period 2004/05 to 2010/11. However, fluctuation was observed during the period. At first, it was highly increased and reached in peak which is the highest recorded for the given period for the FY 2005/06. Again it was sharply decreased for the period 2006/07. Then it was remain constant at decreasing order to year 2008/09. In the FY 2010/11 it was increased. For the future, trend of work-in-process is in slightly decreasing order. Table 4.17 and figure 4.14 give the picture of actual work-in-process and its trend value.

4.2.12.7 Trend Analysis of Finished Goods:

Table 4.18

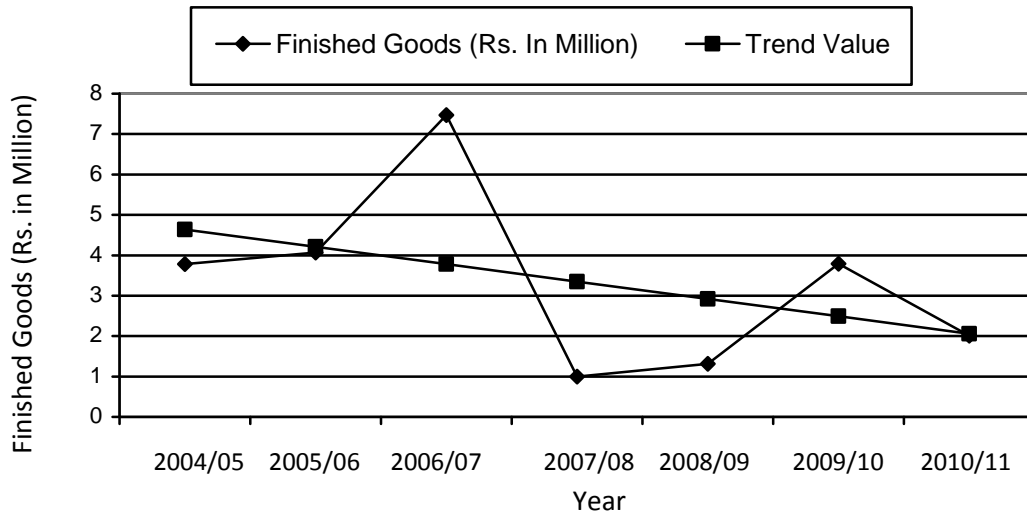
Trend Analysis of Finished Goods

Fiscal Year (X)	Finished Goods (Rs in Million)	Trend Value
2004/05	3.78	4.639
2005/06	4.07	4.209
2006/07	7.47	3.780
2007/08	1.00	3.350
2008/09	1.31	2.920
2009/10	3.79	2.491
2010/11	2.01	2.061

Source: Annual reports of BNTL and Appendix 4

Figure 4.15

Trend Analysis of Finished Goods



Source: Table 4.18

Finished goods were highly fluctuations in the given period. At the beginning, it was sharply increased and reached at peak point in 2006/07 after than it was dramatically decreased to the FY 2007/08. It was minimum level for the period 2004/05 to 2010/11. In overall finished goods were always in increasing order except in FY 2007/08 and 2010/11. It was highly decreased. Table 4.18 and figure 4.15 show the condition.

4.2.12.8 Trend Analysis of Cost of Goods Sold (COGS):

Table 4.19

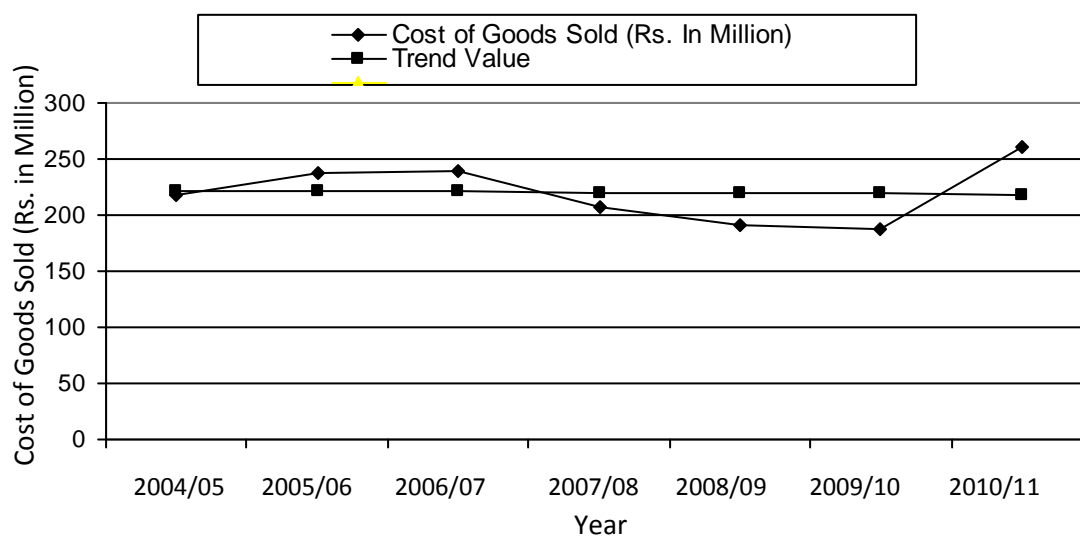
Trend Analysis of Cost of Goods Sold (COGS)

Fiscal Year (X)	COGS (Rs in Million)	Trend Value
2004/05	217.83	222.207
2005/06	237.11	221.525
2006/07	238.59	220.843
2007/08	207.99	220.160
2008/09	191.96	219.478
2009/10	187.72	218.795
2010/11	259.93	218.113

Source: Annual Reports of BNTL and Appendix 4

Figure 4.16

Trend Analysis of Cost of Goods Sold (COGS)



Source: Table 4.19

Cost of goods sold for the study period was found decreasing 217.83 million in 2004/05 to 187.72 million in 2009/10. There was continuous increase COGS from the year 2004/05 to 2006/07 after then there was decreasing from the FY 2006/07 to 2009/10 after that it was increased to 259.72 million in 2010/11. But trend values show the slight decreasing trend of COGS.

4.2.12.9 Trend Analysis of Net Profit:

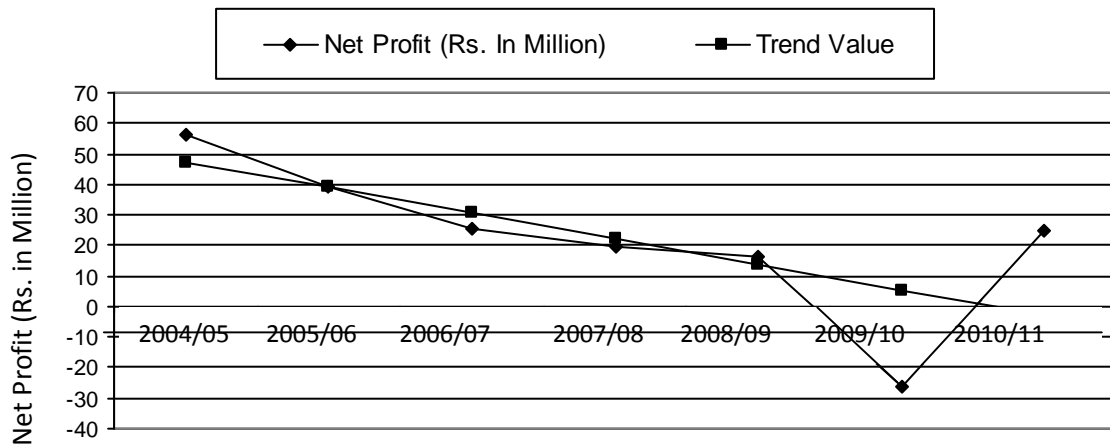
Table 4.20

Trend Analysis of Net Profit

Fiscal Year (X)	Net profit (Rs in Million)	Trend Value
2004/05	56.26	47.25
2005/06	39.14	38.90
2006/07	25.36	30.55
2007/08	19.55	22.20
2008/09	16.28	13.85
2009/10	(26.02)	5.50
2010/11	24.80	(2.85)

Source: Annual Reports of BNTL

Figure 4.17
Trend Analysis of Net Profit



Source: Table 4.20

Net profit was found declined from 56.26 Rupees during 2004/05 to its lowest level of (26.02) millions rupees for the year 2009/10. Trend values have also shown the continuously decreasing trend of net profit for the study period. Both trend values and net profit line were in negative values. The values of net profit, which was sharply, decrease from the FY 2008/09 to 2009/10. In 2009/10 the net profit is (26.02) millions, which was highest negative value. The trend value was also in negative value. In 2010/11 the net profit increased and reached to 24.08 millions but the trend value shows negative profit. Opening values are the highest recorded net profit for the year 2004/05, which is shown in figure and table.

4.3 Major Findings of the Study:

Inventory management planning and control are highly complicated task since it affects the profitability of manufacturing industries. On the basis of the data presentation and their financial and statistical analysis of BNTL, the major findings related to this study have been presented below.

- 1) Required raw materials for the production of different types of soft drinks are imported from the foreign countries like Iran, Pakistan, Indonesia, Germany and India.

- 2) Letter of credit is used to import raw materials from foreign countries.
- 3) In purchase procedure; purchase manager should maintain all the necessary records keeping in mind the most important objectives of the purchase department i.e. purchasing right quality and quantity of material at the reasonable rate at proper time to help smooth running of the production function.
- 4) Goods receiving process is a document on the basis of which purchases are verified and payment is made to the suppliers. It is also helpful in filling any claim for short supplies. It provides a complete record of all materials received.
- 5) Store Control Device Practice: In BNTL, the store control device is adopted in Bin card and store ledger. The company has not applied ABC analysis techniques to control various types of inventory in the stores.
 - Bin cards: In context of BNTL with its help the storekeeper can send material requisition for the purchase of material in time
 - Store ledger: The store ledger is systematically maintained by BNTL. This ledger provides the information for the pricing of material issued and the money value at any time for each item maintained in store.
- 6) Issuing Material: Material once received by the store is issued by the concerned department as per the quantity demanded in the requisition from previously provided to the store department
- 7) Demand and sales of company are very fluctuating. The main reason for such fluctuating is season. The season is main reason that types of demand fluctuation.
- 8) In average there is more or less balance between the annual requirement and purchase. By coefficient of variation, the annual purchase is inconsistent i.e. annual purchase is more inconsistent than the annual requirement. This is the symbol of poor estimation of annual requirement.
- 9) There is not cost classification system so there is difficulty to determine the ordering and carrying cost.

- 10) The company was not following scientific inventory management techniques i.e. economic order quantity model for purchasing different types of raw materials.
- 11) In average the actual order size per order is greater than the economic order size. Standard deviation and coefficient of variation indicate that the actual order size per order for the different periods is more fluctuating than the economic order size.
- 12) The average actual inventory cost is higher than that of the economic inventory costs. Thus, the company should make economic order size to minimize the inventory cost.
- 13) The higher value of standard deviation for actual sales indicates its inconsistent nature compared to closing stock. However, value of C.V. indicates that closing stock fluctuates more than actual sales. The value of correlation coefficient $+0.28$ means the positive relationship between these two variables i.e. increase in closing stock result into increase in actual sale and vice versa.
- 14) The system of inventory management of the company is scientific. So it fulfils its demand in whole year.
- 15) Sales of the company are very fluctuating but net profit of the company is decreasing and reaches in negative.
- 16) Higher value of standard deviation for actual purchase compared to closing stock indicates that actual purchase fluctuates more than the closing stock. However value of C.V. indicates that actual purchase is relatively stable compared to closing stocks. The value of Correlation Coefficient ($+0.19$) means the positive relationship between these two variables. This means the movement of both variables is almost in the same direction.
- 17) In an average actual purchase is slightly greater than the actual sales. Value of both S.D. and C.V. signifies the consistent nature of actual sales compared to actual purchase.

- 18) Investment in inventories in relation to total assets: Investment in inventories in relation to total assets was only 22.23% in the case of BNTL for the study period. From this, it can be concluded that in an average, there is lower value of inventory in relation to total assets therefore; the BNTL does not maintain the adequate level of inventory to fulfill the demand. Inventory conversion period. In BNTL, the average length of time requires converting material into finished goods and then to sell these goods required 221 days.
- 19) Payable deferral period: In BNTL average payable deferral periods for the study period was 220 days and payment is made 1.67 times in a year for purchase and labour.
- 20) Inventory turnover: Inventory turnover ratio is an indicator of the efficiency of management. The inventory turnover for the study period was fluctuating with the average of 1.69. The highest ratio signifying the most efficient inventory management was recorded in 2010/11 and the lowest signifying the worst inventory management situation was recorded in 2005/06 within the study period.
- 21) Proportion of inventory to current assets: In an average 32.04 percent of total current assets is covered by the inventory. But the ratios are slightly fluctuating over the study period.
- 22) Trend Analysis:

Table 4.21
Findings of Trend Analysis

Variable	Slope of Trend line	Nature of Actual Line
Purchase	Slightly downward slope	Fluctuating (Most of time below trend line)
Sales	Slightly downward slope	Fluctuating (Most of time above trend line)
Purchase of Raw Material	Moderately downward slope	Fluctuating (Most of time above trend line)
Inventory	Slightly downward slope	Fluctuating (Most of time below trend line)
Raw Material	Slightly downward slope	Fluctuating
Work-in-Process	Slightly upward slope	Fluctuating
Finished Goods	Highly downward slope	Highly Fluctuating
Cost of Goods Sold (COGS)	Slightly downward slope	Slightly Fluctuating (like equal)
Net Profit	Highly downward slope	Fluctuating (down trend line)

Source: Figure 4.9 to Figure 4.17

The major findings of the trend analysis indicate that there are all variables in downward sloping trend however raw material is in upward trend.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

Inventory management is one of the most important functions in any organization. Without effective and efficient inventory management, no one organization can achieve its goal. Success of any enterprises basically depends on the efficiency and effectiveness of systematic management. Inventory management is the most important part for manufacturing company. The company has invested the most of amount for inventory, where the functions are associated as purchasing, storing, selling, distribution etc.

The details about inventory management and introduction of the study have been already presented in the first chapter. The second chapter describes about framework and review of literature. Similarly the research methodology of the study is described in the third chapter. All the available data related to inventory decision sorted out by issues of inventory management of Bottlers Nepal (Terai) Limited are presented, analyzed and the major findings of the study has been also presented in the chapter four.

Summary of the study and recommendation on the basis of the main findings are studied in this concluding chapter which is derived from the analysis of financial statement of BNTL and conclusion is presented.

5.1 Summary:

Inventory management is the most important part for manufacturing company. A firm cannot achieve its goal unless inventories are controlled effectively and capital is allocated efficiently. Inventory functions are associated with production, marketing, finance and administration etc. Inventory constitutes the most significant part of current assets. It should therefore be managed efficiently to avoid unnecessary investment. Bottlers Nepal (Terai) Limited is the leading multinational company among the manufacturing and processing

company, which was established in 1987, BNTL supplies the quality product at right time at reasonable price. To earn profit, it is necessary to run the company efficiently, economically as well as profitability. To ensure this situation in BNTL, the efficient management of inventory takes vital role. So, this study is concerned with in what extent the company is applying the inventory management techniques to minimize the cost of inventory, which directly affect the price of product.

The basic problem area of this study is to examine the inventory management system practiced by the company, which is unscientific. The carrying cost, ordering costs, order size, safety stock maintained are unsatisfactory and unscientific. It is not paying much attention to the lead-time. Therefore all these functions lead to increase total cost of the company.

Most of manufacturing and trading company invests a huge amount of money in the form of inventory. BNTL is also being the manufacturing company, which invests huge amount of capital in form of inventory and cost of carrying inventory, is higher out of total inventory cost. The cost of inventory directly affects the cost of production and profitability of company. It means slight reduction in cost of inventory, decreases the production cost and ultimately increases the profitability at remarkable rate. For this, the efficient management of inventory is desirable.

This study is based on the inventory management of BNTL. It is done with a view to solve the problem arises on achieving the objectives of the BNTL. Here, the main objectives of the study are to analyze the inventory practices and to analyze the inventory management system followed by BNTL. To make this study, the related literatures have been reviewed. Review of literature gives the concept of inventory management and frameworks from various books, journals and articles.

The basic objectives of the study are to examine the management of inventory in BNTL. To fulfill the objectives as described, appropriate research methodology has been developed. It consists the research design, population and sample, nature and source of data, data gathering procedures, data period covered and method of analysis. In order to carry out the study, data have been basically collected from secondary sources such as annual reports, official report and financial statement provided by BNTL. The primary data is also collected from with direct interviews with concerned staffs of the company to find out the problem of company and then the collected data are tabulated and presented as the stated methodology. Then the analysis has been made using the descriptive analysis of inventory management and others analytical tools. This study covers only seven years of financial data i.e. from 2004 to 2010. It also used the various inventory tools and statistical tools to analyze the available data.

Descriptive analysis consists of the purchasing procedure practice in BNTL, store control device practice and issuing materials. In case of inventory management, analysis is done by the analysis of AR and AP. The company has poor estimation of AR. So the company should make the purchase budget. The company does not purchases the raw material based on the economic order quantity. So if the company wants to minimize the inventory cost, the company should use EOQ model.

The relationship between sales and closing stock, purchase and closing stock and sales and purchase has positive relationship. The average value of inventory in relation to total assets is very lower; therefore, the BNTL does not maintain the adequate level of inventory to fulfill the demand. The average inventory conversion period is 221 days and the company has not fixed policy. In average inventory turnover ratio is very low. It indicates that the company has maintained the higher level of inventory. In an average inventory to current assets ratio is 32.04 in the study period the ratio is slightly fluctuating.

To find out the future trend, the trend analysis of purchase, sales, purchase of raw materials, inventory, raw materials, work-in-process, finished goods, cost of goods sold and net profit have been done. The trend analysis shows that except for the work in progress, all other variable shows the downward slope.

5.2 Conclusion:

The study stresses the need for a good inventory system to maintain a suitable level of inventory so as to be able to fulfill the company's requirement on time. The growing number of corporations in Nepal is facing problems of inventory. Due to lack of proper inventory policies, there are many corporations where large amount of capital has been blocked up and very little measures have been taken to manage the inventories on the basis of inventory decision models and techniques that have so far developed. The main objectives of this study are to analyze the inventory management practices of BNTL and problem faced by BNTL in the management of inventory. For the purpose of this study, the data and the necessary information were collected from the records and annual reports provided by the company.

BNTL has applied only bin cards and store ledger as the inventory control techniques, but not applied the ABC analysis. The company does not classify the inventory cost into carrying cost and ordering cost. The company does not follow the economic purchase order the total cost of carrying and ordering the inventory is higher. By the analysis, actual inventory cost is greater than the economic order size of inventory cost. The average inventory conversion period BNTL is 221 days but the payable deferral period is 220 days. The average inventory turnover ratio is 1.69, which indicates that BNTL has maintained higher level of inventory as compared to the total cost of goods sold. The average trend except WIP, the variables are decreasing. So it can be said that the company can't get success for the better performance.

By the overall analysis, it can be concluded that BNTL should maintain the economic order size, which helps to minimize the inventory cost and to increase the profit of the company.

5.3 Recommendation:

The study stresses the need of a good inventory management system to the better performance of the company. So, analyzing the available data, some findings were extracted. Based on the major findings it may be appropriate to make some suggestions and recommendation for proper management of inventory in BNTL. Some of the recommendations based on the major finding are as follows:

- Coordination among Different Departments: Purchase plan should be prepared for different types of raw materials with the proper co-operation and co-ordination among the planning, purchasing, storing production, marketing and sales department to avoid the excess investment on inventory.
- Minimize the Inventory Cost: The popular scientific inventory management techniques should be applied by the company for purchasing different types of raw materials so as to maintain optimum level of inventory and to minimize the total inventory cost i.e. carrying cost and holding cost.
- ABC Analysis: The Company should apply the selective inventory model (ABC analysis) to control the inventories in the store. ABC analysis divides the inventory into three groups i.e. A, B and C according to their usage value which helps to apply proper degree of control for different groups of inventory and minimize the investment on inventory and cost of storage.
- Optimal Order Size: In BNTL average actual order size surpasses the average economic order size consequence of which is the greater average actual inventory cost compared to average economic inventory cost thereby reducing the efficiency of the company, therefore effective

steps must be taken to minimize this gap so that the company should run in most efficient way.

- Adequate Investment in Inventories: Lower investment on inventories in relation to total assets may create immediate crisis in the side of production in short duration and unfavorable circumstances. Therefore, it is necessary to maintain the adequate level of investment on inventories.
- Purchase Budget: The Company should make purchase budget because the entire departments need to fulfill their needs as per the budget allocated. This should be made on the basis of past experience.
- To Increase the Profit: In context of BNTL, to increase the profit of the company, the company should minimize the operating cost and inventory holding cost with the use of optimal EOQ, which is higher in the case of the company.
- Inventory Conversion Period: In the context of BNTL, there is no fixed policy of inventory conversion period so the company should make plan to maintain the fixed inventory conversion period.
- Inventory Turnover Ratio: The average inventory turnover ratio is 1.69 times. It seems that the company maintained higher level of inventory as compared to the total cost of goods sold, so the company has to maintain the adequate level of inventory to meet the demand. So the company should make the optimum inventory management policy, the higher inventory level makes the higher costs of inventory, so it is necessary to make the optimum inventory management plan.
- Effective Management: It is essential to give regular training on inventory management. For the changing environment, the training and seminars play a vital role to develop the employees' efficiency. Consequently, managerial forecasting ability of the concerned staffs will be enhanced.

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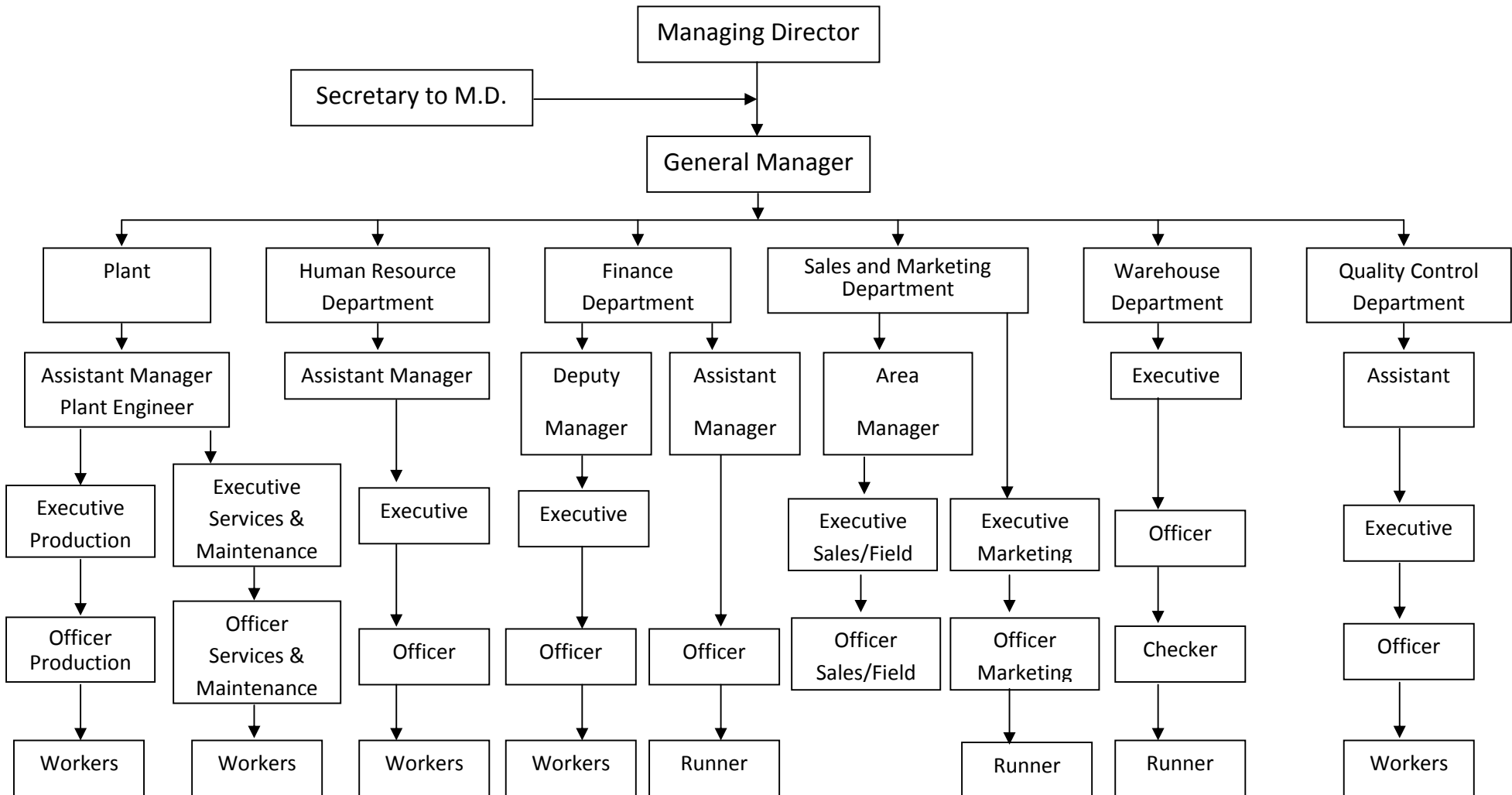
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Appendix-1

Organizational Structure of Bottler's Nepal (Terai) Limited



Appendix-2
Bin Card of BNTL
Bottler's Nepal (Terai) Limited
 Bharatpur, Chitwan

Mate Code:.....

BIN CARD

Folio

No:

Description:

Location:

Date	Reference	Receipt	Issued	Balance	Signature

Minimum Level:..... Re-order Level:..... Re-order Quantity:

Appendix-3
Store Ledger of BNTL
Bottler's Nepal (Terai) Limited, Bharatpur

Purchase Consumption During the Period of 20..... to 20.....

Stock Ledger

Date	Ref. No.	MRN	Received			Issued			Closing Balance		
			GRN	Qty.	Rate	Amt.	Qty.	Rate	Amt.	Qty.	Rate
Opening Balance											
Adjustment of											

Appendix-4
Compiled Data of BTNL related to Inventory
Rs. In Million

Particulars	Year						
	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
Sales	532.95	461.49	465.44	431.94	401.32	354.1	484.99
COGS	217.83	237.11	238.59	207.99	191.96	187.72	259.93
Purchase	589.54	488.37	422.1	455.53	501.03	435.98	546.19
Purchase of Raw Material	236.48	228.48	112.93	174.55	180.9	136.4	191.63
Inventory	150.86	177.74	134.4	114.29	151.11	108.42	100.10
Average Inventory	122.57	164.3	156.07	124.34	132.7	129.76	104.26
Raw Material	53.27	96.00	25.95	35.27	76.28	66.91	50.13
Finished Goods	3.78	4.07	7.47	1.00	1.31	3.79	2.01
Work-in-Process	0.38	0.56	0.42	0.37	0.36	0.49	0.47
Raw Material Consumption	212.11	187.07	188.05	199.03	205.11	145.78	208.42
Net Profit	56.26	39.14	25.36	19.55	16.28	(26.02)	24.80
A/C Payable	132.38	162.6	117.39	106.73	150.82	109.04	162.07
Current Assets	490.17	561.49	518.66	443.15	479.07	225.15	328.61
Total Assets	612.02	687.92	667.62	572.21	699.34	418.77	499.35

Appendix-5(a)

Total Inventory Cost and Order Size in Practice of BNTL

Rs. in Million

Particular	Year									
	2061	2062	2063	2064	2065	2066	2067	Average	S.D.	C.V.
No. of Order (N)	4	4	4	4	4	4	4	4		
Annual Purchase of Raw Material (A)	236.48	228.28	112.93	174.55	180.9	136.4	191.63	180.17	41.50	
Order Size (in Rs.) (Q)	59.12	57.07	28.23	43.64	45.22	34.1	47.91	45.38		
Average Inventory	29.56	28.54	14.12	21.82	22.61	17.05	23.95	22.69		
A. Total Carrying Cost (C)	5.91	5.71	2.82	4.36	4.52	3.41	4.79	4.54		
B. Total Ordering Cost (O)	2	2	2	2	2	2	2	2		
(A+B) Total Inventory Cost	7.91	7.71	4.82	6.36	6.52	5.41	6.79	6.54	1.12	0.17

Where,

$$\text{Order Size (Q)} = \frac{\text{Annual Purchase of Raw Material}}{\text{Number of Order}}$$

$$\text{Average Inventory} = \frac{\text{Order Size}}{2}$$

$$\text{Order Cost} = \text{Total Cost of an Order} \times \text{Number of Order}$$

$$\text{Carrying Cost} = \text{Carrying Cost per Unit} \times \text{Average Inventory}$$

Appendix-5(b)

Total Inventory Cost and Economic Order Quantity in Practice of BNTL

Rs. in Million

Particular	Year									
	2061	2062	2063	2064	2065	2066	2067	Average	S.D.	C.V.
No. of Order (N)	6.51≈7	6.12≈6	5.7≈6	5.59≈6	6.73≈7	5.39≈5	6.45≈6			
Annual Consumption (A)	212.11	187.07	188.05	199.02	205.11	145.78	208.42	192.22	22.62	11.77%
Order Size (in Rs.) (Q)	30.30	34.18	31.34	33.17	29.30	29.16	34.74	30.91	2.66	8.61%
Average Inventory	15.15	17.09	15.67	16.59	14.65	14.58	17.37	15.46		
A. Total Carrying Cost (C)	3.03	3.12	3.13	3.32	2.93	3.25	3.47			
B. Total Ordering Cost (O)	3.5	3	3	3	3	2.5	3			
(A+B) Total Inventory Cost	6.53	6.12	6.13	6.32	5.93	5.75	6.47		0.28	4.53%
Actual EOQ	30.30	34.18	31.34	33.17	29.30	29.16	34.74	30.91	2.66	8.61%

Where,

$$\text{Order Size (Q)} = \frac{\text{Annual Purchase of Raw Material}}{\text{Number of Order}}$$

$$\text{Average Inventory} = \frac{\text{Order Size}}{2}$$

$$\text{Order Cost} = \text{Total Cost of an Order} \times \text{Number of Order}$$

Carrying Cost = Carrying Cost per Unit × Average Inventory

$$EOQ = \sqrt{\frac{2AO}{C}}$$

Where,

A = Annual Consumption

O = Ordering Cost per Order (Rs. 0.5 per Order)

C = Carrying Cost per Unit (0.20 per Unit)

$$\text{Average } (\bar{X}) = \frac{\sum X}{N}$$

$$\text{Standard Deviation } (\sigma) = \sqrt{\frac{\sum (X - \bar{X})^2}{N - 1}}$$

$$\text{Coefficient of Variance} = \frac{\sigma}{\bar{X}}$$