INVENTORY MANAGEMENT OF BOTTLERS NEPAL (TERAI) LIMITED

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By:

RISHI RAM NEUPANE

Birendra Multiple Campus, Bharatpur, Chitwan
T.U. Registration No. 7-2-240-213-2002
Exam Roll No. 190104 (2064-066)
Roll No. 107/064

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RECOMMENDATION

This is to certify that the thesis

Submitted by:
RISHI RAM NEUPANE

Entitled:

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Has been prepared as approved by this Department in the prescribed format of the Faculty of Management. This thesis is forwarded for evaluation.

…….	…….
Sushil Dahal	**Keshav Bhakta Sapkota**
(Thesis Supervisor and Programme Incharge)	**Campus Chief**

…….
Baikuntha Prasad Bhusal
Chairperson
(Research Committee)

Date:

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We have conducted the viva-voice examination of the thesis presented by

RISHI RAM NEUPANE

Entitled:

INVENTORY MANAGEMENT OF BOTTLERS NEPAL (TERAI) LIMITED

And found the thesis to be the original work of the student and written according to the prescribed format. We recommend the thesis to be accepted as partial fulfillment of the requirement for Master Degree of Business Studies (M.B.S.)

VIVA-VOCE COMMITTEE

Chairperson, Research Committee:…….

Member (Thesis Supervisor) …….

Member (External Expert) …….

Date:

DECLARATION

I hereby declare that work reported in this thesis entitled **"INVENTORY MANAGEMENT OF BOTTLERS NEPAL (TERAI) LIMITED"** submitted to Birendra Multiple Campus, Faculty of Management, Tribhuvan University, is my original work done in the form of partial fulfillment of the requirement for the Master's of Business Studies (MBS) under the supervision of Lecture **Sushil Dahal**, of Birendra Multiple Campus, Chitwan, Nepal.

Date:…….

……..…...……

RISHI RAM NEUPANE

T.U. Registration No. 7-2-240-213-2002

Exam Roll No. 190104 (2064-066)

Roll No. 107/064

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RISHI RAM NEUPANE
Birendra Multiple Campus

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ABBREVIATION

&	:	And
A.D.	:	Anno Domini
ABC	:	Activity Based Costing
AIC	:	Agriculture Inputs Corporation
BNL	:	Bottlers Nepal Limited
BNTL	:	Bottlers Nepal (Terai) Limited
C.V.	:	Coefficient of Variation
CEDA	:	Centre for Economic Development and Administration
Co	:	Company
COGS	:	Cost of Goods Sold
e.g.	:	For Example
EOQ	:	Economic Order Quantity
etc	:	Etcetera
FIFO	:	First In First Out
FY	:	Fiscal Year
GRN	:	Goods Receiving Note
HCCL	:	Himal Cement Company Limited
i.e.	:	That is
ICAN	:	Institute of Chartered Accountants of Nepal
ICP	:	Inventory Conversion Period
IT	:	Information Technology
ITR	:	Inventory Turnover Ratio
JIT	:	Just In Time
LC	:	Letter of Credit
LIFO	:	Last In First Out
Ltd.	:	Limited
M. Ton.	:	Metric Ton
MRN	:	Material-Receiving Note
NAS	:	Nepal Accounting standard
P.E.	:	Probable Error
PDP	:	Payable Deferral Period
Pvt.	:	Private
Qty.	:	Quantity
R.M.	:	Raw Material
Rs	:	Rupees
S.D.	:	Standard Deviation
S.E.	:	Standard Error
TCC	:	Total Carrying Cost
TOC	:	Total Ordering Cost
TSC	:	Total Stocking Cost
TU	:	Tribhuvan University
WIP	:	Work In Progress

CHAPTER-ONE

INTRODUCTION

1.1 Background of the Study

An organization need to keep different types of inventory. Inventory is the one of the most important assets for every organization. Every organization has large percentage of the total capital is invested in inventory. Inventory management plays a vital role in any organization. It is a most important element of the firm that serves as, determinant to achieve desired sales level. Organization keep inventory to by this they can run their business most efficiently and effectively. In this way manage inventory properly to use in necessity is called inventory management. Organizations can earn more profit by means of effective management of investment on inventory. Otherwise, it may suffer from losses. Inventories are the stocks heads in the business. Stocks may be of Raw Materials, work-in-progress, finished goods, Spares part and supplies. Thus, inventory is the variable to all industries. This varies is not only the number and nature of goods of hold but also due to uncertainty of demand and supply of goods. Raw materials are inputs required to produce finished goods to safety the customer's demand. Inventories of work-in-progress are semi-finished products, which helps in the smooth production process. Inventories of finished products are the stock of finished goods ready for sales. Stock of supplies includes the materials required for day to day operation of machinery. Inventory management helps to avoid over and under investment in inventory. Inventory management helps to maintain adequate level of inventory required for production process and distribution. It also helps to fix the ordering level and quantity for minimizing the cost for ordering and holding inventory. "Inventories complied periodically recorded in the books of account for proper measurement of periodic profit and for include in the balance sheet at the end of the accounting period" *Hanif & Mukherjee, 2010:11.1*

Inventory management involves planning of the optimum level of inventory and of inventory cost supported by an appropriate organization structure. This is staffs by trained manpower and directed by top management. It involves both financial as

well as physical dimension and these dimensional are interrelated and can not be looked in isolation.

The level of material inventories is anticipated production, reliability of resources of supply, operation. Work-in-progress inventories in strongly influenced by the production period. This is the time between placing raw material in production and completing the finished product. Decreasing the production period can increases inventory turnover. The level of finished goods inventories is a matter of coordinating production and sales.

Manufacturing means any industries that made 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 company 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 inter the market of any nation. If the finished products are not sufficient of 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 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 gave so far developed. 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.

Management of every organization is always working against risk and uncertainties. Organization should be alter in deciding their personnel, financial resource and requirement of inventory equally. General management of the organization should actively involve in developing the better ways of managing their inventories. If so the product cost can be controlled and minimized. This makes the firm able to exist in the highly competitive world of today. The organization's investment on inventories is productive but in the absence of proper management it could block the capital, which can be better utilized in other alternative having high profitability. On the other hand, it could loose the market share of the firm. Finally it may have impact for achieving goal of the organization. Proper inventory management helps to overcome in under and over stocking of material. Therefore it is obvious that inventory management play vital role in the profitability of the organization.

1.2. Brief Introduction of Bottlers Nepal (Terai) Limited

Bottlers Nepal (Terai) Limited is the leading multinational company among the manufacturing and processing company in Nepal. The company manufactures the soft drink under the brand name of Coca-Cola Company. It is the subsidiary company of Bottlers Nepal Limited, Balaju and Katmandu Established in 1987, and BNTL is one of the leading figures of Nepalese industrial sector. The company is located ward no. 9 of Bharatpur municipality in Chitwan District, Nepal. Occupying the area of 1, 65,600sq feet with the altitude of 1500ft above mean sea level. It represents the first serge scale multinational manufacturing company of Chtwan, Nepal.

Coke, Sprite, Fanta (Orange, lemon, and soda) are the major product of the company for the production of these, product certain inputs are pre-requisite i.e. concentrate. Crown coke, closure and sugar which are not produced in the country. Therefore these inputs are important from another country like, Singapore, Iran, Pakistan, Indonesia, German and India. The company had given prime importance to its quality product for which it has 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 2009 to refine the wastewater generated in the production process.

1.3 Statement of Problem

Inventory is one of the most important assets of any organization, inventory management involves planning of the optimal levels of inventory and control of inventory cost supported by an appropriate organization structure, which is staffed by trained personal and directed by top management. The reduction of in excessive inventories carries a favorable impact on a company's profitability. Most of the Nepalese manufacturing companies are victimized by the unscientific inventory management system. It is one of the most important causes of adverse impact on profit of these companies. In the context of inventory management "Management experts claim that inventory management in Nepal is probably the weakest aspect of management. The tools and techniques for controlling physical as well as financial dimension." *Agrawal, 2000: 239.*

Most of Nepalese manufacturing companies are suffered by the losses due to the lack of proper management of inventory. Both excessive and inadequate level of inventories are not desirable and danger. Over investment tied up the firms fund creating the risk of liquidity and their will be loss of profit due to excessive carrying cost. On other hand inadequate level of inventories abstract the flow of production as will as market operation. So both situation of over and under investment should be avoided by maintaining optimum level of inventory.

The basic problem of the study is to examine the inventory management system that is exercised in BNTL. Effective and efficient inventory management system can only yield expected profit of the enterprises. Maintain suitable inventory level adaptations crucial for any organization. Various tools and techniques have been developed for the systematic and scientific inventory management system to handle inventory management problem. Most of Nepalese manufacturing companies are suffered by the losses due to the lack of proper management of inventory. Most of the companies do not use the various tools and techniques that

have been developed for the systematic and scientific inventory management system to handle inventory management problem.

The present study tries to find out the answer of the following questions.

i. Which inventory management techniques does the company use?
ii. What is the trend of procument and sales of BNTL?
iii. Is the inventory management policy of BNTL is properly handle the level of inventory?
iv. Whether they application Nepal Accounting Standard (NAS) in inventory management of BNTL?
v. What problems the company has been facing in the management of inventory?

1.4 Objectives of the Study

Most of the Nepalese organization is failing management of their inventory properly. Bottlers Nepal (Terai) Limited is also not free from these weaknesses. This study has attempted to concentrate on the problem faced by Bottlers Nepal and eliminates the obstacles in the inventory Management.

The main objective of this study is to examine the identify inventory management technique of Bottlers Nepal (Terai) Limited and its impact on profitability. In order to meet the main objectives the following specific objective has been proposed.

i. To study the technique used for managing the inventory of BNTL.
ii. To study the trend of procurement inventory and sales of BNTL.
iii. To analyze the applicability of NAS in inventory Management of BNTL Ltd.
iv. To identify the problem faced by BNTL in the management of inventory & the way of solving it.

1.5 Significance of the Study

Without efficient and effective inventory management, an organization cannot achieve its objectives. So, a topic chosen by researcher will be useful to both i.e. organizations as will as researchers. As researchers know the inventory management plays a vital role in manufacturing as well as trading organization equally. The knowledge of sound keeping inventory management helps both i.e. organization and customers. So researcher trying to emphasis on the importance of inventory management in the organization. Which tools and techniques can be used while keeping sound inventory management in the organization? What are the weaknesses of the organization while keeping sound inventory management system?

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 will try 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 efficiency.

1.6 Limitations of the Study

The study confine only about Inventory Management in Bottlers Nepal (Terai) Limited. There are following limitation of the study

a) This study only covers a span of 5 years (2062/063 to 2067/068).
b) The study will consider only BNTL and will be based upon annual reports of BNTL i.e. based on secondary source of data.
c) This study is concentrated on the area of inventory management of BNTL.

1.7 Focus of the Study

Inventory management is one of the most important tasks in any organization. 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 profitability. So, without effective and efficient inventory management no one organization can achieve its goal. To earn high profit, it is necessary to run the company more efficiently as will as economically BNTL supplies the quality product at right time at a reasonable price.

The cost of inventory directly affects the production cost as will as profitability of the company. BNTL is a manufacturing enterprise, that's why investment in inventory and cost of carrying inventory is required to reduce the total operating cost. It means a slight reduction in inventory cost reduces the production cost and then increases the profitability at a remarkable rate. For this purpose optimum level of inventory is desirable. The main objective of inventory management is to put the inventory at an appropriate level so that inventory cost can be minimized. This study was focused in the inventory management of BNTL. The study can provide the guidelines and help to make the plan, policies and program for the efficient management of BNTL.

1.8 Organization of the Study

This study has been spread altogether into five chapters, the introduction 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:

Chapter One: First chapter deals with general background of the study, statement of problems, brief introduction of BNTL, objectives of the study, sigfinance of the study. Also it gives the limitation of the study.

Chapter Two: Chapter two deals about the available literature in inventory management. It also includes review of various Studies (i.e. Svarious books, journal, article, master degree thesis etc.) related with the inventory management.

Chapter Three: Chapter three deals about research methodology used to use of inventory management on BNTL. It consists of research design, population and sample, nature and sources of data, data gathering procedure, data period covered, tools and technique used in the presentation and analysis of data

Chapter Four: Fourth chapter fulfils the objectives of the study by explains and analyzes the relevant data by using various statistical and accounting tools. Here different statistical tools as well as tables and figures will be presented, interpreted to accomplish the objectives of the study. At the last part of this chapter, the major finding of the whole study have been presented.

Chapter five: Chapter five presents the summary, conclusion and suggestion of the study.

CHAPTER-TWO

REVIEW OF LITERATURE

There are many researchers 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

The term inventory refers to assets, which will be sold in future in the normal course of business operations. 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 sales level. Inventories are an idle resource, which is useable and has value. The idle resource may be man, money, material, plan requirement. 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 material, semi-finished goods, finished products, parts and supplies are the form inventory.

"Inventory means the aggregate of the those items of tangible personal property which(1) are held for sale in the ordinary course of business (2) are in process of production for such sale or (3) are to be currently consumed in the production of goods or services to be available for sale" *AICPA.* 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 sales level. Inventory form a link between production and sales of product. The optimum level of inventories should be judged in relation to the flexibility in inventories. The lower levels of inventories make the less flexibility or the firm and higher level of inventory increase flexibility of the organization.

Fair Value is amount for which an assets could be exchanged or billability settled, between knowledgeable willing precise is an arm's length transaction *NAS, 2008.132*. 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.

Management is an art, which is devoted for planning, directing, co-ordination and controlling 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. "To maintain a large size of inventories of raw materials and working progress for efficient and smooth production and of finished goods for uninterrupted sales operations." *I M Pandey ; 2006:625*

A manufacturing company must maintain a certain amount of inventory during the production, the inventory known as work-in-process. Work-in-process is materials that have been partly fabricated but are not yet completed. Work-in-process inventory is strongly influenced by the length of the production period, which is the time between placing the raw materials in 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 that make them.

2.2 Inventory Management

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 hold four kinds of inventories namely, raw materials, work-in-progress, finished goods and spare parts and supplies. The need of inventories is for the transaction motive, precautionary motive and speculative motive.

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. "Inventory as a current assets, differ from the other current assets because only financial manager are not involved. Rather, all the views concerning the appropriate level of inventory would differ among the different functional areas" *Khan & Jain, 2003:20.4*. Generally inventory management covers the function of:

2.2.1 Purchasing

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

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. 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 at the proper time and lowest price consistently with the quality desired

Objective of Purchasing

The major objectives of scientific purchasing may stated as follows.

i. Buying the quality, which is neither too much that, involves belonging of the capital not too little that holds up the regular supply for production.
ii. Procurement of materials, which best suit the product and the purposes for which they are intended.
iii. Maintaining continue supply to ensure production schedule at a minimum investment.
iv. Procurement of required quality and quantity of materials at the best price not necessarily at the lowest price.
v. Improvement of the product with reference to quality and distribution by means of selection of adequate materials.
vi. Developing fullest co-operation and co-ordination marinating internal relationship among various department of the company.
vii. 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.
viii. Avoidance of duplication of materials, leading to waste of materials and equipment.
ix. Maintenance of company competitive position in the market by having company's quality standards in accordance with the demands of the consumers.
x. Creation of goodwill for the company through dealing with supplies.

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 department 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 vendor and purchase records etc.

iv. **Selective 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, delivery record and other service required and his past co-operation. Sometimes suppliers are 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 vender is selected out of.

v. **Purchase Order:** After selecting the vendor supplier a purchase order is prepared in the prescribed from by the purchase department and sent to the vendor authorizing him to supply specified quantity of materials at the stipulated terms at the time and place mentioned there in. It forms a formal contract between the purchase 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.

2.2.2 Store Keeping

Store keeping service function in a manufacturing concern, which deals with the physical storage of goods under the custodian well-trained and experienced person termed as storekeeper. The important of store keeping 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. Store keeping is that aspect if inventory control, which is concerned, with the physical storage of goods. The responsibility of store keeping 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 least cost.

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

Objective of Storekeeping

i. Using the storage available space and labour effectively.
ii. Facilitating ordering of required materials.
iii. Receiving, handling and issuing goods economically and efficiently.
iv. Minimizing the investment on inventories.
v. Minimizing the inventory holding cost.
vi. Maintaining regular supply of raw materials at all times when properly authorized.
vii. Protection of all goods in stores against all losses from fires, theft and obsolesce.

To achieve the above said objectives a firm generally uses different types of controlling devices.

Bin Cards: Bin card makes a record of all receipts and issue of materials and kept for each items of stores carried. The storekeepers maintain these cards and he is responsible for any differences 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. “This ledger is kept in the costing department and is identical with 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 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, :2001 : II-54.

For items 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 is presented in Appendix II.

Store Ledger: This ledger is kept in the costing department and is identical with 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 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, :2001 : II-54).

2.2.3 Issuing and Pricing

Material should be issued against requisition slop. The prices of the issues can be determined in the basic of cost price or market price.

2.3 Nature of Inventory

An inventory serves as cushions to observe the stock in demand forecast and provides more efficient use of resources. Inventory for any organization is necessary thing and require careful planning and formulation of organization. Every business operation whether big or small has maintained some inventory. Depending upon the nature of the industry and firm, inventory may be durable or non-durable, perishable or non-perishable, valuable and inexpensive. Inventories are stock of the product in a company is manufacturing for sale and component that make up the product. There are various form in which inventory exist in a manufacturing industry.

Manufacturing firm generally has four types of inventories. Which are as follows?

i) Raw material inventories

Raw materials are those basic inputs that are converted into finished product through the manufacturing process. Raw materials inventories are those units, which have been purchased and stored for future production. Manufacturing firm for smooth running of production operation holds raw material inventories. Materials used in factory traditionally classified as direct and indirect materials and part that can be directly identified with the unit cost of the finished goods. Indirect materials are generally defined, as the material used in the manufacturing process which cannot be identified. “Raw Material are those basic inputs that are converted in to finished product through the manufacturing process .Raw materials inventories are those units which have been purchased and for future production.’’ (Pandey, 2006:624) 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. Bottlers Nepal (Terai) Limited is a manufacturing company so for the production of soft drinks different kinds of materials are used in the production process.

ii) Work-in-progress inventories

This category includes those materials that have been committed to the production process but have not been completed. "WIP Inventories are semi –Manufactured products. They represent products that need more work before they become finished products for sale. (Pandey, 2006:624)". WIP inventories are a necessary part of modern industrial production systems, firm's production department will want to maintain reasonable WIP inventories to minimize cost delays and idle time. 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. Stocks of raw material and Work –in –process facilitate production, while stock of finished goods is required for smooth marketing operation. Thus, inventories serve as a link between the production and consumption of goods. *Pandey, 2006:624*" 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.

2.4 Motive of Holding Inventories

"Inventory 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 will 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 three types of inventories namely raw material, work-in-progress & finished goods.

The question of managing inventories arises only when the company holds inventories. Maintaining inventories involves typing up of the company's fund and incurrence of storage and handling costs. Although it is expensive to maintain inventories, why does a company held inventories? A company held inventories for three general motives.

a) Transaction Motive

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. So, the transaction motive emphasis the need to maintain inventories to facilitate smooth production and sale operation. 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

The precautionary motive, in necessitates holding of inventories to safe guard against the risk of unpredictable change in demand and supply forces and other factors. A firm cannot produce immediately when customers demand goods. Therefore, to supply finished goods on a regular basis their stock has to be maintained. 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. 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 production cycle. Full production cycle complete stick of WIP has to be maintained. Efficient firms constantly try to make production cycle smaller by improving their production techniques.

c) Speculative Motive

The firm may purchase large quantities of raw materials that needed for desired production and sales level to obtain quality discount of bulk purchasing. 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.

2.4.1 Need and Importance of Inventory Management

"Inventory presents the major elements in the working capital of many businesses under taking and accordingly requires substantial investment in inventory can be minimized, desired inventory levels can be maintained for smooth production operation and increased consumer satisfaction and total inventory cost can be minimized." *Mukherjee & Hanif , 2010 :11.2*

Inventory management plays a vital role in any organization. Inventory constitutes the most significant part of current assets of a large majority manufacturing organization. Inventory represents the major elements on the working capital of many business undertakings and accordingly required substantial investments. The need to be effectively managed so that,

i. Investment in inventory can be minimized.
ii. Desired inventory levels can be maintained for smooth productions operation and increased consumer satisfaction.
iii. Total inventory cost can be minimized.

Inventory management is an important function of an organization cover various aspect input process, i.e. it deals with raw materials, procurement of machines and other equipment necessary for the production process and spare parts for the maintains of the plant. Thus in an production process inventor management can be considered as an preliminary to transformation process. It involves planning and programming for the procurement of material and capital goods of desired quality and specification at reasonable price and at the required time, it is also concerned with market exploration for the items be purchase to have up to date information, storage and stock control. Inspection of the material received in the enterprise,

transportation and material handling operation related to material and many other functions.

Importance of inventory management can be written as follows:

i) Inventory helps in maintaining the economy by absorbing some of the fluctuations when the demand for an item fluctuates or is seasonal.
ii) Inventory also reduced product cost because there is an additional advantage of batching and long smooth running production runs.
iii) Inventory provide service to the customers immediately or at a short notice.
iv) Inventory helps in smooth and efficient running of business.
v) Due to absence of stock, the company may have to pay of inventory may earn price discount because bulk purchasing received late and so many sales others are likely to be rejected.
vi) Pipeline stocks (also called process and movement inventories) also necessary where the significant amount of time is consumed in transshipment of items from one localities to another

2.4.2 Objectives of Inventory Management

To maintain the proper inventory or optimal level of inventory in industry is quite significant. But it is difficult task the management because the optimal level of inventory always between two points of excessive and inadequate inventories. An inventory management should be:

a) To maintain large size of inventories of raw material work-in-process for efficient and smooth production and of finished goods for uninterrupted sales operation.
b) To maintain a minimum investment in inventories to maximize profitability. *Pandey,2006:625*

To achieve the above objectives inventory management should perform following functions.

a) Maintain sufficient stocks of raw materials in period of short supply and anticipated price changes.

b) Ensure a continuous supply of raw material to facilitate uninterrupted production.
c) Maintain sufficient finished goods inventory for smooth sales operation & efficient customer services.
d) Control investment in inventories and keep in at optimum level.
e) Minimize the carrying cost & time.

Under investment inventories are also not good for company. It carries some problems such as production hold-ups 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 in adequate 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 of between costs and benefits.

Risk 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 issue the inventory is followed LIFO and FIFO method is used to issue the inventory.

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 and up-to-date record of every item of stocks under a proper system of inventory control.

2.5 Classification of Cost

The goal of the inventory management is to provide the inventories for sustaining operation at the lowest possible cost. Cost is certainly considerable factor in purchasing, production and maintaining inventory. To solve cost problem the decision factor are, when to purchase? And how much to purchase at a time? The first step in inventory management is to identify all the costs involved purchasing and maintaining inventories typical costs associated with the inventories are describes below.

2.5.1 Carrying Cost or Holding Costs

The cost associated with having inventories which includes storage cost, insurance cost of typing up fund, depreciation cost and so on. These costs generally increase in production to the average amount of inventory held "Cost incurred for the maintaining a given level of inventory are called carrying costs, they include.

a) Warehousing cost
b) Insurance and taxes
c) Handling cost
d) Capital or opportunity cost
e) Clerical and staff
f) Deterioration and obsolesce
g) Storage cost

Pandey, 2006:626

Carrying cost is the first category of inventory management cost which is generally associated proportionally with the average value of inventory.

The total carrying cost is calculated as follows.

Total Carrying Cost $= \frac{Q}{2} C$

Where,

C = Carrying Cost per unit.

Q= Ordering size inventory units.

2.5.2 Ordering Cost

Ordering costs are the costs of placing on order if, the items are purchased from others or production setup costs if produced with in the firm. Ordering costs includes the costs of running a purchasing department, personnel and telephone or latter writing expenses associated with placing orders, and the costs of preparing specification. Ordering costs would also include the related costs of receiving and inspecting the material and the costs of playing invoices. Ordering cost is the cost of placing orders for the purchase of materials and includes include the cost incurred in the following.

Cost of staff posted in the purchasing department, inspection section and payment department.

i. Cost of stationary, postage and telephone charge.
ii. Cost of placing order or production setup costs.
iii. Shipping and handling costs.
iv. Quantity discount taken at last

Jain & Narang, 2001: II-11

It is the second category of inventory maintenance cost. Generally, this cost is fixed in nature with some exception. This cost involves both fixed and variable costs, assuming the ordering cost (O) if fixed per order, the total ordering cost is calculated simply by multiplying 'O' by the number of times to be ordered per year. Therefore, total ordering cost is calculated as follows.

Total Ordering Cost = $O \times N$ or $O \times \frac{A}{Q}$

Where,

O = Cost of placing on order

N = Number of order to be ordered per year

A = Total requirement

Q = Quantity per order, where, quantity per order is equal

2.5.3 Safety Stock Cost

Safety stock represents the inventories held by the firm in the effort to avoid running short of goods to meet sales opportunities. If safety stocks are inadequate, the firm will incur less sales and the loss of customer goodwill. The expenses involve in this cost are

i. Loss of sales
ii. Loss of customer goodwill
iii. Disruption of production

The third category of inventory cost is the cost of maintaining safety stock.

The cost of maintaining safety stock may be needed to calculate separately to account for the cost of maintaining safety stock for some other reasons. It is calculated simply by multiplying the carrying cost per unit by the safety stock.

Cost of Safety Stock CSS) = S×C

Now, we can calculate the total cost maintaining inventory (TCMI) summing up all the cost.

We can get TCMI by combining TCC, TOC and CSS. (Pandey, 2006:630)

TCMI = TCC + TOC + CSS or

TCMI = [(C × AI] + [(O) × (N)] + [(C × (S)]

Where,

TCMI = Total cost of maintaining inventory,

TCC = Total carrying cost

TOC = Total ordering cost

CSS = Cost of safety stock

C = Carrying cost per unit

AI = Average inventory

N = Number of orders made during the year and

S = Safety stock

O = Cost of placing order

2.6 Techniques of Inventory Management

According to *Atton N. Smith* "Inventory is money on which a company pays interest rather than collects interest. It is always in danger of devaluation. Every firm should have an optimum level of inventory of optimal balance level between too much inventory and too low inventory managements techniques to solve inventory management problem faced by the most of the manufacturing firms."

In inventory management technique, we seek how to minimize the inventory cost. Adequate inventory facilitate smooth production activities on the other hands, excessive inventory in idle resource of the firm and the large amount of money is blocked unnecessarily. "In management inventories the firm's objectives should be in consonance with the wealth maximization principle. To achieve this firm should

determine the optimal level of inventory. Efficiently controlled inventories make the firm flexible. Inefficient inventory control results in unbalanced inventory and inflexibility. The firm may be sometimes out of stock and sometimes may pile unnecessary stocks; such situation increases the level of investment and makes the firm unprofitable.

To manage inventories efficiency, answers to be south to the following two questions:

i. How much should be order?
ii. When should it be order?

"The first question how much to order, relate to the problem of determining economic order quantity and answered with an analysis of costs of maintaining certain levels of inventories. The second question, when to order, arises because of uncertainty and is a problem of determining the re-order point." *Pandey, 2006: 626.*

The major problem of inventory management is mentioned 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.

2.6.1 Economic Order Quantity (EOQ)

The Economic Order Quantity (EOQ) is an important concept in the purchase of raw material as well as in the storage of finished goods and in transit inventories. In our analysis we wish to determine the optimal order quantity for a particular item of inventory given, its forecasted usage, ordering cost and carrying cost, ordering means either the purchase of the item or the production. Assume, for the moment that usage of a particular item of inventory is known with certainty. This usage is steady through out the period of time being analyzed. In others, if usage were 2600 items for 6 months period, 100 items would be used each week. Although 'EOQ' model can be modified to take account of inversing and decreasing usage overtime, we should not get in to this type of complexity.

We assume that ordering costs ‘O’ are constraint regardless of the size of the order. In the purchase of raw materials or other items these costs represent the clerical costs involved in placing on order as well as certain costs of receiving and checking the goods once they arrive. For finished goods inventories ordering cost involve scheduling and production run. For instance transit inventories, ordering costs are likely to involve nothing more that record keeping the total ordering costs for a period is simply the number of orders for that period of times multiply by the cost per order.

Carrying cost per period ‘C’ represent the cost of inventory shortage 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.

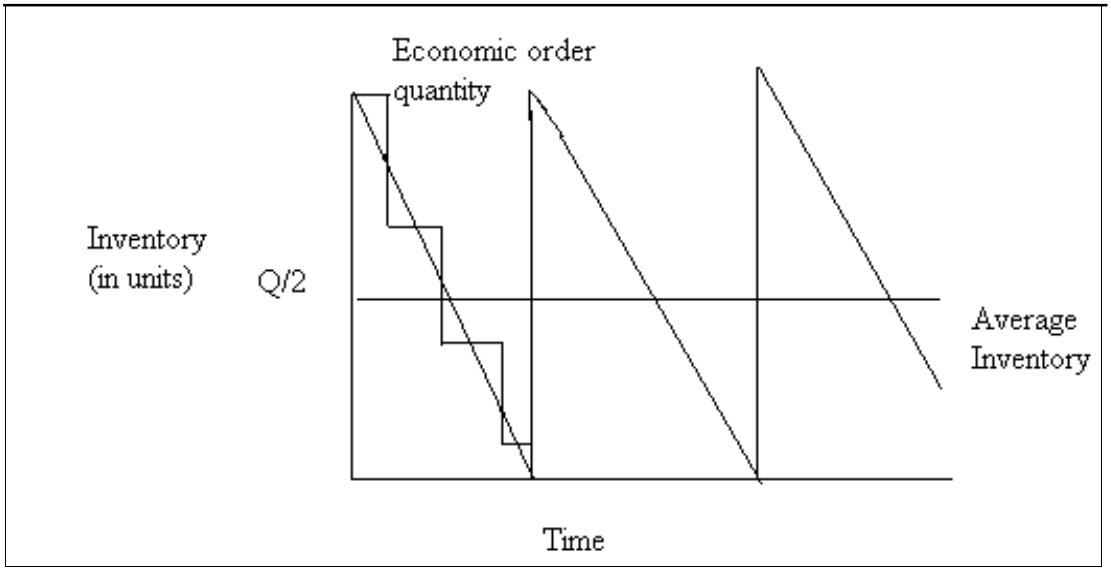
Average in Inventory = Q/2---------- (2.1)

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

Although the quantities demanded are a step function, we assume for analytical purpose that a straight line can approximate it. We see that zero inventories always indicate that further inventory must be ordered.

Figure No. 2.1

Economic Order Quantity (EOQ)



Sources: Agarwal, 1998:542

The carrying cost of inventory is the carrying cost per unit times the average number of units of inventory or CQ/2. The total number of orders for a period of time is simply the total usage (in units) of items of inventory for that period 'A' divided by 'O' consequently, total ordering costs are represented by the ordering cost per order times the number of orders or AO/Q. Total inventory costs then are carrying costs plus ordering costs.

TCC = CQ/2 + AQ/Q---------- (2.2)

We see form equation (1-2) that the higher the order quantity 'Q' the higher carrying costs, but the lower the total ordering costs. The lower the order quantity, the lower the carrying costs will be but the total ordering costs will be higher. We are concerned with the trade off between the economics of increased order size and the added cost of carrying additional inventory.

To determine the optimum order quantity 'Q' we differentiate equation (1-2) with respect to Q and set the derivative equal to zero which result into

$Q = (2AO/C)^{1/2}$ ---------- (2.3)

Where,

Q = Economic Order Quantity

A = Annual Requirement

O = Ordering Cost

C = Carrying Cost

2.6.2 Assumption of EOQ

The economic order quantity model is intently attractive because it minimizes the obvious incremental costs associated with inventory replenishment. The concept of EOQ is the based on following assumption

a. 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 assume to continue into the indefinite future
b. The lead time is constants and knows. 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 stick out.
c. Material is orders produced in a lot or batch and lot is placed into inventory all at one time.
d. 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.
e. The item is a single product there is no interaction.

2.6.3 Approach to Set EOQ

The EOQ model can be illustrate by

i) Graphic Approach

ii) Formula Approach

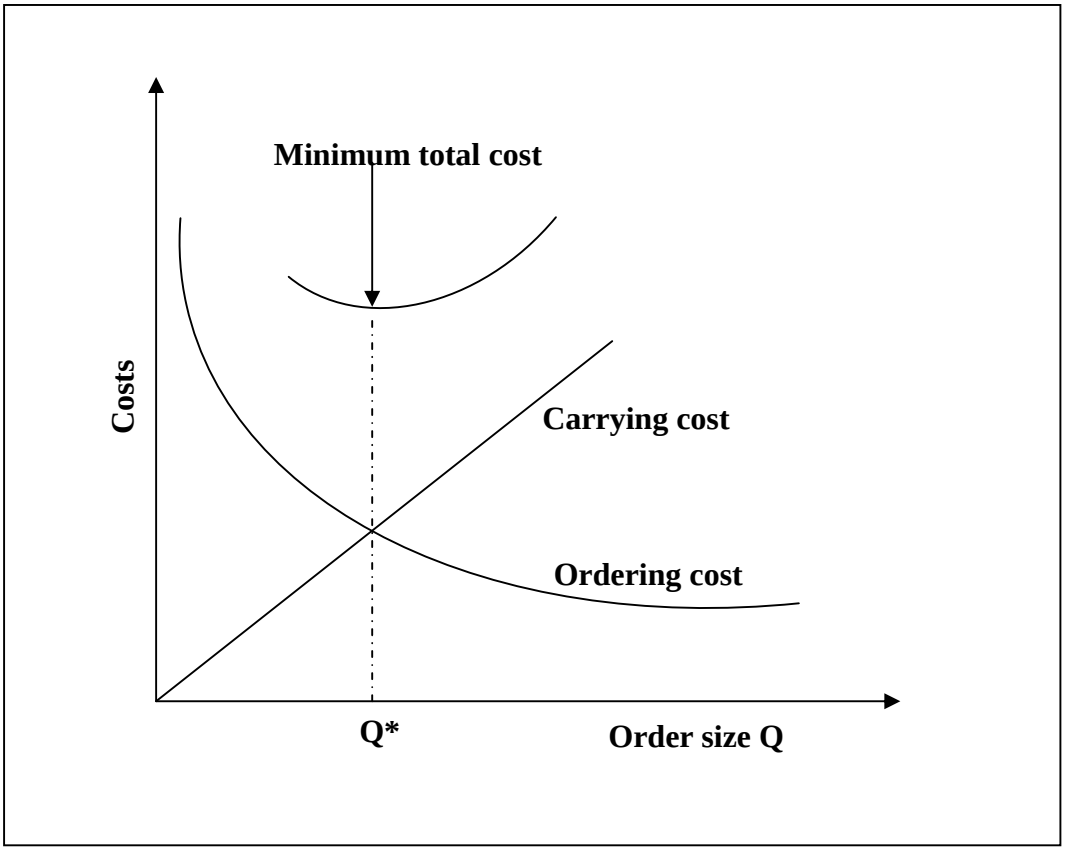
iii) The long analytical approach of Trial and Error Approach

i) Graphic Presentation

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

Figure No. 2.2

Graphical Approach of EOQ



Sources: Pandey, 2006:629

In the figure x- axis represent the order size and y-axis represent the cost. We note that carrying cost increase as the order size increases because, an average a large inventory level will be maintained and ordering costs decline with increase in order size because large order size means less number of orders. The behavior of total cost line is noticeable since it is a sum of two types of cost, which behave differently with order size. The total cost decrease in average ordering cost is more than off set by the increase in carrying cost. *Pandey, 2006:629.*The economic orders quantity occurs at the point 'Q' when the total cost is minimum. If the order is increase, carrying costs exceeds ordering costs that are saved. Thus, the firm operating profit maximized at point Q

ii) Formula Approach

The formula techniques are an important method to calculate economic order quantity. The economic order quantity can using a short cut method, be calculated by the following equation.

Carring cost of EOQ = Ordering cost of EOQ

or $\frac{EOQ}{2}C = \frac{A}{EOQ}O$

or $EOQ^2 C = 2AO$

or $EOQ^2 = \frac{2AO}{C}$

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

Where,

A = Total quantity, O = Ordering cost per order, C = Carrying cost per unit

iii) The Long Analytical Approach or Trial and Error Approach

A firm has different alternative purchase policy of its inventory. Trial and Error approach is a method to calculate economic order quantity. It can purchases its entire requirement an one single order or periodically say weekly, monthly, half yearly and so on. Its more than one time the firm can place an order to purchase inventory. This approach to the determination of EOQ uses different permutations and combination of total cost inventory purchase and so as to find out the total cost. According to this approach the carrying and ordering cost for different sizes of order to purchase inventories computed and the order size with the lowest total cost of inventory is the economic order quantity (*Khan & Jain, 2003: 20.7*).

While determining the EOQ by trial and error technique the following steps are to be taken to undertake.

a) Determining total costs for each lot size chosen.

b) Selecting the ordering quantity which minimizes total costs.

2.6.4 Re-Order Point

The reorder point is the level of inventory at which the firm places an order in the amount of economic order quantity. If the places the order when the inventory reaches the reorder point, the new goods will arrive before firm's runs out of goods to sell. So, determine the reorder point under certainly.

If order is placed when the stocks are over then there is always a chance that the firm may face the situation of shortage. Another alternative is to place the order before the stock is completely exhausted i.e. to order in advance. Again to determine the appropriate time when the order should be placed in advance is a difficult exercise. If an order is placed too early then it may result in pilling up of inventory for the longer period and if it is place too late this may result in shortages. Both these situations are not in the interest of the firm. The problem is known as "when to order" and is very important for any organization. In other words the choice of appropriate point at which an order to replenish the inventory is of great significance. The level of inventory at which re-order should be placed is knows as re-order point. To determine reorder level with certainty, following factors should be taken into account.

a) The time intervening between the date of order of goods and the arrival of supplies.
b) The average quantity consumed within stipulated period.
c) The merger of safety.

The ordering level revised from time to time on consideration of the exigencies relating to the supplies of demand for goods.

2.6.4.1 Re-Order Point Under Certainty

Under certainty situation, re-order point is simply that inventory level, which will be maintain for consumption during the lead time. That is

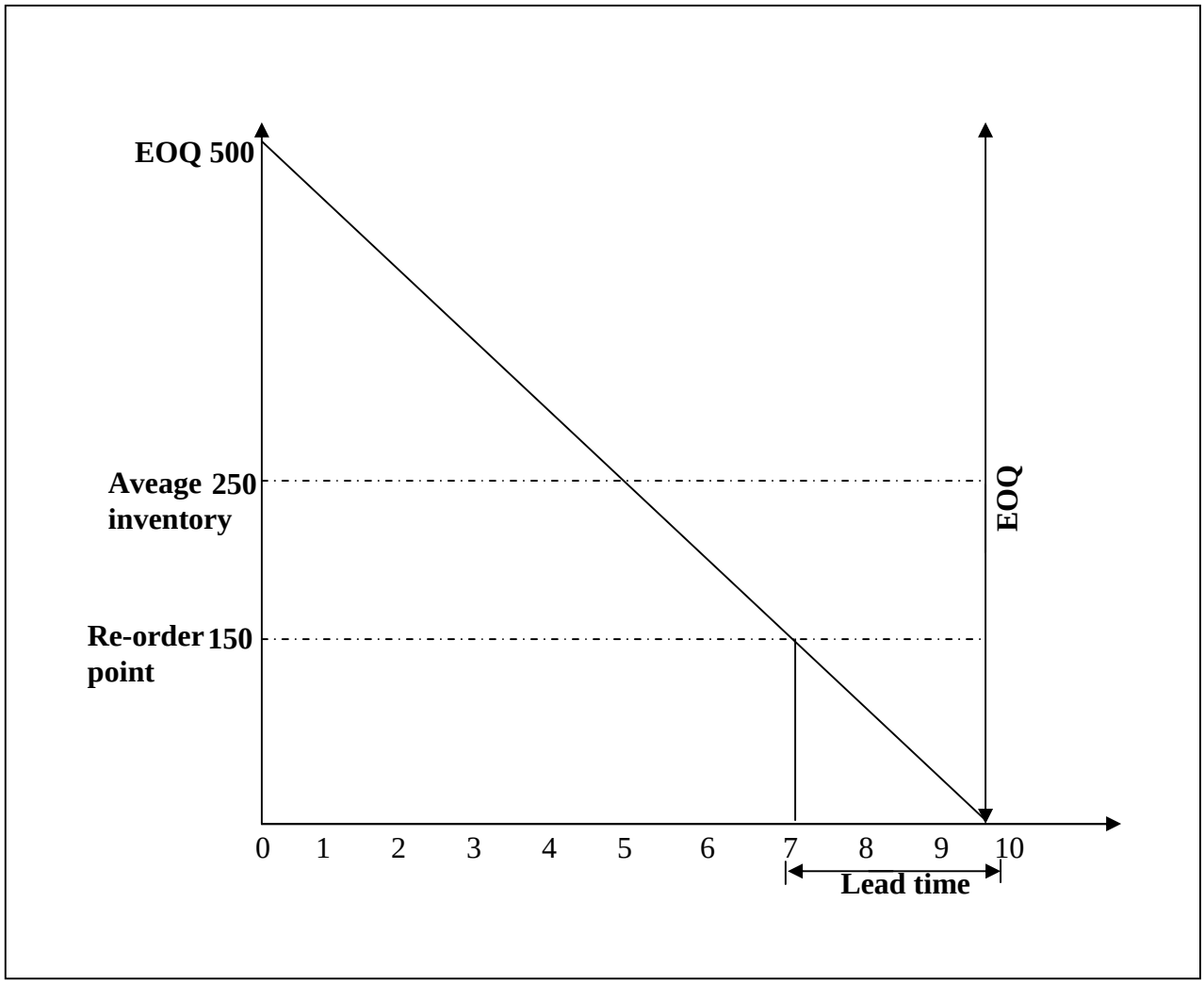
Re-order point = Lead time × Average daily usage

To illustrate, let us assume that the economic order quantity is 500 units, lead time is three weeks and average usage is 50 units per week. If there is no lead time that is delivery of inventory is instantaneous, the new order will be placed at the end of

tenth week, as soon as EOQ reaches zero level. But, as the lead time is three weeks, the new order should be placed at the end of seventh week, when there are 150 units left to consume during the lead time. As soon as the lead time ends and inventory level reaches zero, stock of 500 units will arrive. Thus the order point is 150 units (50units X 3 weeks).

Figure No. 2.3

Re-Order Point under Certainty



Sources: Pandey, 2006:634

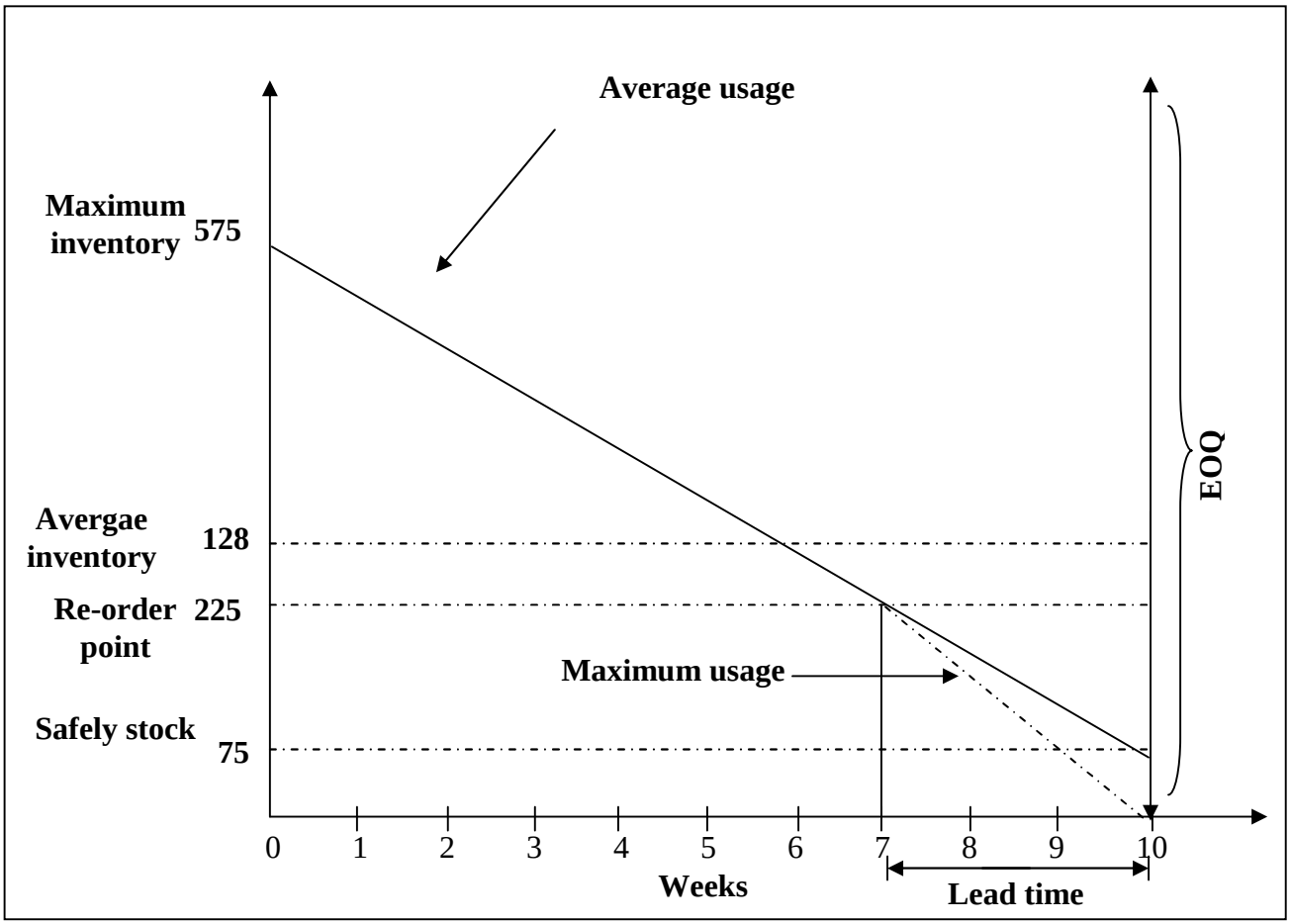
This is illustrated in figure 29.3 which shows that the order will be placed at the end of seventh week, where 150 units are left for consumption during the lead time is nil, the re-order point will be zero level of inventory.

2.6.4.2 Re-Order Point under Uncertainty

Assume the previous in our example the re-order point was computed under the assumption of certainty. It is difficult to predict usage and lead time accurately. The demand for material may fluctuate from day-to-day or from week-to-week similarity the actual delivery time may be different from the normal lead time. If the actual usage increases or the delivery of inventory is delayed, the firm can face a problem of stock-out which can prove to be costly for the firm. Therefore in order to guard against the stock-out, the firm may maintain a safety-stock some minimum or buffer inventory as cushion against expected increased usage and/or delay in delivery time.

Figure No. 2.4

Re-Order point under uncertainty



Sources: Pandey, 2006:630

Assume in the previous example, the reasonable expected stock-out is 25 units per week. The firm should maintain a safety stock of 75 units (25 units X 3 weeks).

Thus the reorder point will be 150 units + 75 units =225 units. The maximum inventory will be equal to the economic order quantity plus the safety stock ie, 500 units + 75 units = 575 units. Thus, the formula to determine the reorder point when safety stock is maintained is as follows:

Re-order point = lead X Average usage + Safety stock (12) figure 29.4 shows the reorder point under the assumption of the safety stock

2.7 Stock Level

Carrying of too much and too little of inventories is deterring mental to the firms. If the inventor is too little, the firm will face frequent stock outs involving high reordering cost and it the 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 level.

2.7.1 Maximum Stock Level

It represents the maximum quantity of an item of inventory that can be hold in stick at any time that stock shouldn't exceed this quantity. The quantity is fixed so that there may be no overstocking. The maximum stock level is affected by availability of financial resources, store space. Lead time and nature of material, reasonability of material and government control. The maximum level is fixed by considering the following points.

i) Re-Order point.

ii) Minimum consumption rate during lead time.

iii) Minimum lead time or order period.

iv) Re-Order quantity.

Maximum stock level = Re-order point + Re-order quantity- (Minimum consumption × Minimum re-order point)

Overstocking should be avoided because of the following disadvantages:

a) Overstocking of material will need more go-down space so more rent will have to be paid.

b) There may be loss due to obsolesce on account of overstocking.
c) There may be fear of depreciation in market value of the Overstocking of material.
d) Overstocking of material unnecessarily bocks working capital Which could be profitable, lying unutilized somewhere else.
e) There are chances of depreciation in quantity because large stocks will be required more time before they are consumed.

The maximum stock level is fixed by taking into account the following factors.

a) Maximum requirements of the stores for production purpose at any point of time.
b) Golden space available.
c) Amount of capital available for maintaining stores.
d) Rate of consumption of the material during the lead time.
e) The time lag between indenting and receiving of the inventory.
f) Possibility of loss in stores by deteriorations, evaporation etc.

2.7.2 Minimum Stock Level

This is the lower limit below which the stock of any item should not normally be allowed to fall carrying of minimum stock avoids a situation of stick out resulting in the stoppage of production. This quantity is fixed so that production as sales may not held up due to storage of inventory. In the determination of minimum stick level the following points are taken into consideration.

i) Re order level
ii) Average or normal consumption
iii) Average or normal lead time

Minimum Stock Level = Re order level - (Normal consumption × Normal lead time)

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.

2.7.3 Danger Stock Level

This is a level at which normal issue of the material are stopped and issued are made only under specific instructions. This is the level below the minimum quantity. It is a single to the concerned people to arrange for the procurement of materials urgently to avoid stock out. It is applying the following formula

Danger Level = Average Consumption × Maximum emergency period

2.7.4 ABC Analysis

ABC analysis is a control technique that divides items into sub classification and uses different control system for each group of inventories. Under these techniques of inventory control, inventories are listed in A, B and C group 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

Usually, a firm has to maintain several types of inventories for different purposes. Equal control and effort for all items is not ordinarily justified. First the different values of inventory items and suggest that we should concentrate our attention on higher valued items and be less concentrate on lower value items. The firm should therefore, classify inventories to identify which items should receive the most priority in controlling. The firm should be selective in its approach to control investment in various types of inventories. This analytical approach called ABC analysis.

The following steps are involved in implementing the ABC analysis:

a) Classify the items of inventories, determining the expected use in units and the price per unit for each unit.
b) Determine the total value of each item by multiplying expected by its unit price.
c) Rank the items in accordance with the total value, giving first rand to the item with highest total value and so on.

d) Complete the ratios (percentage) of number of units of each item to total units of all items and the ratio of total value of each item to total value of all items.

e) Combine items on the basis of their relative value to form three categories A, B and C.

The Items in A, B and C classes can be compared in the following tabular form

Table No. 2.1

ABC Analysis

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

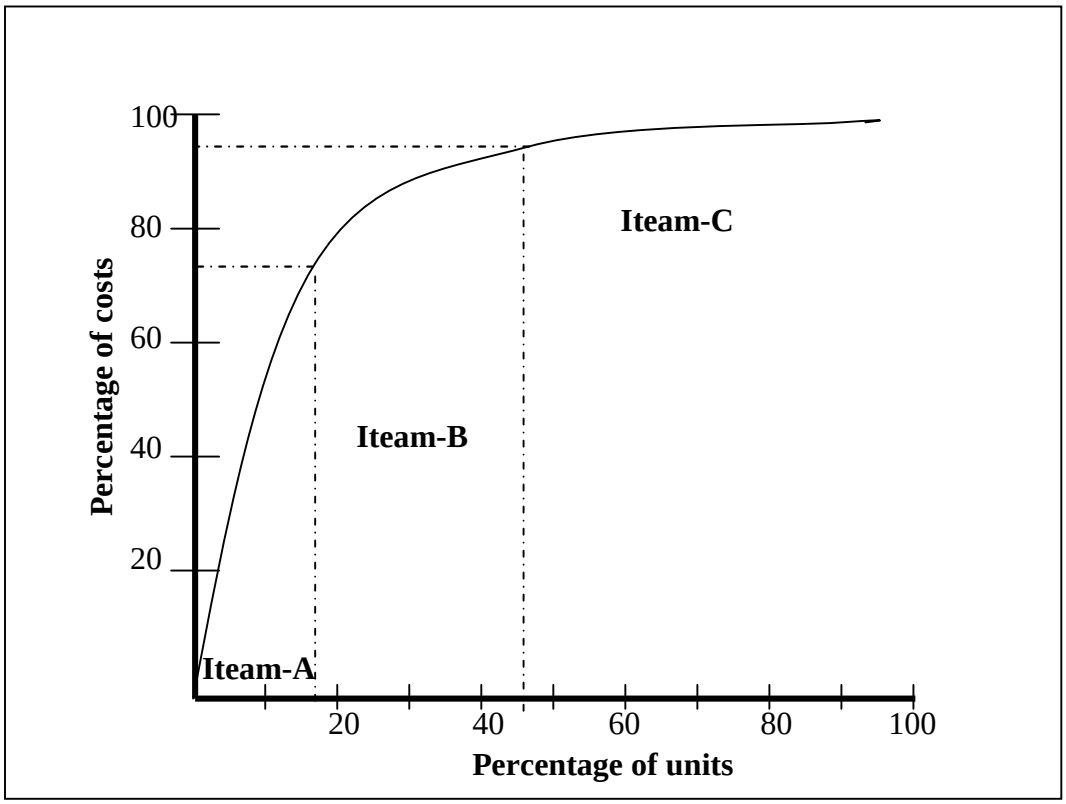
Source: Pandey, 2006 : 630

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’ represent 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 No. 2.5

Graphic Presentation of ABC Analysis



Source: Pandey, 2006 : 634

Some Point stand out table given about while group 'A' is the least important in terms of the number of items, it is by for 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 then 'A' but more that 'C', which involves only 10% of the total value although number-wise its share is as high as 55 percent.

2.7.5 Advantage of ABC analysis

i) A strict control is exercised on the items, which represent a high percentage of the materials 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 cost 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 seasonable quantity of materials, which account for high percentage of value of consumption, will be maintained in the stores. (Jain and Narang, 2001: II-21

2.8 Inventory Valuation

Conceptually, the process of value that multiplying physical quantity of goods by cost per unit. But in practice many organizations purchase different types of raw materials at different price at different times price material remain change time to time. There are many types of raw materials remain the stock. It isn't always possible to identify the individual particular purchase group. At that situation, firm have faced difficulties in valuation the inventory.

"The primary basis of accounting for inventory cost, which has been defined generally as the price paid or consideration given to acquire an assets. As applied to inventories, cost means in principal the sum of the applicable expenditures and charge directly of indirectly incurred in bringing an article to its existing condition and location." (AICPA, 1961:28) In any firm different goods are purchased at different time at different price. But the problem to assign value to these good 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 profit can not be calculated unless assets are properly values.

The false valuation of the inventory directly affects the profits. If inventory values at a lower value then actual, the profit will decrease and as result shareholders would get less dividend. On the other hand, if inventory is valued more than actual value, would be increased and the shareholders will receive more dividends a part

of which would 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 stick of the current period will become opening stock the next period.

Valuation of inventories affects profit of the year. Therefore, method of valuation of inventory should not be changed year to enable comparison of profit different years. Various methods of valuation of the inventory are as follows:

2.8.1 Specific Identification Method:

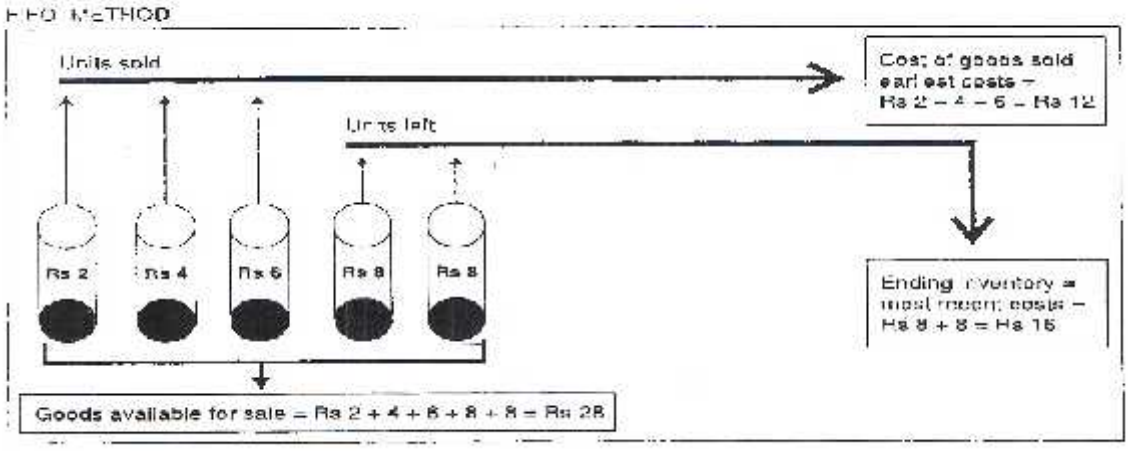
The specific identification method requires that each unit in inventory be identified with the particular time it was purchased. In this method, items have serial numbers or are distinguishable by modes, colures or size to identify the particular items but specific items separate at first and recorded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

2.8.2 First In First Out (FIFO) Method

This method is based on the premise that the first item purchase is the first item sold, that is, all the inventories are sold in the order in which they are acquired. Since the oldest stock in the inventory is sold first, the inventory is on the basis that the inventories in hand represent the ones most recently purchased or produced and cost of goods sold represents the cost of items acquired in the earlier purchase.

Figure No. 2.6

First In First Out (FIFO) Method



Sources: Mukharjee & Hanif 2010:11.5

Advantages:

1. Closing inventory is recorded strictly at cost.
2. Inventory costs are changed to products in the order of their incurrence.
3. There is no accounting recognition of unrealized holding grams or losses.
4. This method produces a Balance Sheet value of inventories close to current replacement cost.

Disadvantages:

1. Since current revenues are matched with oldest costs, its maximizes the effects of price fluctuations upon reported income.
2. The assigned to inventories may not reflect the current price.
3. This method should not be adopted during the period of rising prices.
4. Different costs may be assigned to inventories used for the production of identical jobs.

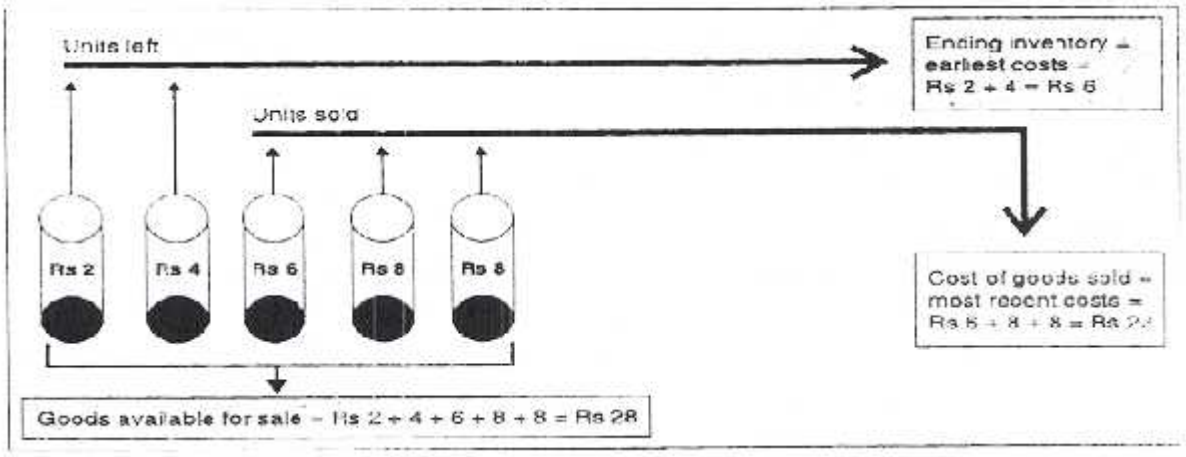
2.8.3 Last in First Out Method (LIFO) :

Under the last-in-First-out method, the mest recent units purchased are assumed to be First units sold, that is, the calculation of the cost of inventories is on the basis that the closing inventory in hand represents the earliest units purchased or

produced. Therfore, the inventories which are assumed to come from the most recent purchase or production and the closing inventories is assumed to have come from the earliest purchase or production.

Figure No. 2.7

Last in First Out Method (LIFO)



Sources: Mukharjee &Hanif 2010:11.6

A**dvantage:**

1. This method matches current costs with current revenues and, thereby,minimizes the distortions caused by inflation.

2. Stocks are valued strictly on cost.

3. This method tends to give the lowest possible values for net income and, thereby,liability for income tax cari be reduced.

Disadvantages:

1. This method cannot be adopted when prices fluctuate too frequently. When prices are rising, this method results in the higher costs being matched against current revenues. Conversely when prices are falling,the lowest costs are matched against current revenues.

2. This method seldom accords a physical flow of goods,rather a cost flow of goods.

3. The value of inventories in the Balance Sheet does not reflect the cuurent prices.

4. It permits a deferral in recognition of holding gains and losses.

2.8.4 Weighted Average (periodic) Method:

This method gives a middle course between the effects of FIFO and LIFO methods. Under this method, the costs to be assigned to be assigned to inventories are ascertained by applying to the closing inventory an average cost computed by dividing the total cost of units by the total number of such units. The average cost is calculated by applying the following formula:

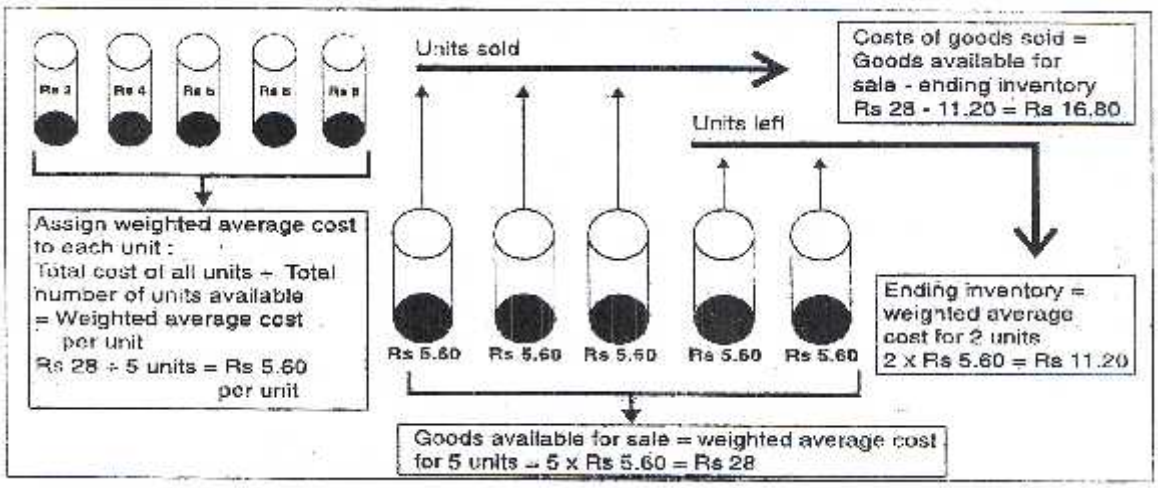
$$\text{Weighted Average Cost per Unit} = \frac{\text{Opening Inventory in Rs + Purchase (in Rs)}}{\text{Opening Inventory + Purchase (In units)}}$$

The value of the closing inventory is ascertained by multiplying the number of units on hand (from the physical count) by the weighted average cost per unit.

Under this method, inventory is valued at an assumed cost instead of actual cost. This is because this method assumes that all items available for sale during the year were acquired at an average cost, and that all items sold hold this same average cost (see the diagram below)

Figure No. 2.8

Weighted Average (periodic) Method



Sources: (Mukharjee & Hanif 2010:11.7)

Advantage and Disadvantages: As compared to FIFO and LIFO, in times of rising price, this method normally results in a higher cost of goods sold figure and, in effect, a lower net income figure than the FIFO method but in a lower goods sold and higher net income figure than the LIFO method. In the Balance Sheet, the value of the inventory normally gives a lower figure than FIFO but a higher figure

than LIFO. This method of costing inventory is used only with the periodic inventory method.

Example

The average cost per unit for calculating closing inventory is calculated as under = Rs 1,000 + Rs 9,000 + Rs 7,000

$$= \frac{\text{Rs } 1{,}000 + \text{Rs } 9{,}000 + \text{Rs } 7{,}000}{1{,}000+6{,}000+3{,}500} = \text{Rs } 1.62(\text{App.})$$

Therefore, the value of closing inventory will be 8,000 units @ Rs 1.62 per unit =Rs12,960

2.8.5 Weighted Average (Perpetual) Moving Average Method

This method can only be applied with the perpetual inventory method. Under this method, an average cost per unit for the Inventory is computed after each purchase. The following formula is used to ascertain average cost per unit:

$$\textit{Average Cost per Unit} = \frac{\textit{Total cost of inventory on hand (after each purchase)}}{\textit{Total number of units in inventory on hand (After each purchase)}}$$

Following is the perpetual inventory record under moving average:

2.8.6 Base Stock Method

To carry out production without any interruption, it is necessary to maintain a certain minimum level of stock. Under this method, cost assigned to stock is its original cost with was spent for purchasing such minimum stock. In other words, the cost is assigned to the inventories on the basis that a fixed unit value is ascribed to a predetermined number of units of inventory. if the actual inventory in hand exceeds the minimum level, such excess is valued by some other method. if the actual inventory falls below the minimum level, the level is treated as having been reduced permanently for the purpose of stock valuation and the fixed value is applied to the number in stock.

2.8.7. Standard Cost Method

LIFO, FIFO and weighted average cost method are after awkward to work within the subsidiary records for materials under perpetual inventory system. For this standard cost method may be used in accounting for individual items in materials inventory. *Goyal, 1997:294*

This method changes material unit into factory at a predetermined a budget or estimated price reflecting a normal or an expected future price receipts and issues of materials are recorded in quantities only on materials cared there by greatly simplifying the record keeping. Then, there is a basis for comparing existing cost from day to day. This should exist under normal condition.

2.8.8 Inflation Price Method

Under this method, closing stick is valued at a price higher than actual cost to provide normal loss.

2.8.9 Higher In First Out Method

This method is based on the assumption that closing stock of items always remains at the minimum value. So sots 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.

2.9. 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 stick for use in production while realizable price is used in respect of the items that are kept in stock for sale. This method is valuation of stock is followed when the market value is lower than the cost so that possible losses may be provided for. This method can also be successful used for the valuation for obsolete items of stock, which has been lying in the store for a long time. (Jain & Narang, 1995: 270)

2.9.1 Just In Time Inventory

Just in time inventory 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. “The management of inventory has become very sophisticated in recent years. In certain industries the production process lends itself to ‘just-in-time’ inventory control. As the name implies, the idea is that inventories are acquired inserted in production at the exact times they are needed. This requires efficient purchasing. It is Very reliable suppliers and efficient handling system. One thing that has made this possible is the advent of instant information through sophisticated computer networks.” (Van Horne, 1990: 450-451)

A JIT authoring and engineer at Toyota Motor Company identifies seven wastes, as target of continuous improvement in product process. The seven wastes are:

i) Waste of over production
ii) Waste of waiting
iii) Waste of transportation
iv) Waste of processing itself
v) Waste of stocks
vi) Waste of motions
vii) Waste of making defective products

2.10 Inventory and the Financial Manager

The inventory control methods give is a means for determining on optimal level of inventory, as well as how much should be ordered and when. These tools are necessary for managing inventory efficiently and balancing the advantages of additional inventory against the cost of carrying it. Computers have opened new words it inventory control and operation research has many applications to inventory management.

Although inventory management is not the direct operating responsibility of the financial manager, the investment of funds in inventory is an important aspect of financial management. Consequently, the financial manager must be familiar with

ways to control inventories effectively. The greater the opportunity cost of funds invested in inventory, the lower the optimum level of average inventory and the lower the optimal order quantity, all others things held constant. The EOQ model also can be useful to the financial manager in planning for inventory financing.

When demand or usage of inventory is uncertain the financial manager may try to effect policies that will reduce the average lead-time required to receive inventory once on order is place. The lower the average lead time, the lower will be the safety stock needed and the lower the total investment in inventory will be, all other things held constant. The greater opportunity cost of funds invested in inventory, the greater the inventive to reduce this lead-time. The purchasing department may try to find new vendors that promise quicker delivery, or it may pressure existing goods faster by producing a smaller fun. In either case, there is a trade off between the added cost involved in reducing the lead-time and the opportunity cost of funds tied up in inventory.

The financial manager is concerned also with the risk involved in carrying inventory. The major risk is that the market values of specific inventories will less than the value at which they were acquired. Certain types of inventory are subject to obsolesce, whether it is in technology or in consumer tastes. A change in technology may make and electronic component worthless. If change in style cause a retailer to sell at lower and lower prices, all the things being the same. In other situations, the principal risk is that of fluctuations in market price. Same types of inventory such as capper are subjected to rather wide price swings. The financial manager is perhaps in the best place to make an objective analysis of the risks associated with the firm's investment in inventories. These risks must be considered in determining the appropriate level of inventory the firm should carry.

The opportunity cost of funds is the link by which the financial manager tries inventory management to the overall objectives of the firm. In this regard, inventory can be treated as an asset to which capital is committed, as any capital budgeting project. Different items of inventory may involve different risks, and these differences can be incorporated in to an analysis of risk, similar to that for capital budgeting. We know that the greater the efficiency with which the firm

manage its inventory, the lower the required investment and the greater the shareholders wealth, all other things being the same.

2.11 Inventory in Nepal Accounting Standard

2.11.1 Introduction of Nepal Accounting Standard

The Accounting Standards Board (ASB) is an independent statutory body with the responsibility to set and issue accounting standards for preparation and presentation of financials statements in Nepal. The ASB was established in March 2003 with an amendment to the Institute of Chartered Accountants of Nepal Act 1997 incorporating the provision for its establishment and operation. The ASB is primarily responsible for setting accounting and financial reporting standards for business enterprises in line with the International Financial Reporting Standards (IFRSs). Since 2007, ASB has also been entrusted by Nepal Government with the responsibility to develop accounting standards for public sector in line with the International Public Sector Accounting Standards (IPSASs).

The ASB consists of 13 members comprising a Chairman appointed by the Government of Nepal from Fellow Chartered Accountants and other members representating from Ministry of Finance, Office of the Auditor General, Financial Comptroller General Office, Inland Revenue Department, Company Registrar Office, Security Exchange Board, the Institute of Chartered Accountants of Nepal and the Registered Auditors.

2.11.2 Definitions of inventories

The following terms are used in this Standard with the meanings specified: Fair value is the amount for which an asset could be exchanged, or a liability settled, between knowledgeable, willing parties in an arm's length transaction Inventories are assets:

a. Held for sale in the ordinary course of business;

b. In the process of production for such sale; or

c. In the form of materials or supplies to be consumed in the production process or in the rendering of services. Net realizable value is the estimated selling price in

the ordinary course of business less the estimated costs of completion and the estimated costs necessary to make the sale.

2.11.3 Measurement of inventories

Inventories shall be measured at the lower of cost and net realizable value.

2.11.4 Cost of inventories

The cost of inventories shall comprise all costs of purchase, costs of conversion and other costs incurred in bringing the inventories to their present location and condition.

2.11.5 Cost of purchase

The costs of purchase of inventories comprise the purchase price, import duties and other taxes (other than those subsequently recoverable by the entity from the taxing authorities), and transport, handling and other costs directly attributable to the acquisition of finished goods, materials and services. Trade discounts, rebates and other similar items are deducted in determining the costs of purchase. Costs of conversion

Other costs

Example of costs excluded from the cost of inventories and recognized as expenses in the period in which they are incurred are:

a. Abnormal amounts of wasted materials, labour, or other production costs;
b. Storage costs, unless those costs are necessary in the production process prior to a further production stage;
c. Administrative overheads that do not contribute to bringing inventories to their present location and condition; and
d. Selling costs.

2.11.6 Techniques for the measurement of cost

Techniques for the measurement of the cost of inventories, such as the Standard cost method or the retail method, may be used for convenience if the results

approximate cost. Standard costs take into account normal levels of materials and supplies, labour, efficiency and capacity utilization. They are regularly reviewed and, if necessary, revised in the light of current conditions.

2.11.7 Cost formulas

The cost of inventories of items that are not ordinarily interchangeable and goods or services produced and segregated for specific projects shall be assigned by using specific identification of their individual costs.

The cost of inventories shall be assigned by using the first-in, first-out (FIFO) or weighted average cost formula. An entity shall use the same cost formula for all inventories having a similar nature and use to the entity. For inventories with a different nature or use, different cost formulas may be justified.

2.11.8 Net realizable value

The cost of inventories may not be recoverable if those inventories are damaged, if they have become wholly or partially obsolete, or if their selling prices have declined. The cost of inventories may also not be recoverable if the estimated costs of completion or the estimated costs to be incurred to make the sale have increased. The practice of writing inventories down below cost to net realisable value is consistent with the view that assets shall not be carried in excess of amounts expected to be realized from their sale or use.

2.11.9 Recognition as an expense

When inventories are sold, the carrying amount of those inventories shall be recognized as an expense in the period in which the related revenue is recognized. The amount of any write-down of inventories to net realizable value and all losses of inventories shall be recognized as an expense in the period the write-down or loss occurs. The amount of any reversal of any write-down of inventories, arising from an increase in net realizable value, shall be recognized as a reduction in the amount of inventories recognized as an expense in the period in which the reversal occurs.

2.11.10 Disclosure by Nepal Accounting Standard About Inventory

The financial statements shall disclose:

(a) The accounting policies adopted in measuring inventories, including the cost formula used;

(b)The total carrying amount of inventories and the carrying amount in classifications appropriate to the entity;

(c) The carrying amount of inventories carried at fair value less costs to sell;

(d) The amount of inventories recognized as an expense during the period;

(e) The amount of any write-down of inventories recognized as an expense in the period.

(f) The amount of any reversal of any write-down that is recognized as a reduction in the amount of inventories recognized as expense in the period.

(g)The circumstances or events that led to the reversal of a write-down of inventories.

(h) The carrying amount of inventories pledged as security for liabilities.

2.12 Related Studies on Inventory Management

2.12.1 Review of Articles:

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.

Agrawal (1980), management expert of Nepal, claims that inventory management in Nepal is probably the weakest aspect of management. The tools and techniques for controlling inventory has not been applies in Nepalese enterprises for controlling their physical as financial dimensions.

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.

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.

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

2.12.2. Review of Related Studies

Some researchers have been made in the area of Inventory management in Nepalese context for the fulfillment of Master Degree in Business studies (MBS) and master degree in Business Administration (MBA). A few researchers made the research in inventory management of manufacturing company. Among them some selected are review.

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

a) Factory had not produced the materials in the basis of economic order quantity.
b) There was no mechanized system for handling materials.
c) The inventories of shoes and upper leather were so high which had tied up huge amounts.
d) The inventory turnover ratio was satisfactory.
e) Whole inventory position of the factory was in increasing order.

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

Puspa Raj Baral (1994) he has made study regarding “Inventory management: A case Study of Gandaki Noodles Pvt. Ltd.” The main objective of his study was highlighting the company’s policies and objectives functions and activities regarding inventory management. Finally he came to know that the factory is

following neither economic order quantity model in its purchasing decision not ABC analysis in inventory management.

Ojha (1995) had also made the study on the profit planning in public manufacturing with comparative study of Royal Drug Limited (RDL) and herbs production and processing company (HPPC). The company had not adopted optimum inventory policy and paid due attention while preparing new material purchase and raw material requirement budget. Te use of EOQ technology was completely ignored by the RDL.

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 into practicable and realistic.

Amrit Kumar Sharma Gaire (1999) has conducted a research work on the topic of "Inventory Management: a case study of Royal Drug Ltd.(RDL)". The main objective of his study is to identify the problem underlying in inventory management and control system of RDL. Other objectives of his study are:

i) To assess the type of inventory maintained in RDL.
ii) To examine that the techniques being employed to manage the inventory RDL.
iii) To suggest proper inventory model to RDL based on analysis.
iv) To find out inventory position of RDL.

On the basis of study conducted by Mr. Gaire the following suggestion have been recommended.

i) The company should define its objective and goals clearly.
ii) The company should follow all the quantitative techniques and models such as EOQ model, ABC analysis model so that total inventory can be reduced.
iii) Ledger cards can also be used to manage inventory in a simply way.
iv) General Manager should be professional one and be should not changed frequently due to political interference.

Singha Raj Basnet (1999) his degree thesis expressed his view that reality Himal Cement Company Limited (HCCL) is not applying the different method or

techniques of inventory management. To manage its inventory effectively a firm analysis, re-order level etc. in inventory management, which minimizes in 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 with run profit in future.

Indra Shrestha (2000) conduct the empirical study on "Inventory management of Manufacturing Industries in Nepal (with special reference to Kwick Food)". She tried to highlight the inventory management of Thai foods and kwick foods, to find out applied techniques used to manage inventory, to analyze existing inventory position of Thai food and kwick food and to analyze the profit and production cost. During her study, she found that company was not purchasing raw material from inside the country. Company was not using ABC classification, EOQ techniques while managing inventory. She suggested the company keep record in scientific way, to purchase raw material from inside the nation, to increase the selling price of product according to cost price, to use ABC classification to use EOQ technique while managing inventory.

Sanuja Shrestha (2005) had studied about the inventory problem 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 quality of collected materials are fluctuating from year to year. The company is not adopted appropriate EOQ model in purchasing decision.

Saraswoti Poudel (2011) her degree thesis expressed her view that reality Bottlers Nepal (Terai) Limited (BNTL) is not applying the different method or techniques of inventory management. To manage its inventory effectively a firm analysis, re-order level etc. in inventory management, which minimizes in the inventory, cost consequently will result into positive profitability. The company is not adopted appropriate EOQ model in purchasing decision

2.13 Research Gap

These few studies conducted earlier have now needed to carryout a study to assess the recent development in inventory management. The data used in the previous study is of five years but this study covers the data of seven years. Although there various studies related to inventory management regarding different organizations and available in different libraries, but reviewed literature indicates that there are few studies devoted in inventory in Nepalese context. Nobody of the earliest studies has focused on role of inventory in overall profit planning of the organization although inventory and different components of profit planning like production planning, purchase planning etc. are closely related to each other. Similarly nobody analyze the applicability Nepal Accounting Standard (NAS) in inventory Management of BNTL Ltd. As well as manufacturing industry. Similarly nobody had shown the relationship of inventory with sales, production and purchase although. They are closely related to each other. Moreover this study has not been done by previous researcher as separately. Further no one had tested the correlation of different parts of the inventories. Further here the researcher had analyzed the t-test of correlation of coefficient. Thus to fill the gap this study has been conducted. Thus this study will be milestone in the field paper mill ltd. In spite to above, multiple gaps among the researchers view as well as there is time gap regarding the study of inventory management.

CHAPTER-THREE

RESEARCH METHODOLOGY

This chapter presents research methodology adopted in achieving the objectives of the study. This chapter contains nature of research, nature and sources of data information, data collection procedure and finally different accounting and statistical tools and techniques were used to analyze the relevant information.

Research methodology is the way to solve systematically about the research problem. It is the planned and systematic dealing with collection, analysis and interpretation of fact and figures.

The basic objective of the study is to envision the present position of the inventory management and impact on profitability and efficiency of BNTL. We need appropriate research methodology to achieve the objective of the study. The study on the inventory management of BNTL concentrates in the issues of efficiency to maintain inventory management systematically. So, that the inventory can be controlled properly and cost minimized for the inventory.

3.1. Research Design

Research design is the plan, structure and strategy of investigation conceived. The plan is the overall scheme of program of research. It includes and outlines of what the investigator will do from writing the hypothesis and their operational implication to the financial analysis of data. The research design is plan to obtain the answer of research questions through analysis of data. Research is systematic search for knowledge. It applies scientific methods of the study of universe.

A research design in the arrangement of conditions of collection and analysis of data in a manner the aims to combine relevance to the research purpose with economy in procedure. The formidable problem that follows in task of defining the research is the preparation of the research project popularly known as research design.

The study will also focus on the quantities aspects of effectiveness of inventory management and theoretical prescription 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 "Inventory Management of BNTL deals with procuring sales and distribution procedure, trend 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

The total numbers of manufacturing industries in Nepal are the population to this study because research work is related with inventory management of manufacturing industry in Nepal. At present 18 listed Manufacturing company in Nepal But due to the various limitations such as time, financial resource, availability of data etc. constrained the study, for this reason, only one manufacturing company Bottlers Nepal (Terai) Limited is randomly selected for the purpose of the research work.

3.3. Nature and Sources of Data

According to the nature of the data the result will be obtained. So information is the life blood of any research work. To fulfill the objectives of the study primary data are collected through questionnaire, informal interview as will as unstructured dialogues and discussions with staffs of BNTL. While secondary data were collected from the following sources.

i) Annual report and financial statement of the company.
ii) Published and unpublished official
iii) Previous unpublished thesis and other related documents.
iv) Nepal Accounting standard
v) Other news paper, article and magazine etc.

3.4. Data Gathering Procedures

Data gathering consists of obtaining information from somebody's hand. It is very difficult activity of the whole research process but it is most important part of the research. The secondary data are directly obtained from various sources mentioned above for the purpose of data analysis. These are taken from Bottler Nepal (Terai) Limited and get information from the records. For primary information, with a view of collecting the additional information, with a view of collecting the additional information, information interviews with the official have been taken. All the gathered data have been used accordingly to need and requirement of the study.

3.5. Data Period Covered

The study covers the period of seven years i.e. F/Y 2061/062 to 2067/068.

3.6. Tools and Technique used in Presentation and Analysis of collected data

To analyze the collected facts and figures, various, statistical, tools are used for the effectiveness of inventory management and control wherever necessary. The techniques includes are statistical tools, graphs, Karl Pearson coefficient and correlation. And the inventory management techniques applied in this study is EOQ, different stock levels, inventory turnover and ABC analysis.

3.6.1. Descriptive Analysis

Descriptive analysis consist the purchase practices, 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 is as follows.

3.6.2.1. Economic Order Quantity (EOQ)

The economic order quantity may be defined as that level of inventory order that minimize the total cost associated with inventory management. In terms of calculation, EOQ is calculated in Rupees due to the unavailability of data quantity. EOQ can be determined by the following way.

i) Formula method

ii) Table method

iii) Graph method

i) Formula method:

Carring cost of EOQ = Ordering cost of EOQ

or $\frac{EOQ}{2}C = \frac{A}{EOQ}O$

or $EOQ^2 C = 2AO$

or $EOQ^2 = \frac{2AO}{C}$

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

Where,

A = Annual demand

O = Ordering cost per order

C = Carrying cost per unit per year Thus, EOQ mainly depends on two types of costs.

a) Ordering Cost: Ordering costs are also termed as a preparation cost, 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 includes.

i) Set up cost of machine and finished goods inventory.

ii) Clerical costs

iii) L/C 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

i) Interest on capital investment

ii) Clerical and staff

iii) Loss due to pilferage, spillage, deterioration and obsolescence

iv) Insurance

ii) Table Method:

Example

Annual requirement = A

Cost of per order = O

Carrying cost per unit =C

Table No. 3.1

Calculation of economic order quantity under Table Method

S.N	No of order (N)	1	2	3	4	5	6	7
i	Order Size (Q)							
ii	Average Quantity (ii÷i)							
iii	Total Carrying Cost (Q/2)×C							
iv	Total Ordering Cost (N×O)							
v	Total Cost (iv+v)							

In the above table, we find lowest cost order number is where economic lot size. Therefore, this units is economic order quantity .this lot size where the carrying cost and ordering cost are equal.

Where, Order Size $= \frac{Annual\ Requirement}{Number\ of\ Order}$

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

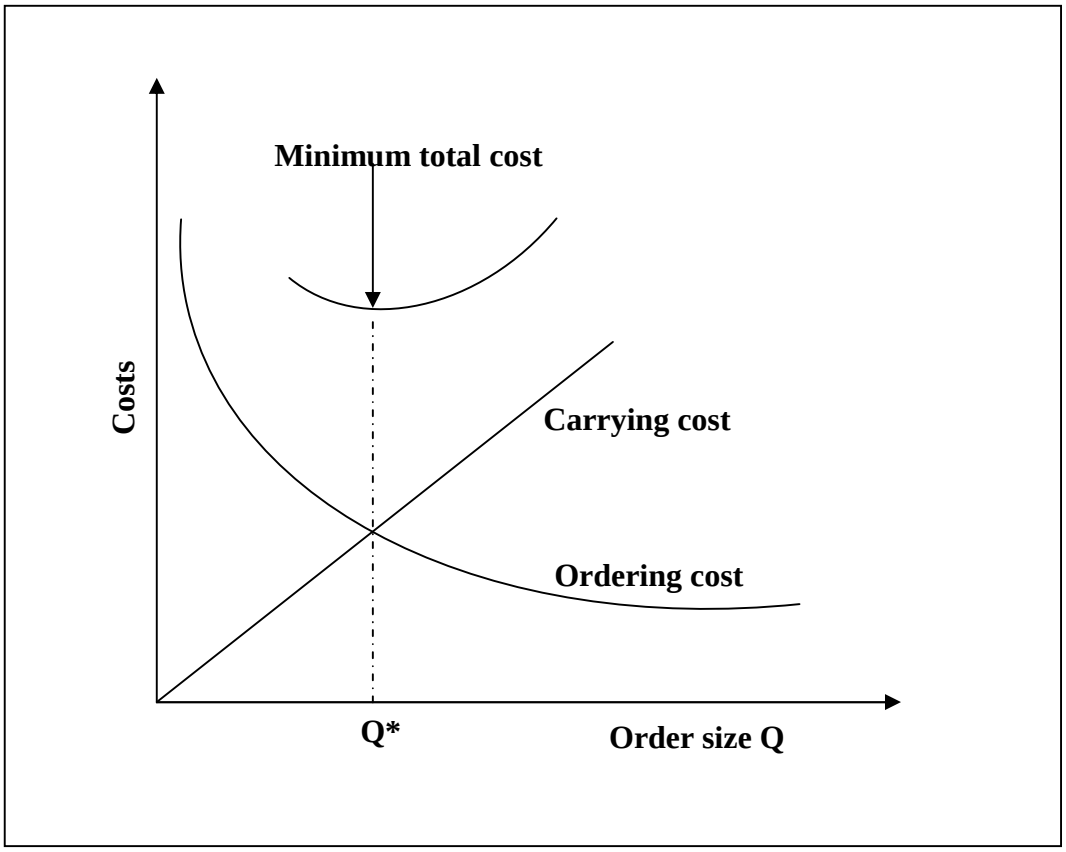
Total Carrying Cost = Carrying Cost per Unit × Average Inventory

Total Ordering Cost = Total Cost of an Order × Number of Order

iii) Graphical Approach of EOQ

Figure No: 3.1

Graphical Approach of EOQ



Sources: Pandey, 2006:629

In the figure x- axis represent the order size and y-axis represent the cost. We note that carrying cost increase as the order size increases because, an average a large inventory level will be maintained and ordering costs decline with increase in order size because large order size means less number of orders. The behavior of total cost line is noticeable since it is a sum of two types of cost, which behave differently with order size. The total cost decrease in average ordering cost is more than off set by the increase in carrying cost. *Pandey, 2006:629*.The economic orders quantity occurs at the point 'Q' when the total cost is minimum. If the order is increase, carrying costs exceeds ordering costs that are saved. Thus, the firm operating profit maximized at point Q.

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:

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

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 computed as:

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

The inventory conversion period is the overage 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 stage 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:

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

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

3.6.2.5 Inventory Turnover:

Inventory turnover is calculated to show the rate of turn over 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 8 times. This ratio is worked out by dividing the COGS with the average.

$$IT = \frac{GOGS}{Average\ Inventory}$$

This ratio is an indication of the efficiency of the management of finished goods stock. If the ratio is high, then the efficiency will be considered to at high level but if the ratio is low, then steps will have to be taken to increase sales. Otherwise liquid position of the concern will be adversely affected and the concern might rut the risk of insolvency.

3.6.2.6 Inventory to Current Assets (ICA)

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

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

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

3.6.3 Statistical Tools

Statistical tools used for the study are 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 Karl Pearson's Correlation Coefficient

This method popularly known as Pearson's coefficient of correlation widely used 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.

i) Annual required and annual purchase
ii) Sales and closing stock
iii) Purchase and closing stock

iv) Sales and purchase

According to the Karl Pearson correlation coefficient is calculated as follows:

$$r_{xy} = \frac{N\sum XY - \sum X \times \sum Y}{\sqrt{[N\sum X^2 - (\sum x)^2][N\sum Y^2 - (\sum Y)^2]}}$$

Where,

x = The first variable

y = The next variable

n = Number of years (Observation)

3.6.3.2 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 ht 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.

$$Y = a + bx$$

Where,

Y = The estimated value of Y for given value of obtained from the line of regression of Y on X

a = Intercept or mean value of Y

b = Stop of trend line/rate of change

x = Time (in time series analysis)

$$a = \frac{\sum y}{\sum x}$$

$$b = \frac{\sum xy}{\sum x^2}$$

Where,

a = Regression constant (Intercept)

b = Regression coefficient of change

$\sum Y$ = Total value of dependent variable

$\sum XY$ = Total value of the production of items in the two series

$\sum X^2$ = Total value of the sum of the times in X series

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.

3.6.3.3 Probable Error

Probable error is an old measure of ascertaining the reliability of the value of Pearson's coefficient of correlation. 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 below

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

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

$$\text{P.E. (r)} = 0.6745 \times \text{S. E. (r)}$$

$$= 0.6745 \times \frac{1 - r^2}{\sqrt{n}}$$

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

CHAPTER-FOUR

PRESENTATION AND ANALYSIS OF DATA

In this chapter effort have been made to process the obtained data analysis and interpret them. The available data are presented in table and graph and they are analyzed with the help of statistical mathematical and inventory management tools and are finally interpreted to explore the facts related to inventory management in BNTL.

4.1. Descriptive Analysis

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

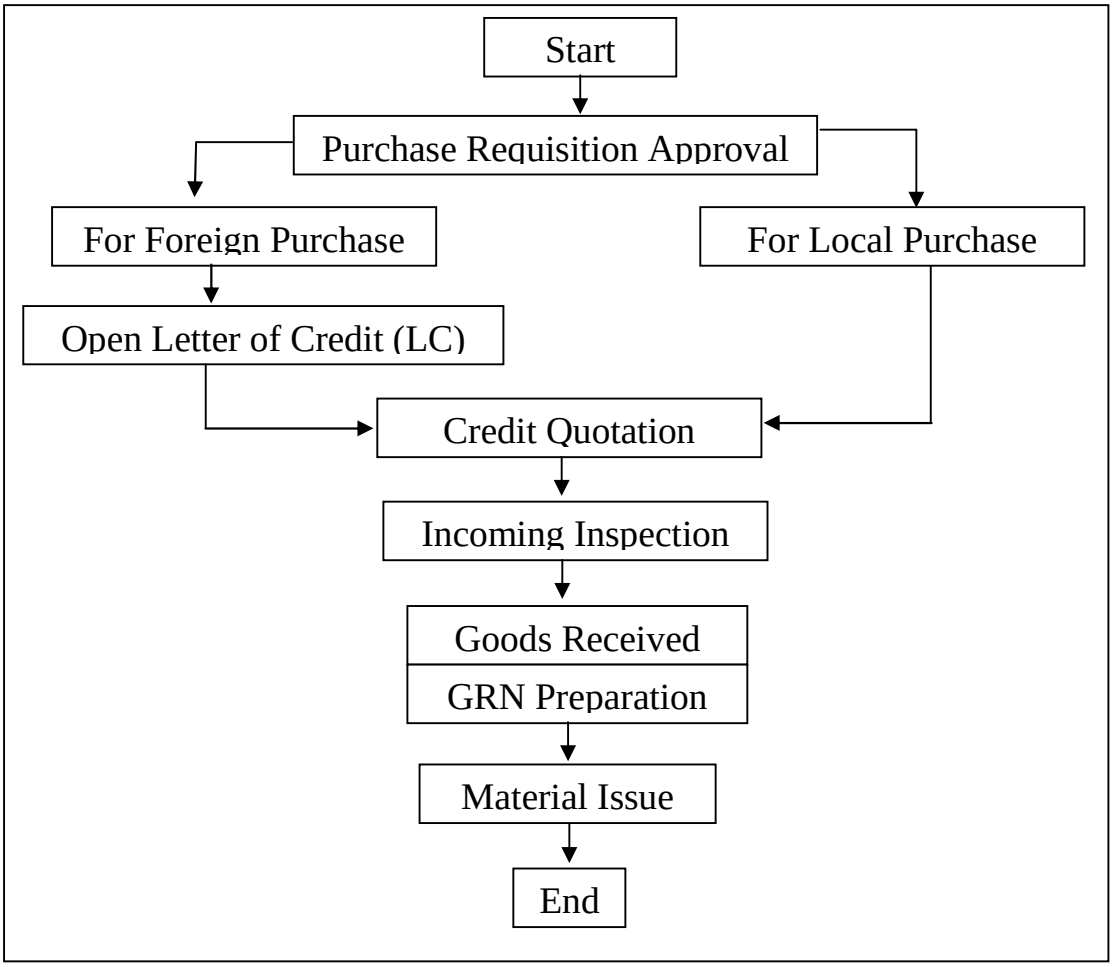
4.1.1. Purchasing Procedure in BNTL

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

BNTL need 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 No. 4.1

Purchasing Procedure of Essential in BNTL



Source: Standard operating Procedure of BNTL.

4.1.1.1. Collection of Requisition

Purchasing manager of purchasing department of BNTL collect the purchase requisition from the store department for all items and start immediately with the collection of purchase requisition from the respective department for the supply of essential.

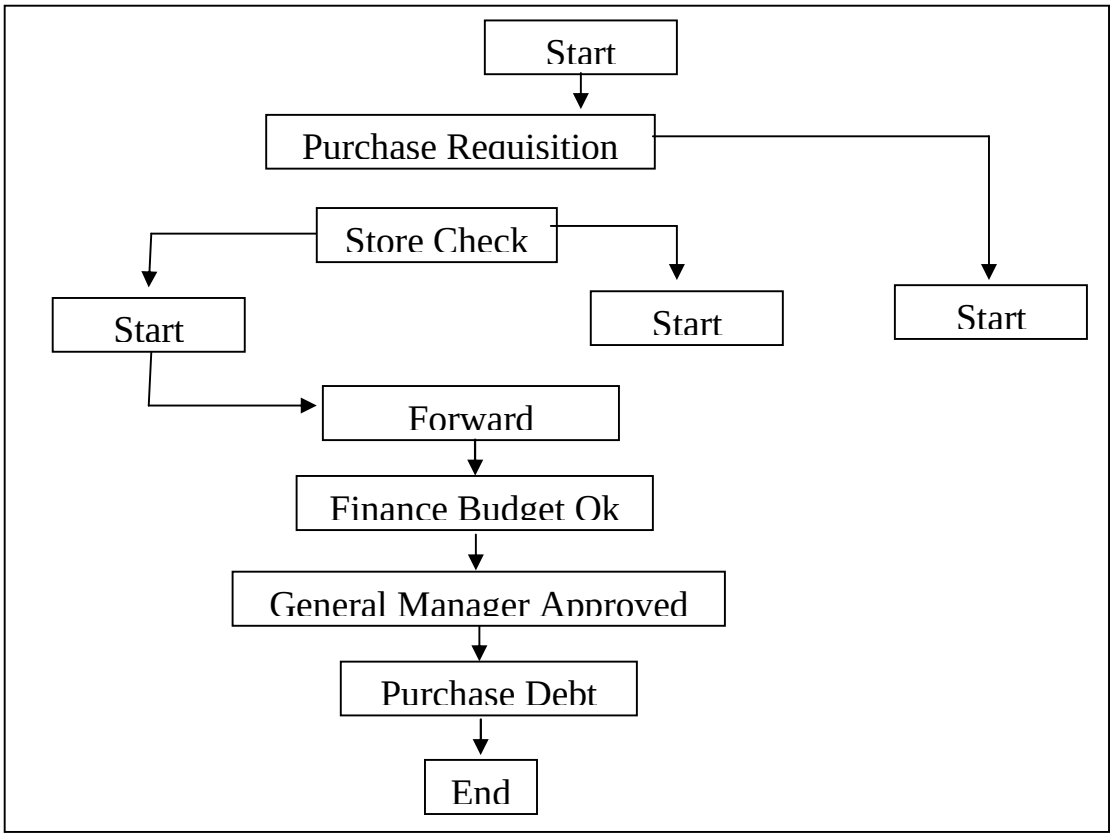
4.1.1.2. Approval of Purchase Requisition

When the purchase requisition is received by the purchasing department, then purchasing manager decides, what when and how much to buy. Once the concern departments experience the deficit of raw materials, it fills the purchase requisition from. Store department checks the availability of that raw material in store. If it is

available in sufficient quantity at the store then the process in 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 the process is presented in figure.

Figure No. 4.2

Approval of Purchase Requisition of BNTL



Source: Standard operating Procedure of BNTL.

The quantity of purchasing raw materials directly affects the investment on inventory and the cost associated with inventory, ultimately affects the profitability rate of the company. So the company should determine appropriate purchase quantity of raw materials to minimize the investment on inventory and cost associated with it. To cope with this situation the company may apply the EOQ model to determine the appropriate quantity of EOQ materials.

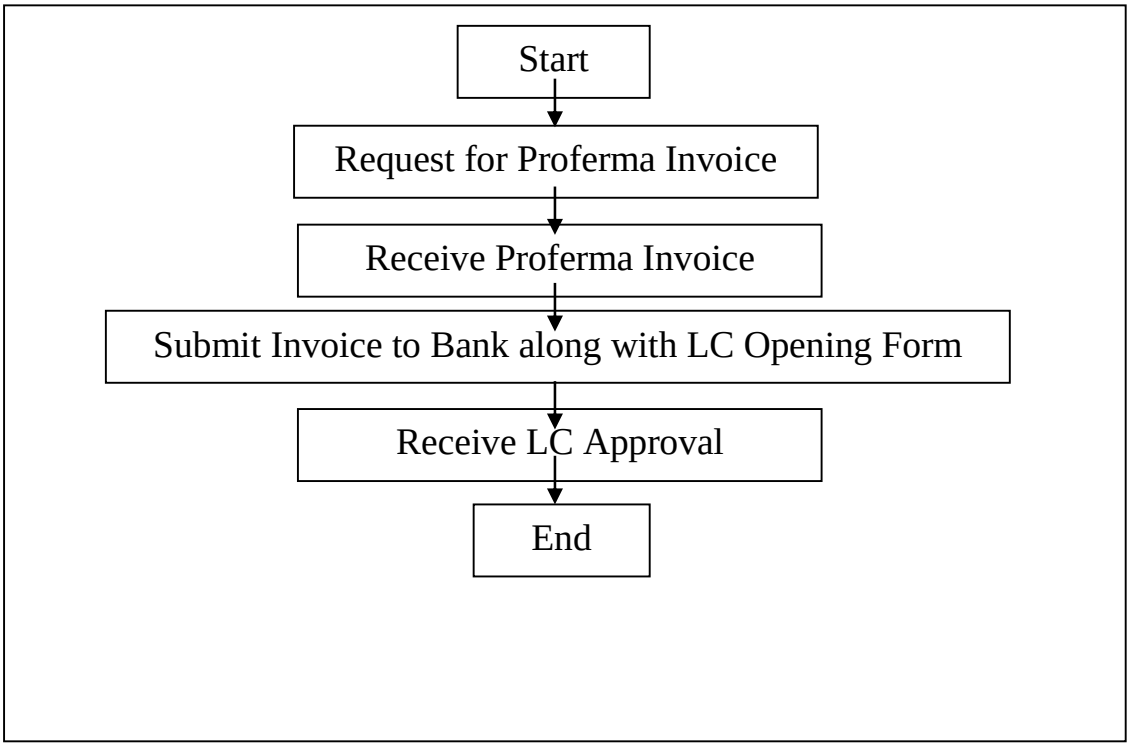
4.1.1.3 Opening of Letter of Credit (LC)

It is generally applicable for important for materials from foreign countries. Opening of L. C. starts with the request for proferma invoice to the bank. After

receiving such proferma invoice, it will submit to concern band along with L.C. opening form. At the end the bank provides L.C. approval. (Figure 4.3 shows the steps of opening LC)

Figure No. 4.3

Opening of Letter of Credit (LC) of BNTL



Source: Standard operating Procedure of BNTL.

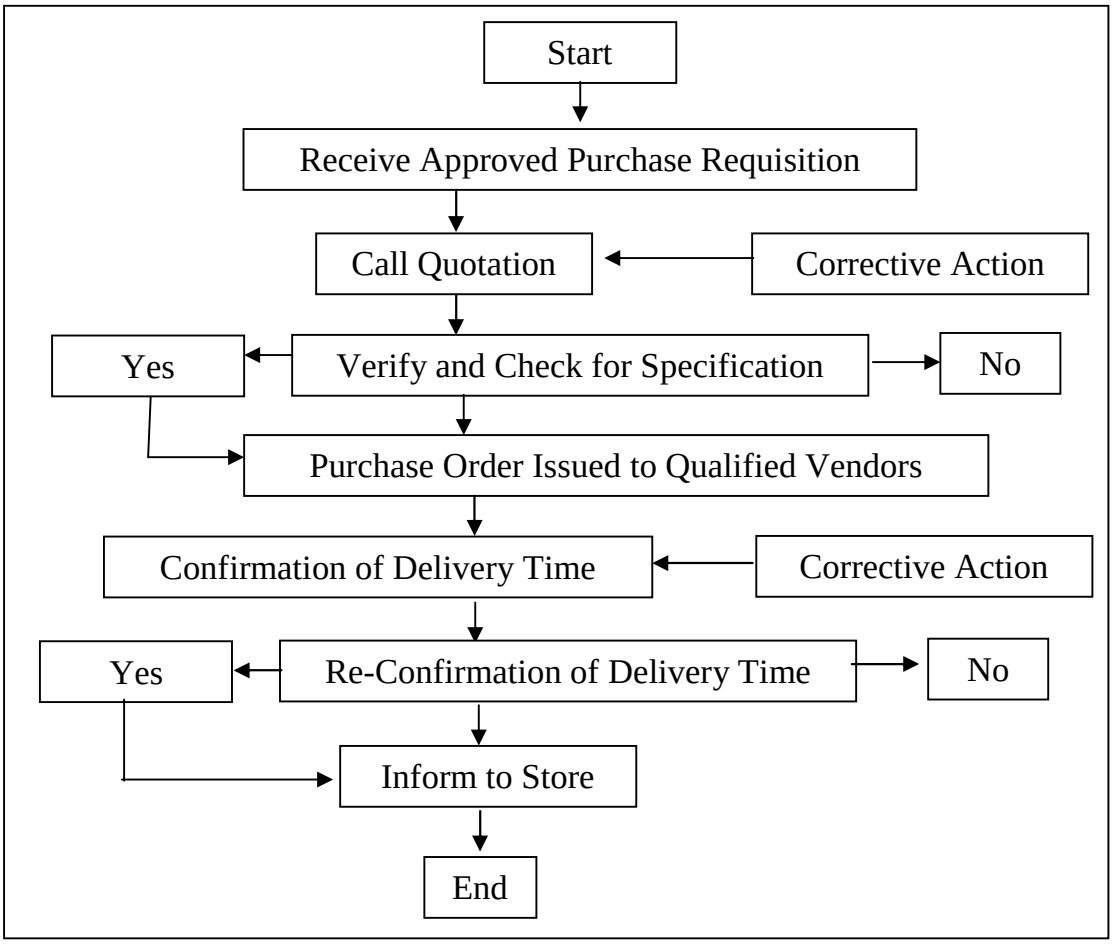
4.1.1.4. Purchase Procedure

Purchasing is the first important function of inventory management in any manufacturing company. So, BNTL also requires different types of raw materials such as coke, 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 of goods quotation will be re-called. Otherwise purchase order will be issued to qualified suppliers specifying the delivery time and store will be informed for sequential of the purchase procedure.

Figure No. 4.4

Purchase Procedure of BNTL



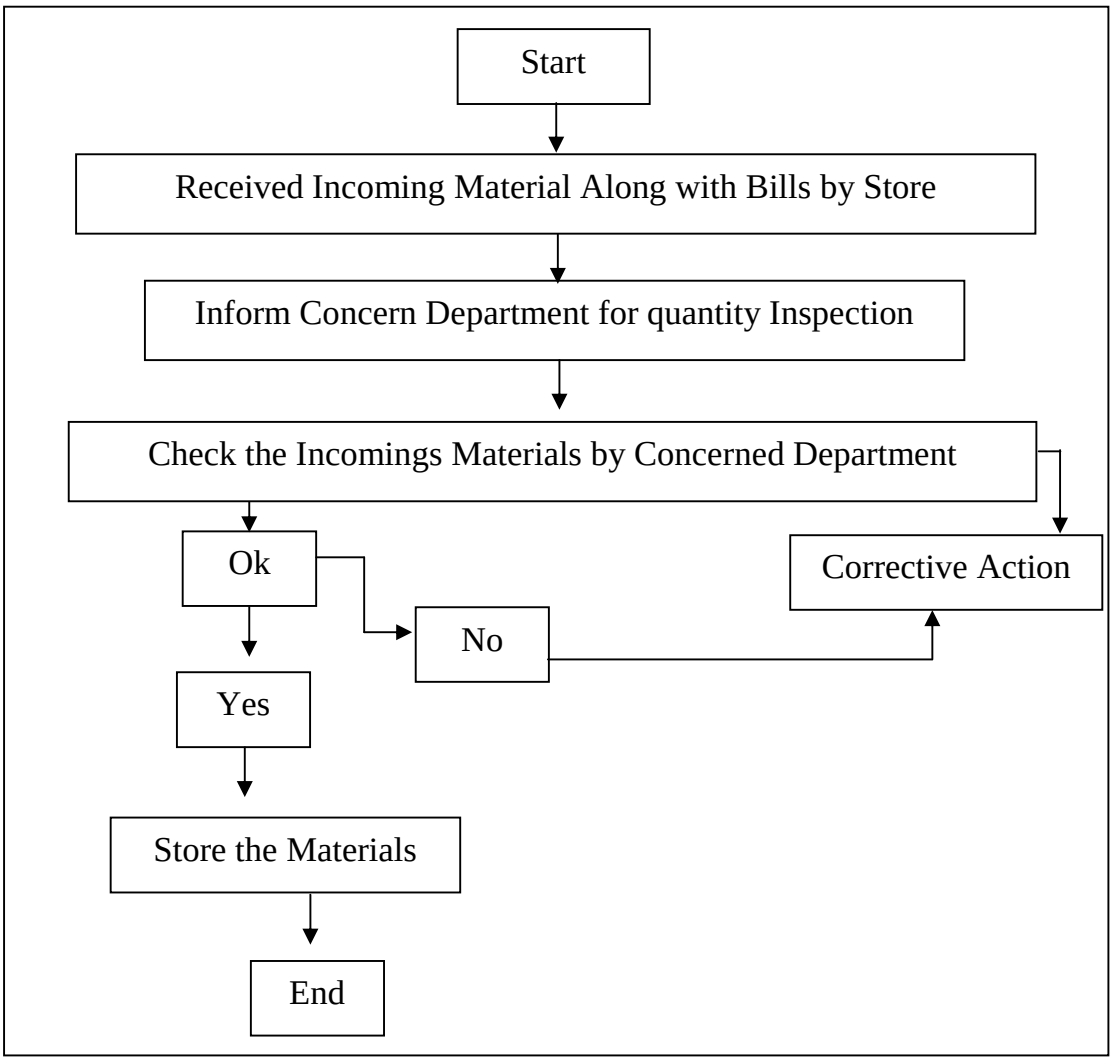
Source: Standard operating Procedure of BNTL.

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 quality inspection. The responsibility of verifying department, but the responsibility to see whether those 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 have to be taken to ensure the correct material of specified quality at correct amount. The flow action of incoming inspection is presented in figure 4.5.

Figure No. 4.5

Incoming Inspection



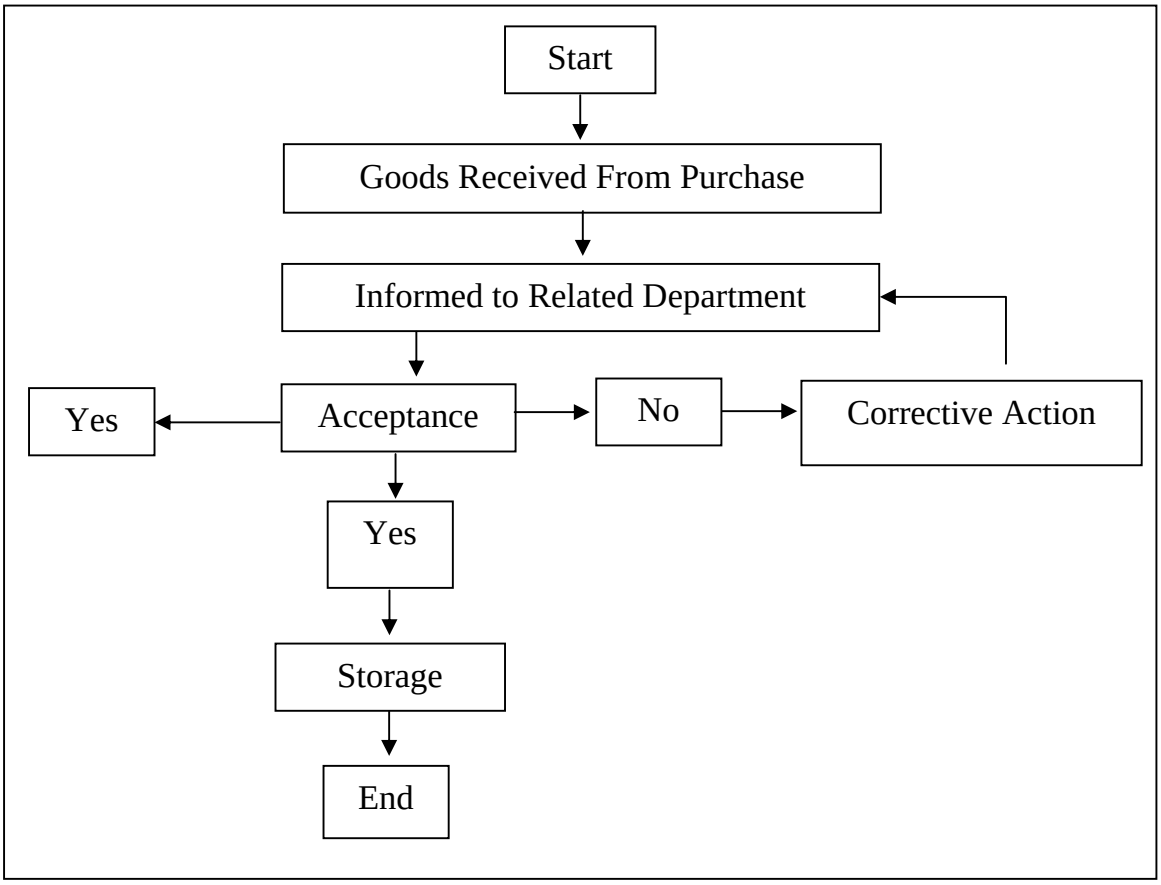
Source: Standard operating Procedure of BNTL.

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 form purchase the related department have to be informed for its acceptance. Than it finally will goes to storage from where concerned department acquire as per it needs. Figure 4.6 shows the picture of goods receiving process.

Figure No. 4.6

Goods Receiving Process of BNTL



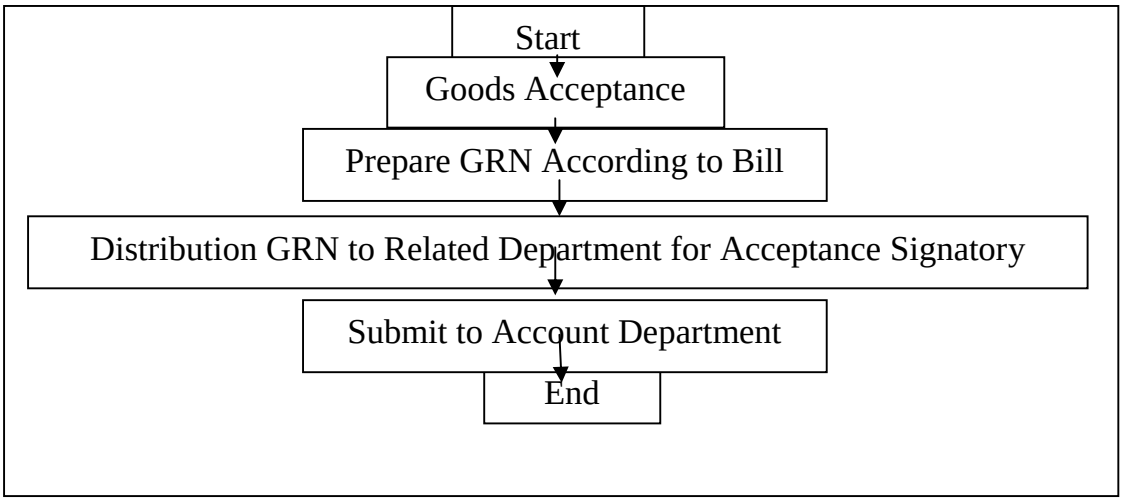
Source: Standard operating Procedure of BNTL.

4.1.1.7 GRN Preparation

GRN (Goods Receiving Notes) should have to be prepared after the foods 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 presented in figure 4.7

Figure No. 4.7

GRN Preparation of BNTL



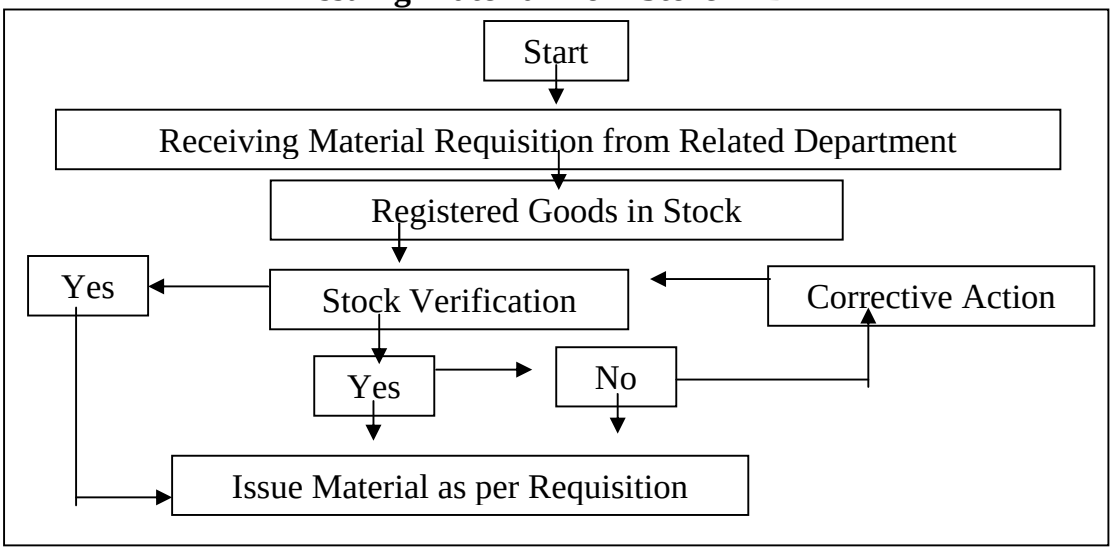
Source: Standard operating Procedure of BNTL.

4.1.3 Issuing Materials

After receiving material requisition from the related department store check the registered goods in stock. Then the stock verification will be made. It is 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 No. 4.8

Issuing Material from Store in BNTL



Source: Standard operating Procedure of 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 Purchase of Raw Materials

Annual requirement and annual actual purchase of raw materials made by the company on different years. Here, there is an erotic rise and fall in both annual requirement and annual purchase of raw materials for the given years. The annual requirement of raw materials of whole seven years, show that there is high fluctuation, Similarly annual purchase of raw materials made by the company shown at increasing trend. The high purchase made in FY 067/068.

Table No. 4.1

Relationship between Annual Requirement and Annual Purchase of Raw Materials *(Rs. in Million)*

Year	Annual Requirement	Annual Purchase	% change Annual Requirement to Annual Purchase
061/062	111.84	112.93	0.97
062/063	164.92	174.24	5.65
063/064	139.89	180.90	29.32
064/065	143.77	136.40	-5.12
065/066	164.30	174.20	6.03
066/067	258.80	262.30	1.35
067/068	281.30	293.10	4.19
Average	180.73	190.63	
S. D.	63.99	68.85	
C. V.	0.35	0.34	

Source: Annual Reports of BNTL form the F/Y 2061/062 to 2067/068

Above table, we compared between annual requirement of raw materials and annual purchase of raw materials, we can see annual requirement of raw material is

always exceeded than annual purchase of raw materials over the period for the FY 2066/067 and 2067/068. In FY 2064/065 annual purchase of raw material is less than annual requirement of raw material but that situation was changed over next two years. In FY 2066/067 and 2067/068 annual purchase of raw material is exceed than annual requirement by 1.35% and 4.9% respectively. Before that annual purchase of raw material was always less than annual requirement of raw materials. In FY 2061/062, 2062/063, 2063/064 and 2065/066 annual requirement of raw material exceeded 0.97%, 5.65%, 29.32% and 6.05% 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 BNIL of seven years was 180.73 and other annual purchase was 190.63, which is less compare between requirement and purchase. Standard deviation for annual requirement and annual purchase of raw material was found 63.99 and 64.85 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 0.34 for annual purchase was 0.35 for annual requirement. In short we concluded that annual requirement is more reliable than annual purchase. In other word, annual inconsistent purchase is the symbol of poor estimation of annual requirement.

4.2.2 Calculation of Economic Order Quantity

The Economic Order Quantity (EOQ) is an important concept in the purchase of raw material as well as in the storage of finished goods and in transit inventories. In our analysis we wish to determine the optimal order quantity for a particular item of inventory given, its forecasted usage, ordering cost and carrying cost, ordering means either the purchase of the item or the production. Assume, for the moment that usage of a particular item of inventory is known with certainty.

The formula techniques are an important method to calculate economic order quantity. The economic order quantity can using a short cut method, be calculated by the following equation.

Carring cost of EOQ = Ordering cost of EOQ

or $\frac{EOQ}{2}C = \frac{A}{EOQ}O$

or $EOQ^2 C = 2AO$

or $EOQ^2 = \frac{2AO}{C}$

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

Where, A = Annual demand, O = Ordering cost per order
C = Carrying cost per unit per year

Table No. 4.2

Calculation of Economic Order Quantity (EOQ)

Year	**Annual Requirement (Rs.in Million)**	**Carrying Cost per re. (in Rs.) 'C'**	**Ordering Cost per Order's' (Rs. in Million)**	**EOQ = $\sqrt{\frac{2AO}{C}}$ (Rs. in Million)**
2061/062	111.84	0.28	0.52	20.35
2062/063	164.92	0.27	0.56	26.11
2063/064	139.89	0.31	0.56	22.34
2064/065	143.77	0.32	0.53	22.00
2065/066	164.30	0.31	0.56	24.32
2066/067	258.80	0.31	0.54	29.88
2067/068	281.30	0.32	0.57	31.70

Source: Annual Reports of BNTL form the F/Y 2061/062 to 2067/068

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

$EOQ = \sqrt{\frac{2X111.84X.52}{0.28}}$

= Rs.20.35

From the table no.4.2 the economic order quantity for different periods are calculated and presented in the above table no 4.2. The table shows the economic order quantity is increasing in every Year .The highest economic order quantity is in FY 2067/068 and economic order quantity is in FY2061/062.

4.2.3 Actual and Economics 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 No. 4.3

Relationship between Actual and Economic Order Size

	Actual		Economic Order Quantity	
Year	**Order Size (Rs.in Million)**	**No. of Order**	**Order Size (Rs.in Million)**	**No. of Order**
061/062	13.98	8	20.35	5
062/063	20.62	8	26.11	6
063/064	17.49	8	22.34	6
064/065	17.97	8	22.00	7
065/066	20.54	8	24.32	7
066/067	32.35	8	29.88	9
067/068	35.16	8	31.70	9
Average	22.59		25.24	
S. D.	7.98		10.37	
C. V.	0.35		0.41	

Source: Annual Reports of BNTL form the F/Y 2061/062 to 2067/068

From the table 4.3, BNTL purchased raw materials every one and half month months. So the number of order in a year is eight times. But by the economic order size the overage number of order per year should be 5, 6, 6, 7, 7, 9 and 9 times in FY 2061/062 to 2067/068 times the actual order greater than the economic order size in FY 2061/062 to 2065/066 and the actual order is less then economic order in FY 2066/067 and 2067/068. By the value of standard deviation it can be concluded that the actual order size per order for the different period is more fluctuated than the economic order size. So, The company doesn't purchase the raw materials based on the economic order quantity but there the EOQ for the different periods are comparison.

4.2.4 Calculation of economic order quantity cost (Cost of EOQ)

Generally total economic order quantity cost comprises of the total ordering cost and total carrying cost. The company doesn't purchase the raw materials based on the economic order quantity if the company purchase of raw in the base of EOQ, table 4.4 presents the actual economic order quantity costs.

Table No. 4.4

Calculation of economic order quantity cost (Cost of EOQ) (*in Million)*

Year	Annual Requirement Rs. (in Million)'A'	EOQ Rs.	Ordering Cost per order 'O' (in Million)	Carrying Cost per Re. 'C'	Total Cost of EOQ
2061/062	111.84	20.35	0.28	0.52	5.72
2062/063	164.92	26.11	0.27	0.56	7.08
2063/064	139.89	22.34	0.31	0.56	7.01
2064/065	143.77	22.00	0.32	0.53	6.93
2065/066	164.30	24.32	0.31	0.56	7.56
2066/067	258.80	29.88	0.31	0.54	9.35
2067/068	281.30	31.70	0.32	0.57	10.11

Cost of EOQ = $\frac{EOQ}{2}C + \frac{A}{EOQ}O$

$= \frac{20.35}{2}0..52 + \frac{111.84}{20.35}0.50$

= 2.86+2.86

= Rs. 5.72

From the table no.4.4 the economic order quantity cost for different periods are calculated and presented in the above table. The table shows the economic order quantity is increasing in every Year from FY 2061/062 to 2066/067 and EOQ cost decrease in FY 2067/068.The highest economic order quantity cost is in FY 2066/067 and economic order quantity is in FY 2061/062.

4.2.5 Inventory Costs

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

Table N0. 4.5

Relationship between of Actual and Economic Inventory Cost *(Rs. in Million)*

Year	Actual Inventory Cost	Total Cost of EOQ
061/062	6.12	5.72
062/063	7.27	7.08
063/064	7.23	7.01
064/065	7.07	6.93
065/066	7.67	7.56
066/067	9.38	9.35
067/068	10.17	10.11
Average	7.84	6.68
S. D.	1.41	1.52
C. V.	0.17	0.23

Source: Annual Reports of BNTL form the F/Y 2061/062 to 2067/068

The economic inventory costs for different periods are calculated and presented in the above table no 4.5. The table chows the actual inventory cost per year in 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 cost is calculated based on the actual consumption of inventory. The average actual inventory cost is greater than that of economic inventory costs. Thus the cost should make economic order size.

4.2.6 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 2061/062 and 2067/068.

Table No. 4.6

Relation between Actual Sales and Closing Stock *(Rs. in Million)*

Year	Actual Sales (X)	Closing Stock (Y)	% Change
061/062	465.44	134.4	28.88
062/063	431.94	114.34	26.47
063/064	401.32	151.11	37.65
064/065	354.1	108.42	30.62
065/066	490.32	128.11	26.13
066/067	520.12	163.01	31.34
067/068	565.1	189.13	33.47
Average	461.19	189.13	
S. D.	71.93	28.53	
C. V.	0.16	0.15	
r_{xy}	0.77		
PE	0.1		

Source: Annual Reports of BNTL form the F/Y 2061/062 to 2067/068

Table 4.6 shows that an actual sale which was increased over period but closing stock was not that trend. It was increased for three years and then decrease in fourth year after that closing stock slightly increased. 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.

Mean, standard deviation and coefficient of variation are calculated to analyze the nature of variability of sales a closing stock. The average actual sales of BNTL for given seven years were 461.19 millions. Deviation of annual sales from average

sale calculated as standard deviation was 71.93 and 28.53 for annual sales 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 to 0.77. Here positive sign indicates the positive relation between actual sales and closing stock. We know that if the value lying between 0.7 to 0.99 prove a high degree of positive correlation. Calculation of probable error and comparing it with correlation coefficient value shows the significant value of correlation coefficient due to value of correlation coefficient (0.77). Table 4.4 also present the calculation of mean, standard deviation, coefficient of correlation, coefficient of correlation and probable error of actual sales and closing stock.

4.2.7 Relation between Actual Purchase and Closing Stock

In manufacturing organization, purchasing is the procuring of materials supplies machine, tools and services required for the equipment maintenance and operation of the business. Purchasing must be of right quantity in proper quality of delivery of the correct time at the most favorable price from other countries. Similarly, losing 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 061/62 and 067/068.

Through the table 4.5 shows that 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 reliability of actual purchase and closing stock of different years standard deviation and coefficient of variation along with mean was calculated. Together with measure of depression, correlation coefficient was also calculated to analyze the relationship between actual purchase and closing stock.

Table No. 4.7

Relation between Actual and Total Closing Stock *(Rs. in Million)*

Year	Actual Purchase (X)	Closing Stock (Y)	% change stock to Purchase
061/062	422.1	134.4	31.84
062/063	455.53	114.34	25.10
063/064	501.03	151.11	30.16
064/065	434.5	108.42	24.95
065/066	470.3	128.11	27.24
066/067	523.02	163.01	31.17
067/068	568.3	189.13	33.28
Average	482.11	141.22	
S. D.	51.92	28.33	
C. V.	0.11	0.2	
r_{xy}	0.92		
PE	0.039		

Source: Annual Reports of BNTL form the F/Y 2061/062 to 2067/068

Average actual purchase was Rs.482.11 million with standard deviation of 51.92 signifying the either deviation of annual purchase from average purchase. Similarly, average closing stock was Rs.41.22 million with standard deviation of 28.33 relatively less deviated compared to actual purchase. Relating to the uniformity or stability actual purchase was found relatively stable compared so that of closing stock which is shown by lower value of coefficient of variation for actual purchase 11% compared to that of closing stock i.e. 20%.

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 justify 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 increasing in closing stock and similarly decrease in actual purchase resulted into decrease in

closing stock. In addition to this the value of 0.92 shows the high degree of positive relationship between these two variables.

Probable error was also measured to ascertain the reliability of the value of pearsons coefficient of correlation and conclude whether simple correlation coefficient is significant or not. Here, r<6PE i.e.(0.92<6×0.039=0.234) shows that coefficient of correlation is not significant. Calculation of coefficient and probable error of actual purchase and closing stock is presented in table 4.5.

4.2.8 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 2061/062 to 2067/068.

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 was made.

Table No. 4.8

Relationship between Actual Total Sales and Actual Total Purchase

(Rs. in Million)

Year	***Actual Sales (X)***	***Actual Purchase (Y)***	***Different (Sales-Purchase)***
061/062	*465.44*	*422.1*	*43.34*
062/063	*431.94*	*455.53*	*-23.59*
063/064	*401.32*	*501.03*	*-99.71*
064/065	*354.1*	*434.5*	*-80.4*
065/066	*490.32*	*470.3*	*20.02*
066/067	*520.12*	*523.02*	*-2.9*
067/068	*565.1*	*568.3*	*-3.2*
Average	*461.19*	*482.11*	
S. D.	*79.93*	*51.92*	
C. V.	*0.14*	*0.11*	
r_{xy}	*0.7*		
PE	*0.13*		

Source: Annual Reports of BNTL form the F/Y 2061/062 to 2067/068

4.2.9 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 No. 4.9

Investment in Inventories in Relation to Total Assets

Year	Inventories	Total Assets	Inventories to Total assets (%)
061/062	134.4	667.62	20.13
062/063	114.34	572.21	19.98
063/064	151.11	699.34	21.61
064/065	108.42	418.77	25.89
065/066	128.11	537.39	23.84
066/067	163.01	614.13	26.54
067/068	189.13	654.52	28.90
Average	27.22		
S. D.	5.03		
C. V.	0.18		

Source: Annual Reports of BNTL form the F/Y 2061/062 to 2067/068

The above table 4.7 shows the percentage of inventory with respect to its total assets in FY 2062 to 2068. In FY 061/062 it was 20% of total assets and decrease by 1% in next year but that after increase by 21.6% and reached to 28.89%. In FY 066/067 to 067/068 it was increase by 2.35%. The average inventory ratio for the period was 27.22% with the standard deviation and CV are 5.03 and 0.18 respectively.

4.2.10 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 (2061/062 to 2067/068).

Table No. 4.10

Inventories Conversion Period of BNTL (in million)

Year	**Inventory** *Rs.*	**COGS** *Rs.*	**Days in Year**	**ICP In Days**
061/062	134.4	238.59	360	203.64
062/063	114.34	207.99	360	197
063/064	151.11	191.96	360	285
064/065	108.42	187.72	360	208.5
065/066	128.11	205.51	360	224.75
066/067	163.01	248.11	360	236
067/068	189.13	283.3	360	239
Average				227.69
S. D.				29.94
C. V.				0.13

Source: Annual Reports of BNTL form the F/Y 2061/062 to 2067/068

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 for the study period 227.69 days. It means that average length of time required converting materials into finished goods and then to sell those required 227 days.

4.2.11 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 No. 4.11

Payable Deferral Period of BNTL

Year	A/P Rs. In Million	COGS Rs. In Million	Days In Year	PDP	Payment Mode = $\left(\frac{360}{PDP}\right)$
061/062	117.39	238.59	360	175	2
062/063	106.73	207.99	360	184	1.96
063/064	150.82	191.96	360	284	1.26
064/065	109.04	187.96	360	209	1.72
065/066	135.3	205.51	360	237	1.52
066/067	154.6	248.11	360	224	1.61
067/068	173.6	283.3	360	219	1.64
Average	135	223			1.67
S. D.	25.51				0.24
C. V.	0.19				0.15

Source: Annual Reports of BNTL form the F/Y 2061/062 to 2067/068

The table 4.9 gives the payable deferral period in days. In FY 2059 payable deferral period is 175 days. In FY 2063 the period was rise to 184 days. In FY 2061, it was 284 days which was decreased to 209 days for the year 2062. 175 days was least payable deferral period during the study period. Further the payable deferral period was increased 175 to 284 days for the year 2062 and 2063respectively. In FY 2062 the payable deferral period is 284 days, which is the highest payable deferral period during the study period. It was however decreased for the FY 2066 and reached to 219 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 135 days and payment is made 1.67 times in year for purchase and labour.

4.2.12 Inventory Turnover

Inventory turnover measures the actively or liquidity of firms inventory. The company should maintain optimum level of inventory for the production and sales actively. 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 absolute inventory.

Table No. 4.12

Inventory Turnover of BNTL

Year	COGS	Average Inventories	Ratio = $\frac{\text{COGS}}{\text{Average Inventories}}$
061/062	238.59	156.07	1.53 Times
062/063	207.99	124.34	1.67
063/064	191.96	132.7	1.45
064/065	187.72	129.76	1.45
065/066	205.51	146.35	1.40
066/067	248.11	163.35	1.52
067/068	283.3	187.04	1.51
Average	1.5		1.5
S. D.	0.42		0.42
C. V.	0.28		0.28

Source: Annual Reports of BNTL form the F/Y 2061/062 to 2067/068

Table 4.10 shows the inventory turnover ratio of BNTL for the study period. In FY 2061 the ratio was 1.67 times which is the highest one for the entire study period and decreased to 1.45 times for the FY 2062. In FY 2065 and 2066 the ratio was continuously increasing and reported to be 1.52 and 1.51 respectively. The ratio was recorded the lowest for the year 2064 was 1.4 times. In FY 2062 and 2063 the ratio of both FY is same which was 1.45 times. The average inventory turnover ratio was 1.50 times.

4.2.13 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 No. 4.13

Proportion of Inventory to Current Assets of BNTL

Year	Inventories	Current Assets	Ratio %
061/062	134.4	518.66	25.91
062/063	114.37	443.15	25.92
063/064	151.11	479.07	32.15
064/065	108.42	225.15	48.15
065/066	128.11	335.11	38.22
066/067	163.01	380.12	42.88
067/068	189.13	439.07	43.07
Average	36.61		
S. D.	8.81		
C. V.	24.06		

Source: Annual Reports of BNTL form the F/Y 2061/062 to 2067/068

The above table shows the percentage of inventory with respect to its current assets. In FY 2062 it was 25.91% and there after the ratio was increased next three years which was FY 2063, 2064 and 2065 reached to 25.92%, 32.15% and 48.15% respectively. After that for next year the ratio was decreased and reached in FY 2065, 38.22%. That after again FY 2065 and 2066 again there was increased in ratio by 42.88% and 43.07% respectively. In year 2065 the ratio was 48.15% which was highest ratio for the study period. In overall the average ratio was 36.6% for the given duration the lowest 25.91% in the year 2062. In average 36.6% of total current assets is covered by the inventories. But ratio is slightly fluctuating over the period.

4.3 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.

4.3.1 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 No. 4.14

Trend analysis of Purchase

Data Base	Year	Mid Value (m)	x=m-a	x^2	Actual Purchase	xy	Trend Value
Historical Data	061/062	61.5	-5	25	422.1	-2110.5	426.71
	062/063	62.5	-4	16	455.53	-1822.1	445.46
	063/064	63.5	-3	9	501.03	-1503.1	464.19
	064/065	64.5	-2	4	434.5	-869	482.92
	065/066	65.5	-1	1	470.3	-470.3	501.65
	066/067	66.5	0	0	523.02	0	520.38
	067/068	67.5	1	1	568.3	568.3	539.11
Estimated Data	068/069	68.5	2	4	573.2	1146.4	557.84
	069/070	69.5	3	9	589.02	1767.06	576.57
	070/071	70.5	4	16	582.05	2328.2	595.30
	071/072	71.5	5	25	605.15	3025.75	614.03
			$\sum x = 0$	$\sum x^2 = 110$	$\sum y = 5724.2$	$\sum xy = 2060.7$	

Source: Annual Reports of BNTL form the F/Y 2061/062 to 2067/068

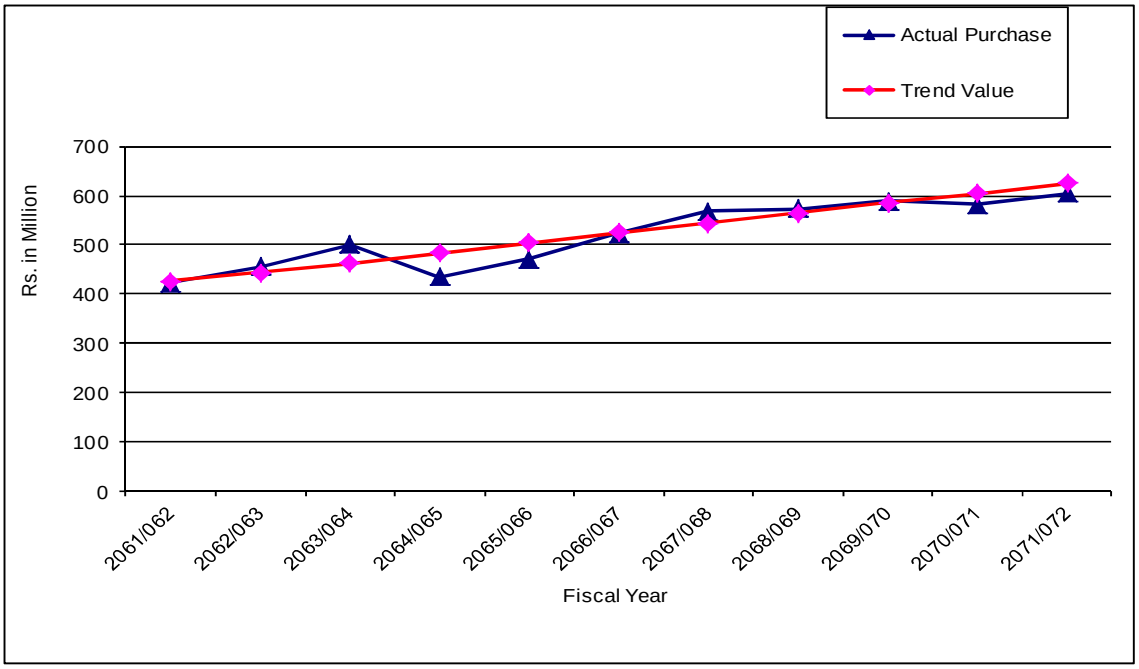
We know, $y = a + bx$ ----------(i)

$$a = \frac{\sum y}{n} = \frac{5724.2}{11} = 520.38$$

$$b = \frac{\sum xy}{\sum x^2} = \frac{2060.7}{110} = 18.73$$

$$Y = 520.38 + 18.73 \times -5$$
$$= 426.7$$

Figure No: 4.9
Trend Analysis of Purchase



Trend Value for the study period show the steady increase of actual purchase throughout the study period. But the actual value was divided from the trend value. The huge gap between the trend values was recorded in year 2062/063 followed by 2064/065. Interesting trend value and actual values were closer for each alternative year 2061/062 to 2064/065 and 067/068. Trend analysis of purchase in presented in table 4.12 and figure 4.9.

4.3.2 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 inclusive, which ensure the inflow of money to industry.

Table No. 4.15

Trend analysis of Sales

Data Base	Year	Mid Value (m)	x= m-a	x^2	Sales	xy	Trend Value
Historical Data	061/062	61.5	-5	25	465.44	-2327.2	385.70
	062/063	62.5	-4	16	431.94	-1727.8	412.06
	063/064	63.5	-3	9	401.32	-1204	438.44
	064/065	64.5	-2	4	354.1	-708.2	464.82
	065/066	65.5	-1	1	490.32	-490.32	491.20
	066/067	66.5	0	0	520.12	0	517.58
	067/068	67.5	1	1	565.1	565.1	543.96
Estimated Data	068/069	68.5	2	4	572.23	1144.46	570.34
	069/070	69.5	3	9	581.21	1743.63	596.72
	070/071	70.5	4	16	652.41	2609.64	623.10
	071/072	71.5	5	25	659.2	3296	649.48
			$\sum x$ = 0	$\sum x^2$ = 110	$\sum y$ = 5693.4	$\sum xy$ = 2901.39	

Source: Annual Reports of BNTL form the F/Y 2061/062 to 2067/068

We know, y = a + bx ----------(i)

a = $\frac{\sum y}{n} = \frac{5693.4}{11} = 517.18$

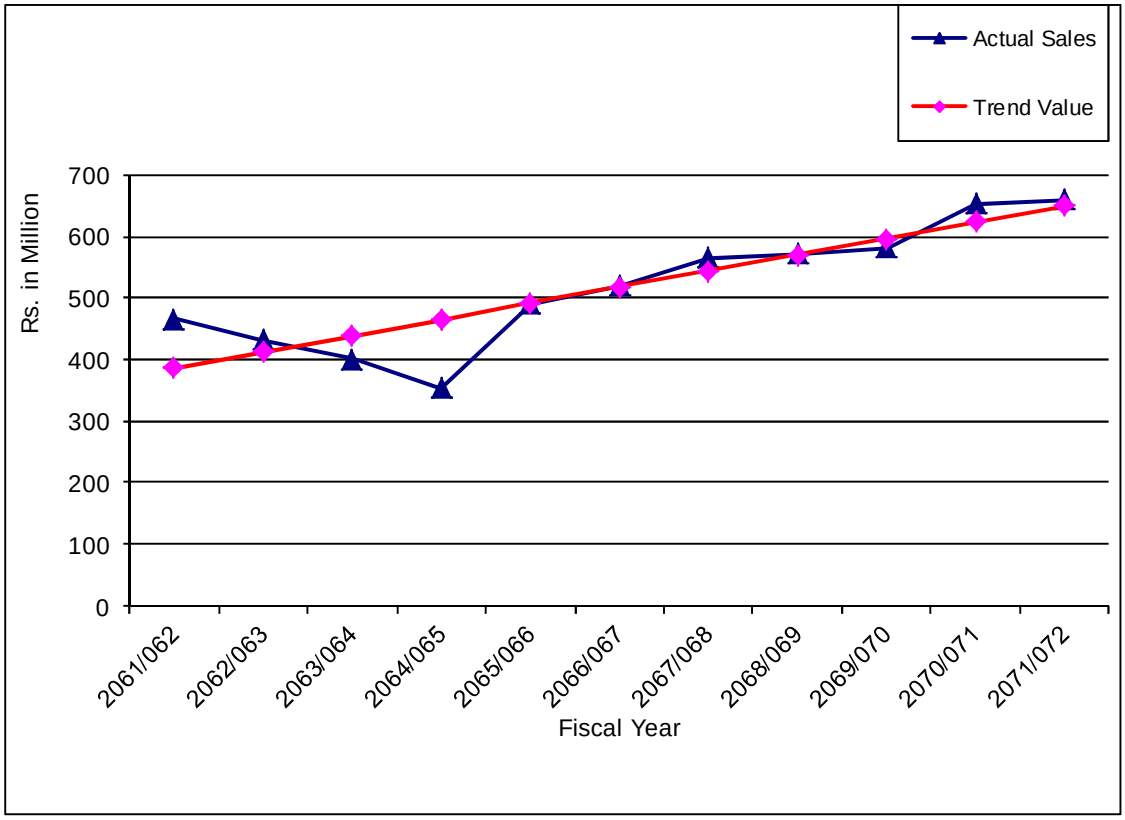
b = $\frac{\sum xy}{\sum x^2} = \frac{2901.39}{110} = 26.37$

Y = 517.18+26.37×-5

385.70

Figure No. 4.10

Trend Analysis of Sales



Sales were also increasing at steady rate during the study period. It has increased from 398 for the year 2061/062 to 524 fro the year 2067/068. However the actual value down the trend value at the beginning but then after actual always above the trend value. In FY 2065/066 there is nearly equal both trend value and actual value. However the actual value remain above the trend value for two consecutive year of 066/067 and 067/068.

4.3.3 Trend Analysis of Purchase of Raw Material

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

Table No. 4.16

Trend Analysis of Raw Material of Purchase

Data Base	Year	Mid Value(m)	x=m-a	x^2	Raw Material(Y)	xy	Trend Value
Historical Data	061/062	61.5	-5	25	112.93	-565	125.23
	062/063	62.5	-4	16	174.55	-698	143.45
	063/064	63.5	-3	9	180.9	-543	161.69
	064/065	64.5	-2	4	136.4	-273	179.93
	065/066	65.5	-1	1	174.2	-174	198.17
	066/067	66.5	0	0	262.3	0	216.41
	067/068	67.5	1	1	293.1	293	234.65
Estimated Data	068/069	68.5	2	4	152.9	306	252.89
	069/070	69.5	3	9	251.46	754	271.13
	070/071	70.5	4	16	303.73	1215	289.37
	071/072	71.5	5	25	338.07	1690	307.61
			$\sum x = 0$	$\sum x^2 = 110$	$\sum y = 2380.54$	$\sum xy = 2006$	

Source: Annual Reports of BNTL form the F/Y 2061/062 to 2067/068

We know, $y = a + bx$ ----------(i)

a = $\frac{\sum y}{n} = \frac{2380.54}{11} = 216.44$

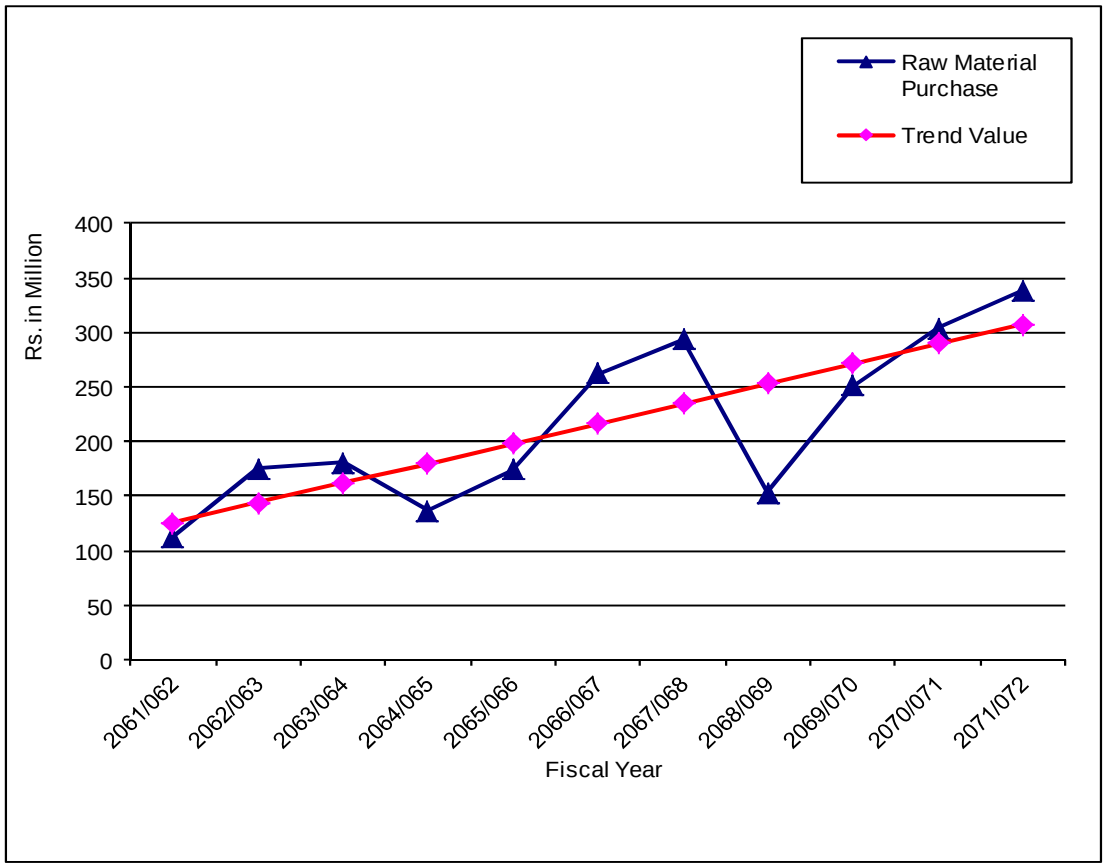
b = $\frac{\sum xy}{\sum x^2} = \frac{2006}{110} = 18.23$

Y = 216.44+18.23×-5

125.25

Figure No. 4.11

Trend Analysis of Raw Material Purchase



The trend value shows in increasing order. At first the trend value is above the actual purchase then after next two year actual purchase was above than trend value, which is 2062/063 and 2063/064. But after than actual purchase was sharply decreased, which happened, we can see actual purchase below the trend value in FY 2064/065 and 2065/066. Again actual purchase rise nest two years which was year 2066/067 and 2067/068. In overall we can compare between trend value and actual purchase, there was high fluctuation them. The whole picture can be seen from table 4.14 and figure 4.11.

4.3.4 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 in optimum position

Table No. 4.17

Trend Analysis of Inventory

Data Base	Year	Mid Value (m)	x=m-a	x^2	Inventory	xy	Trend Value
Historical Data	061/062	61.5	-5	25	134.4	-672	121.06
	062/063	62.5	-4	16	114.29	-457.16	125.83
	063/064	63.5	-3	9	151.11	-453.33	130.58
	064/065	64.5	-2	4	108.42	-216.84	135.33
	065/066	65.5	-1	1	128.11	-128.11	140.08
	066/067	66.5	0	0	163.01	0	144.83
	067/068	67.5	1	1	189.13	189.13	149.58
Estimated Data	068/069	68.5	2	4	123.2	246.4	154.33
	069/070	69.5	3	9	115.2	345.6	159.08
	070/071	70.5	4	16	162.2	648.8	163.83
	071/072	71.5	5	25	204.1	1020.5	168.58
			$\sum x = 0$	$\sum x^2 = 110$	$\sum y = 1593.17$	$\sum xy = 522.99$	

Source: Annual Reports of BNTL form the F/Y 2061/062 to 2067/068

We know, $y = a + bx$ ----------(i)

$$a = \frac{\sum y}{n} = \frac{1593.17}{11} = 144.83$$

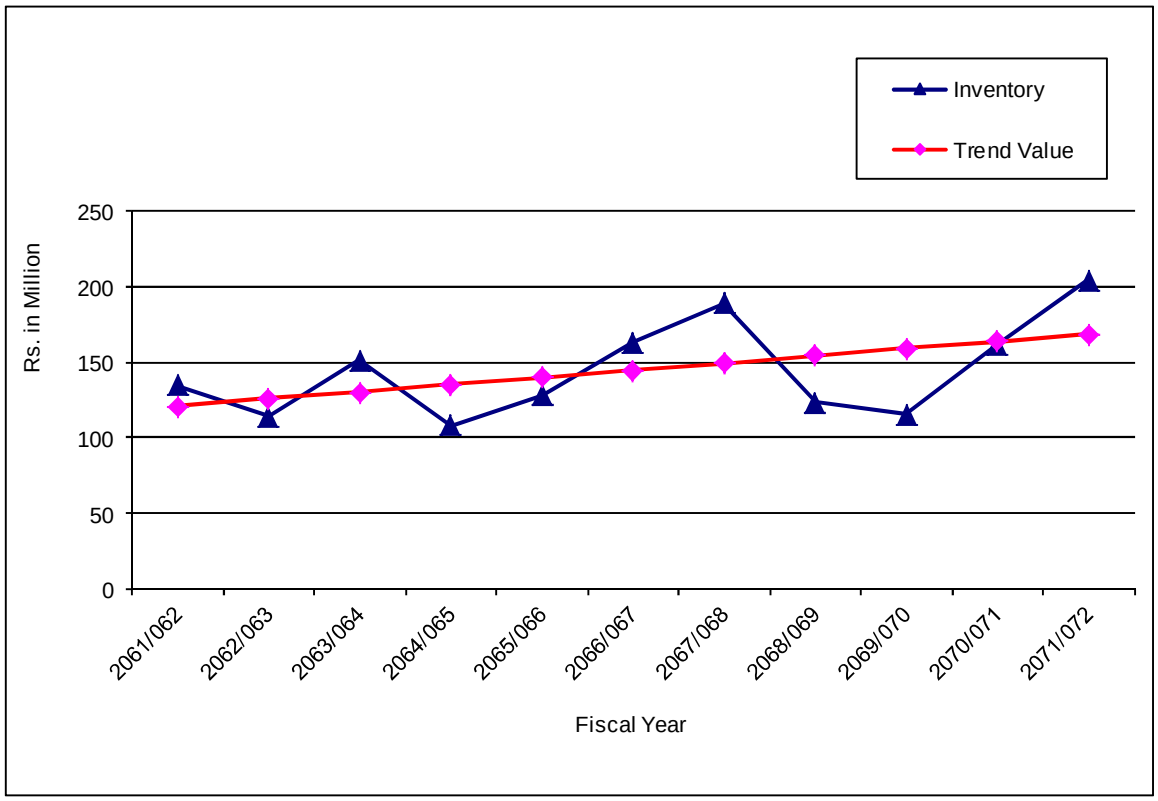
$$b = \frac{\sum xy}{\sum x^2} = \frac{522.99}{110} = 4.75$$

$$Y = 144.83+4.75\times-5$$

$$121.06$$

Figure No. 4.12

Trend Analysis of Inventory



Inventory of BNTL has been increased from 134.4 million during to 2061/062 to 189.13 during 2067/068 signifying the increasing trend. Trend value in the other hand shows also increasing order. However, actual data show 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.

4.3.5 Trend Analysis of Inventory 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 will never faces the raw material shortage in the period of adverse natural and man dame circumstances.

Table No. 4.18

Trend analysis of Inventory of Raw Material

Data Base	**Year**	**Mid Value (m)**	**x=m-a**	**x^2**	**Raw Material(Y)**	**xy**	Trend Value
Historical Data	061/062	61.5	-5	25	25.95	-130	38.62
	062/063	62.5	-4	16	35.27	-141	47.17
	063/064	63.5	-3	9	76.28	-229	55.83
	064/065	64.5	-2	4	68.91	-138	64.49
	065/066	65.5	-1	1	78.81	-78.8	73.15
	066/067	66.5	0	0	82.31	0	81.81
	067/068	67.5	1	1	94.11	94.1	90.47
Estimated Data	068/069	68.5	2	4	98.52	197	99.13
	069/070	69.5	3	9	105.3	316	107.79
	070/071	70.5	4	16	116.3	465	116.45
	071/072	71.5	5	25	119.3	597	125.11
			$\sum x$ = 0	$\sum x^2$ = 110	$\sum y$ = 901.06	$\sum xy$ = 952	

Source: Annual Report of BNTL and Appendix-IV

We know, y = a + bx ----------(i)

$$a = \frac{\sum y}{n} = \frac{901.06}{11} = 81.91$$

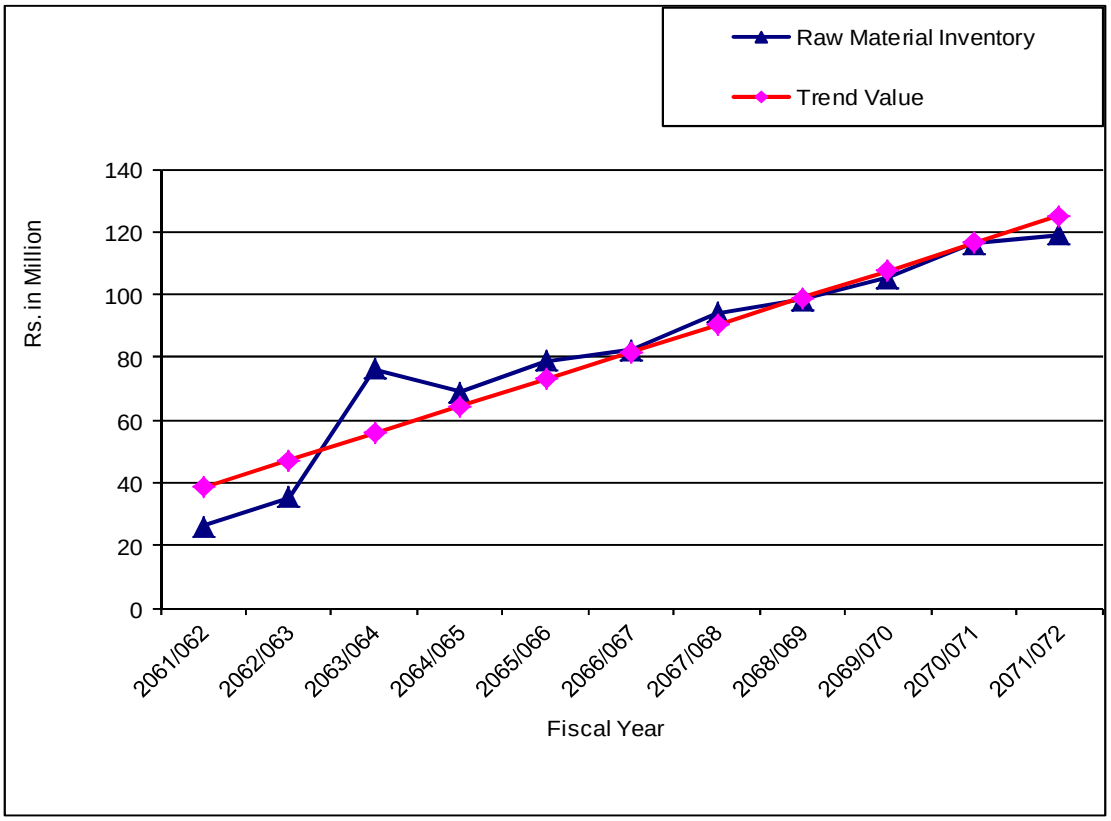
$$b = \frac{\sum xy}{\sum x^2} = \frac{952}{110} = 8.65$$

Y = 81.91+8.65×-5

38.62

Figure No. 4.13

Trend Analysis of Inventory of Raw Material



Above table, we can see different between trend value and inventory of raw materials. At first when the two line started at FY 2061/062 and 2062/063, the trend value is above than raw materials but after then next three years raw material is upward than trend value for 063/064, 062/062 and 2065/066. After then trend value is again above the raw materials next two year, which is 2066/067 and 2067/068. So in overall we can say that the line of raw materials in vary high fluctuation for the period with its maximum for the year 2067/068 and it's minimum for the year 2061/062. And the trend line show more than 100% increase in raw materials.

4.3.6 Trend Analysis of Work-In-Process Inventory:

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

Table No. 4.19

Trend Analysis of W I P Inventory

Data Base	Year	Mid Value (m)	x=m-a	x^2	WIP Invntory	xy	Trend Value
Historical Data	061/062	61.5	-5	25	0.42	-2.1	0.41
	062/063	62.5	-4	16	0.37	-1.48	0.45
	063/064	63.5	-3	9	0.36	-1.08	0.48
	064/065	64.5	-2	4	0.49	-0.98	0.51
	065/066	65.5	-1	1	0.55	-0.55	0.54
	066/067	66.5	0	0	0.63	0	0.57
	067/068	67.5	1	1	0.89	0.89	0.60
Estimated Data	068/069	68.5	2	4	0.81	1.62	0.63
	069/070	69.5	3	9	0.59	1.77	0.66
	070/071	70.5	4	16	0.49	1.96	0.69
	071/072	71.5	5	25	0.68	3.4	0.72
			$\sum x = 0$	$\sum x^2 = 110$	$\sum y = 6.28$	$\sum xy = 3.45$	

Source: Annual Reports of BNTL form the F/Y 2061/062 to 2067/068

We know, $y = a + bx$ ----------(i)

$$a = \frac{\sum y}{n} = \frac{6.28}{11} = .57$$

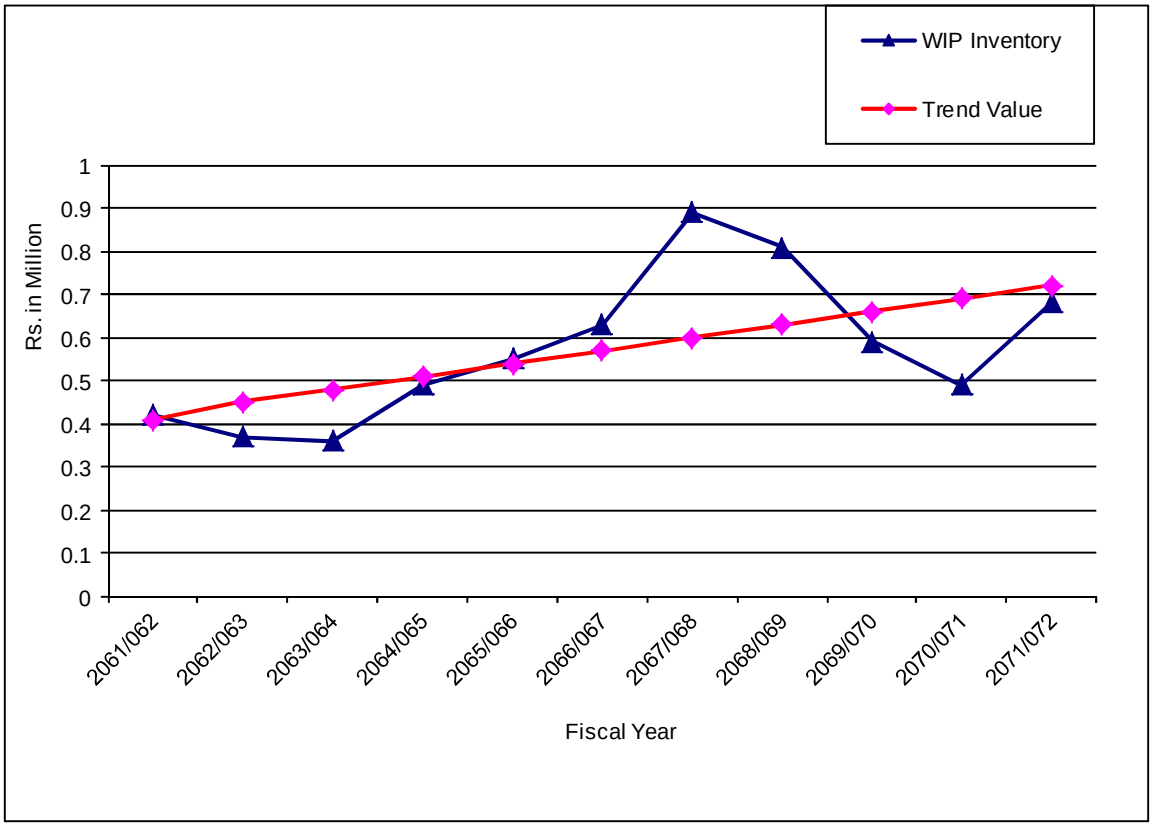
$$b = \frac{\sum xy}{\sum x^2} = \frac{3.45}{110} = .032$$

$$Y = 0.57 + .032 \times -5$$

$$0.41$$

Figure No. 4.14

Trend Analysis of WIP Inventory



There is significant stable in work-in-process for the given period 2061/062 to 2067/068. However fluctuation was observed during the period. At first it was decreased to FY 2061/62 than after it was highly increased and reached in peak which is the highest recorded for the given period for the FY 2062/063 to 067/068. For the future, trend of work-in-process in slightly increasing order. Table 4.17 and figure 4.14 gives the picture of actual work-in-process and its trend value.

4.3.7 Trend Analysis of Finished Goods Inventory:

Finished Goods produced after processing different stage. It serves as indicator for need for capital for company.

Table No. 4.20

Trend analysis of Finished Goods Inventory

Data Base	Year	Mid Value (m)	x=m-a	x^2	F.G Invntory	xy	Trend Value
Historical Data	061/062	61.5	-5	25	7.47	-37.35	4.01
	062/063	62.5	-4	16	1	-4	4.26
	063/064	63.5	-3	9	1.31	-3.93	4.51
	064/065	64.5	-2	4	3.79	-7.58	4.76
	065/066	65.5	-1	1	5.38	-5.38	5.01
	066/067	66.5	0	0	7.55	0	5.26
	067/068	67.5	1	1	9.36	9.36	5.51
Estimated Data	068/069	68.5	2	4	9.25	18.5	5.76
	069/070	69.5	3	9	2.5	7.5	6.01
	070/071	70.5	4	16	1.02	4.08	6.26
	071/072	71.5	5	25	9.25	46.25	6.51
			$\sum x = 0$	$\sum x^2 = 110$	$\sum y = 57.88$	$\sum xy = 27.45$	

Source: Annual Reports of BNTL form the F/Y 2061/062 to 2067/068

We know, $y = a + bx$ ----------(i)

$$a = \frac{\sum y}{n} = \frac{57.88}{11} = 5.26$$

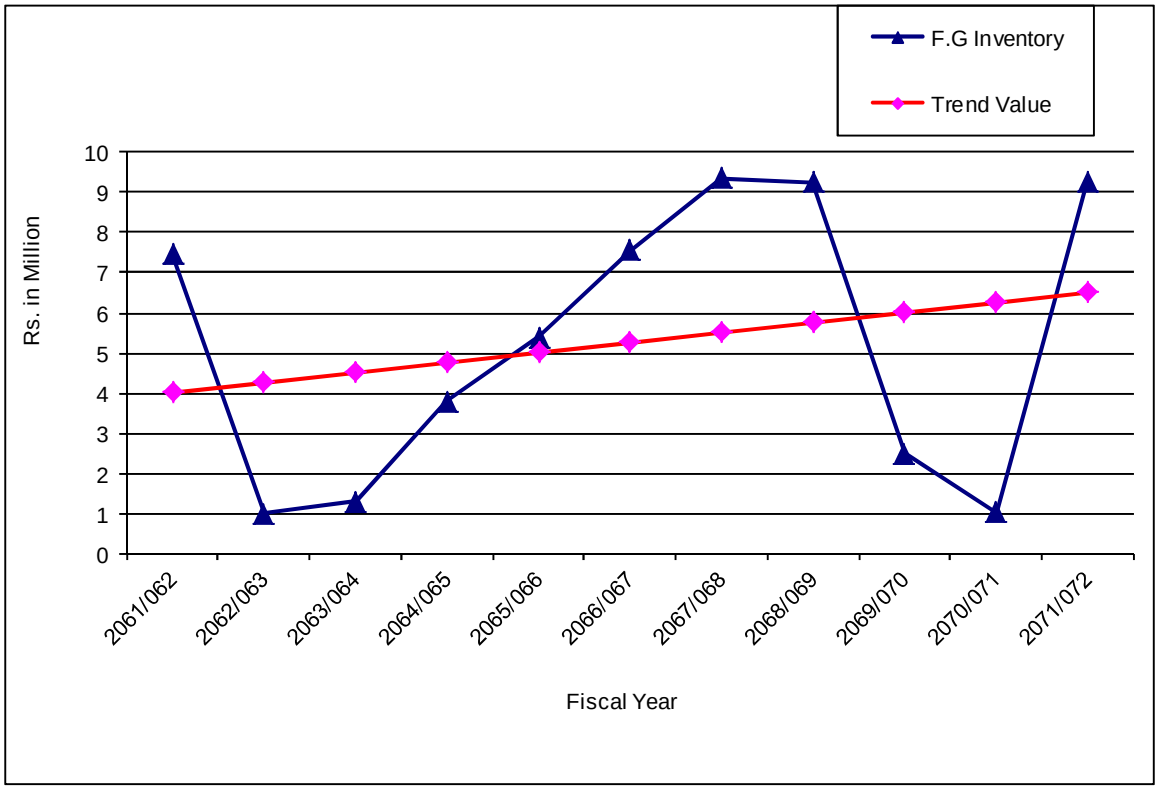
$$b = \frac{\sum xy}{\sum x^2} = \frac{27.45}{110} = 0.25$$

$$Y = 5.26+0.25\times-5$$

$$4.01$$

Figure No. 4.15

Trend Analysis of Finished Goods Inventory



Finished good were highly fluctuations the given period. At the beginning FY 2061/062, it was increasing gradually to the year 2065/066. Then it was sharply increased and reached at peak point. It was minimum level for the period 2062/063 to 2064/065. In overall finished goods were always increasing order except 2062/063 it was highly decreased. Table 4.18 and figure 4.15 show the condition.

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

In the Cost of goods sold organization include all direct expenses of manufacturing cot with deduction closing stock of raw material, WIP & finished goods.

Table No. 4.21

Trend analysis of Cost of Goods Sold (COGS)

Data Base	Year	Mid Value (m)	x=m-a	x^2	Cogs (Y)	xy	Trend Value
Historical Data	061/062	61.5	-5	25	238.59	-1193	161.02
	062/063	62.5	-4	16	207.99	-831.96	183.27
	063/064	63.5	-3	9	191.96	-575.88	205.51
	064/065	64.5	-2	4	187.72	-375.44	227.75
	065/066	65.5	-1	1	205.51	-205.51	249.99
	066/067	66.5	0	0	248.11	0	272.23
	067/068	67.5	1	1	283.3	283.3	294.47
Estimated Data	068/069	68.5	2	4	250.8	501.6	316.71
	069/070	69.5	3	9	326.51	979.53	338.95
	070/071	70.5	4	16	406.07	1624.28	361.19
	071/072	71.5	5	25	447.92	2239.6	383.43
			$\sum x = 0$	$\sum x^2 = 110$	$\sum y = 2994.48$	$\sum xy = 2446.57$	

Source: Annual Reports of BNTL form the F/Y 2061/062 to 2067/068

We know, y = a + bx ----------(i)

$$a = \frac{\sum y}{n} = \frac{2994.48}{11} = 272.23$$

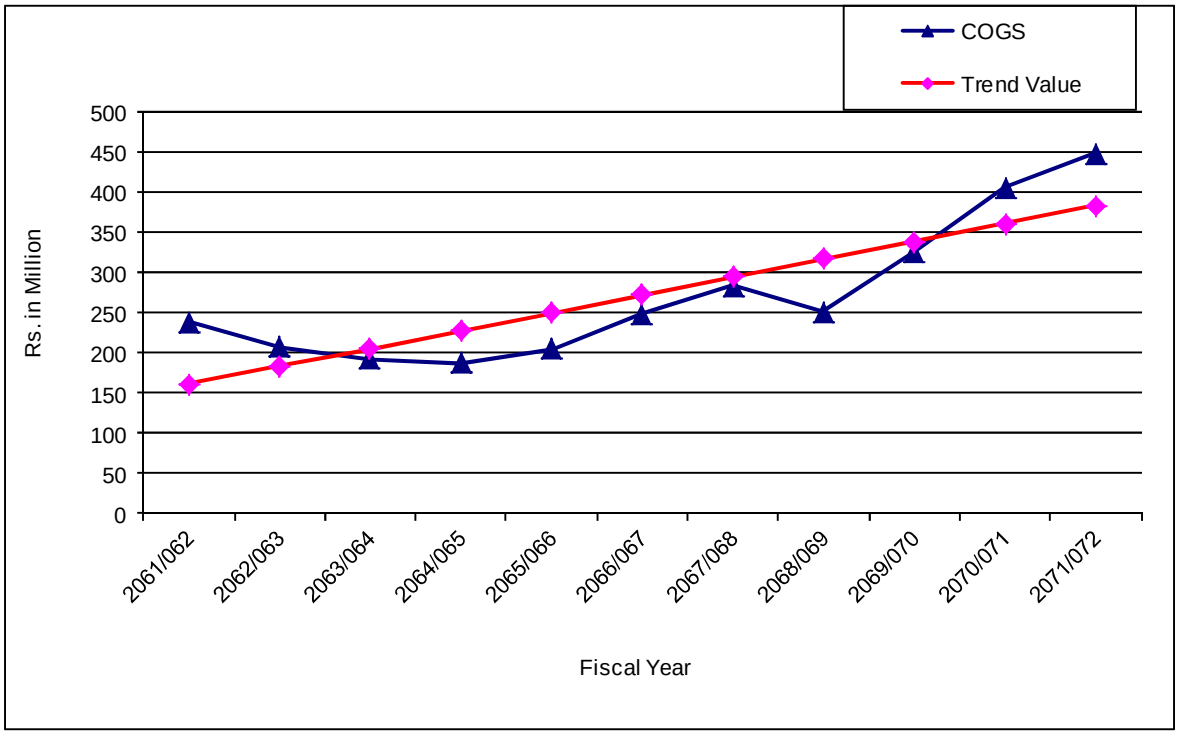
$$b = \frac{\sum xy}{\sum x^2} = \frac{2446.57}{110} = 22.24$$

$$Y = 272.23 + 22.24 \times -5$$

$$161.02$$

Figure No. 4.16

Trend Analysis of Cost of Goods Sold (COGS)



Cost of goods sold the study period was found increasing 283.59 million in 2061/062 to 207.99 million in 2062/063. There was continuous decrease cost of goods from the year 2063/064 to 2065/066 after than there was increasing from the FY 2066/067 to 2067/068. But trend values show always increasing order of COGS.

4.3.9 Trend Analysis of Net Profit (NP)

Net profit is value of earning by company after deduction of all direct and indirect expenses. Net profit shows the operating efficiency of a company.

Table No. 4.22

Trend Analysis of Net Profit

Data Base	Year	Mid Value (m)	x= m-a	x^2	Profit (Y)	xy	Trend Value
Historical Data	061/062	61.5	-5	25	25.36	-126.8	-18.72
	062/063	62.5	-4	16	19.55	-78.2	-2.85
	063/064	63.5	-3	9	16.28	-48.84	13.02
	064/065	64.5	-2	4	-26.02	52.04	28.89
	065/066	65.5	-1	1	20.15	-20.15	44.76
	066/067	66.5	0	0	40.13	0	60.63
	067/068	67.5	1	1	60.11	60.11	76.50
Estimated Data	068/069	68.5	2	4	78.59	157.18	92.37
	069/070	69.5	3	9	133.18	399.54	108.24
	070/071	70.5	4	16	147.2	588.8	124.11
	071/072	71.5	5	25	152.4	762	139.98
			$\sum x$ = 0	$\sum x^2$ = 110	$\sum y$ = 666.93	$\sum xy$ = 1745.7	

Source: Annual Reports of BNTL form the F/Y 2061/062 to 2067/068

We know, $y = a + bx$ ----------(i)

$$a = \frac{\sum y}{n} = \frac{666.93}{11} = 60.63$$

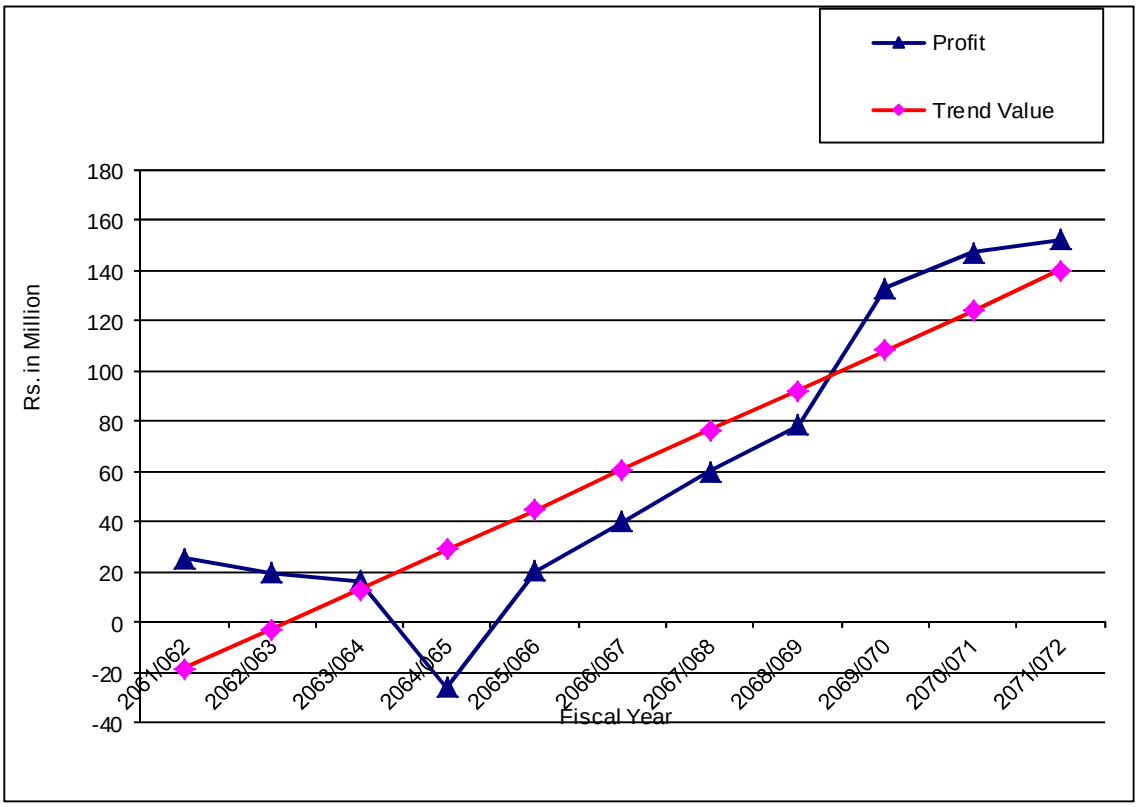
$$b = \frac{\sum xy}{\sum x^2} = \frac{1745.7}{110} = 15.87$$

$$Y = 60.63+15.87\times-5$$

$$-18.72$$

Figure No. 4.17

Trend Analysis of Net Profit



Net profit was found declined from 25.63 Rupees during 2061/62 o its lowest level of (26.02) million rupees for the year 2064/065. Trend values had also shown the continuously increasing rend of net profit for the study period. The value of net profit which sharply decrease from the 2061/062 to 2063/064 and reached into negative point and after than also was increased. The highest value of net profit was 60.11 million to highest point which was 38.21.

4.4 Major Findings of the Study

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

i. Purchase manager should maintain all the necessary records keeping in mind the most important objectives of the purchase department i.e. purchasing good quality and quantity of material at the cheapest rate at proper time to help smooth running of the production function.

ii. Required raw material for the production of different types of soft drinks are imported from the foreign countries like, Iran, Pakistan, Indonesia, German and India.

iii. Letter of Credits used to import raw materials from foreign countries.

iv. Goods receiving process is a document on the basis of which purchases are verified and payment is made to the supplies. It is also helpful in filling any claim for short supplies. It provides a complete record of all materials received.

v. In BNTL the store control device adopted in Bin Card and Store Ledger. The company has not applied ABC analysis techniques to control various type of inventory in the stores.

   a. In control BNTL with its help the storekeeper can sent materials requisition for the purchase of material in time.

   b. The store ledger is systematically maintained BNTL. This ledger provides the information for the pricing of materials issued and the money value at any time for each item maintained in store.

vi. Demand and sales of company is very fluctuation. The main reason of such fluctuation is seasonal variation.

vii. 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.

viii. There is no any cost classification system, so there is difficult to determine the ordering and carrying cost.

ix. By coefficient of variation, the annual requirement is more consistent then annual purchase.

x. In average the actual order size per order is greater than the economics order size. Standard deviation and coefficient of variation indicate that the actual order size per order for the different periods is more fluctuated than the economic order size.

xi. The company was not following scientific inventory management techniques i.e. economic order quantity model for purchasing different types of raw materials.

xii. 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.

xiii. The management of BNTL applied Nepal Accounting Standard about inventory management.

xiv. The system of inventory management of the company is scientific. So it fulfills its demand in whole year.

xv. Sales of the company are very fluctuation but net profit of the company decreasing at first and reached to negative point but after that increased.

xvi. The higher value of standard deviation for actual sales indicates its inconsistent nature compared to closing stock. However, value of CV indicates that closing stock fluctuates more then actual sales. The value of correlation coefficient +0.77 means the positive relationship between these two variable i.e. increase in closing stock result into increase in actual sales and vice versa.

xvii. Higher value of standard deviation for actual purchase compared to closing stock indicates that actual purchase fluctuates more then closing stock. However value of C.V. indicates that actual purchase is relatively stable compared to closing stocks. The value of correlation coefficient

(+0.92) means the positive relationship between these two variables. This means the movement of both variables is almost the same direction.

xviii. In an average actual purchase 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.

xix. Investment in inventories in relation to total assets was only 27.22% in the case of BNIL 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.

xx. In BNTL the average length of time required to convert material into finished goods and then to sell these goods required 227 days.

xxi. In BNTL payable deferral periods for the study period was 135 and payment is made 1.67 times in a year for purchase and labour.

xxii. Inventory turnover ratio is an indicator of efficiency of management. The inventory turnover for the study period was fluctuating with the average of 1.50. The highest ratio signifying the most efficient inventory management was recorded in 2061 and the lowest signifying the worst inventory management situation was recorded in 2062, 2063 and 2064 with the study period.

xxiii. In an average 36.6% of total current assets is covered by the inventory. But the ratios are slightly fluctuating over the study period.

CHAPTER-FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

Without effective and efficient inventory management no one organization can achieve its goal. Inventory management is one of the most important functions in any organization. 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 and distribution etc.

The details about inventory management and introduction of the study have been already been 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 started out by issues of inventory management of Bottlers Nepal (Tarai) Limited are presented, analyzed and the major findings of the study has been also presented in the chapter four.

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

5.1 Summary

Inventory functions are associated with production, marketing, finance and administration etc. Inventory constitutes most significant part of current assets. 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. 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. This was established in 1987, BNTL supply the quality product at right time in a 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 examine the inventory management system practiced by the company 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 invest a huge amount of money in the from of inventory. BNTL also being the manufacturing company invests huge amount capital in from 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 BNT. 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 to analyze the inventory 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 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 reports 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 2061 to 2068. It also used the various inventory tools and statistical tools to analyze the available data.

Descriptive analysis consists of the purchase procedure practice in BNTL. Store control decides practice and issuing materials. In case of inventory management analysis is dine 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 purchase 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 purchase has positive relationship. The average value of inventory in relation to total assets is very lower therefore BNTL does not maintain adequate level of inventory to fulfill the demand. The average inventory conversion period is 227 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 to current assets ratio is 36.6 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 has been done. The trend analysis show that except for the net profit all other variable shows the upward slope.

5.2 Conclusions

The study stresses the need for a good inventory system to maintain a suitable level of inventory so as to 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 of BNTL is 227 days but the payable deferral period is 135 days. The average inventory turnover ratio is 1.50, which indicates that BNTL has maintained higher level of inventory as compared to the total cost of goods sold. The average trend expects net profit the variables are increasing. So the net profit so 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 Recommendations

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:

i. 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.

ii. 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 excessive investment on inventory.

iii. In BNTL average actual order size surpasses the average economic order size consequence of which is the grater average 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.

iv. The popular scientific inventory management techniques like 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.

v. Lower investment on inventories in relation to total assets may create immediate crisis in the side of production in short duration unfavorable circumstances. Therefore it is necessary to maintain the adequate level of investment on inventories.

vi. 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.

vii. In text of BNTL, to increase the profit of the company the company should make the operating and inventory management cost minimized with the use of optimal EOQ which in the case of the company is higher.

viii. In the context of BNTL, there is no fixed policy if inventory conversion period so the company should make plan to maintain the fixed inventory conversion period.

ix. The average inventory ratio 1.50 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 costs of inventory so it is necessary to make the optimum inventory management plan.

x. 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 employee efficiency. Consequently managerial forecasting ability of the concerned staffs will be enhanced.

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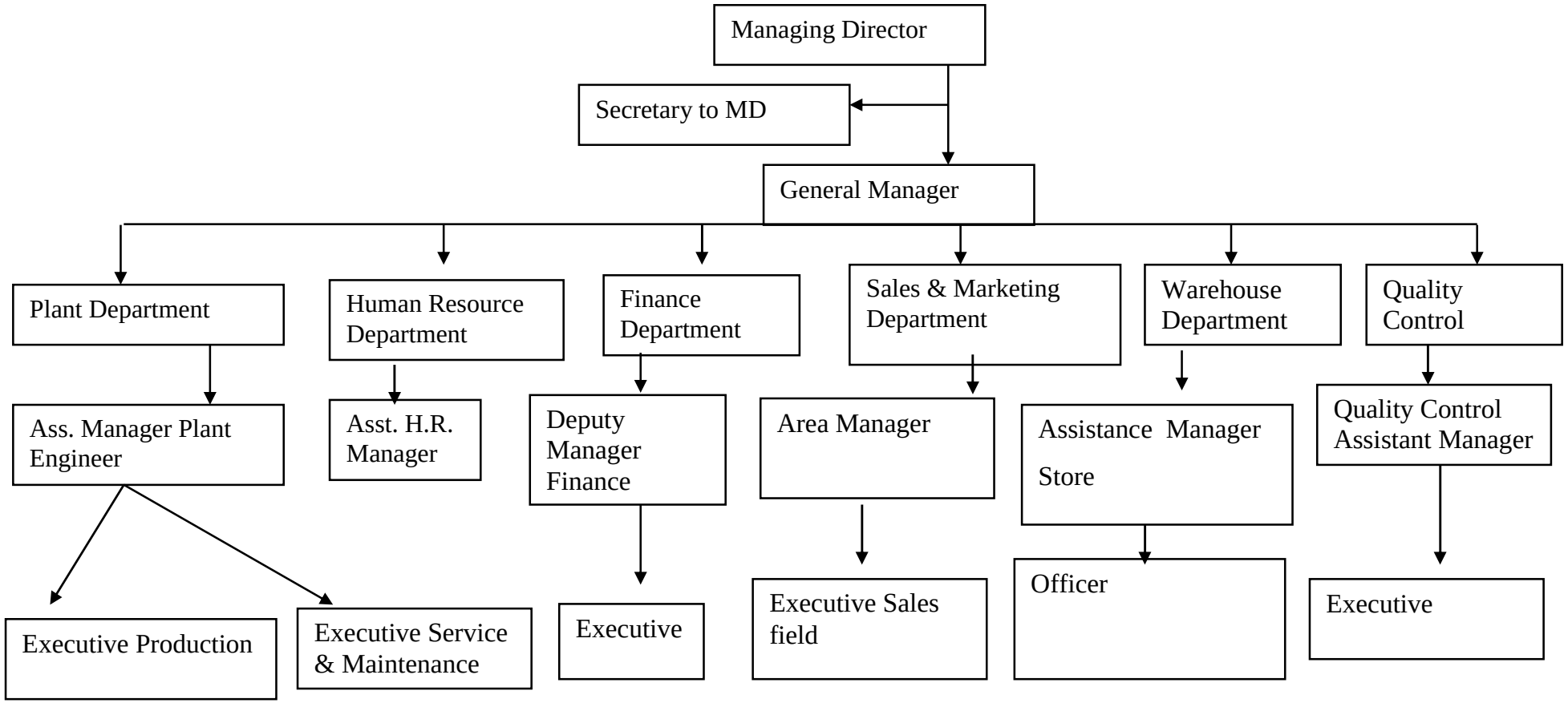
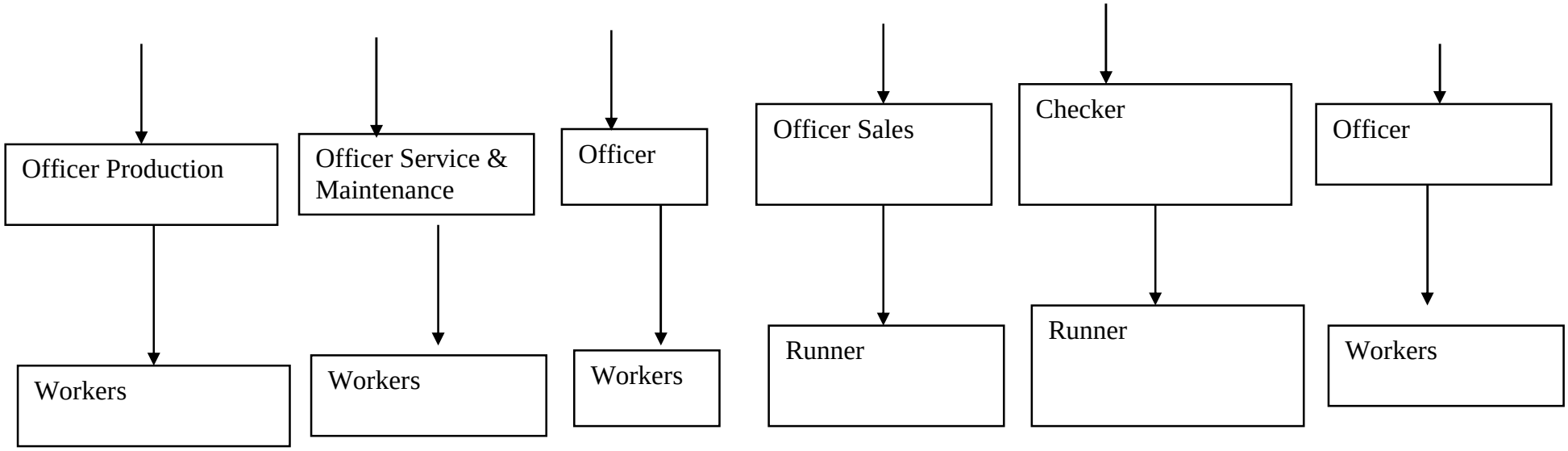
APPENDIX-I

Organizational Structure of Bottlers Nepal (Terai) Limited




Officer Production
Workers
Officer Service & Maintenance
Workers
Officer
Workers
Officer Sales
Runner
Checker
Runner
Officer
Workers

APPENDIX-II

Bin Card of BNTL

Bottler's Nepal (Terai) Limited

Bharatpur, Chitwan

Mate Code: .....

Folio

BIN CARD

No: .....

Description: *Location: .....*

Date	**Reference**	**Receipt**	**Issued**	**Balance**	**Signature**

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

APPENDIX-III

Store Ledger of BNTL

Bottler's Nepal (Terai) Limited

Bharatpur, Chitwan

STOCK LEDGER

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

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

APPENDIX IV

Compiled Data of BNTL Related to Inventory *Rs. in Million*

Particular	Fiscal Year						
	2061/062	**2062/063**	**2063/064**	**2064/065**	**2065/066**	**2066/067**	**2067/068**
Sales	465.44	431.94	401.32	354.1	490.32	520.12	565.1
COGs	238.59	207.99	191.96	187.72	205.51	248.11	283.3
Purchase	422.1	455.53	501.03	434.5	470.3	523.02	568.3
Purchase of Raw Materials	112.93	174.24	180.9	136.4	174.2	262.3	293.1
Inventory	134.4	114.34	151.11	108.42	128.11	163.01	189.13
Average Inventory	156.07	124.34	132.7	129.76	146.35	163.12	187.04
Raw Material	25.95	35.27	76.28	68.91	78.81	82.31	94.11
Finished Goods	7.47	1.00	1.31	3.79	5.38	7.55	9.36
Work-in-process	0.42	0.37	0.36	6.49	0.55	0.63	0.89
Raw Material Consumption	111.84	164.92	139.89	143.77	164.30	258.80	281.61
Net Profit	25.36	19.55	16.28	(26.02)	20.15	40.13	60.11
A/C payable	117.39	106.73	150.82	109.04	135.3	154.6	173.72
Current Assets	518.66	443.15	479.07	225.15	335.11	380.12	439.07
Total Assets	667.62	572.21	699.34	418.77	537.39	614.13	654.52

APPENDIX-V

Calculation of Raw Material Requirement *(Rs. in Million)*

Fiscal Year	Opening Stock of Raw Material	Purchase of Raw Material	Closing Stock of Raw Material	Raw Material Requirement
2061/062	24.86	112.93	25.95	111.84
2062/063	25.95	174.24	35.27	164.92
2063/064	35.27	180.90	76.28	139.89
2064/065	76.28	136.40	68.91	143.77
2065/066	68.91	174.20	78.81	164.30
2066/067	78.81	262.30	82.31	258.80
2067/068	82.31	293.10	94.11	281.30

APPENDIX-VI

Calculation of Ordering Cost *(Rs. in Million)*

S.N	Particulars	2061/062	2062/063	2063/064	2064/065	2065/066	2066/067	2067/068
1	Transportation	1.82	1.88	1.88	1.81	1.88	1.82	1.83
2	Custom Duty	1.52	1.54	1.55	1.51	1.56	1.48	1.51
3	Carriage in Ward	0.26	0.36	0.37	0.26	0.38	0.39	0.38
4	Insurance of Transit	0.31	0.32	0.33	0.32	0.34	0.29	0.41
5	Postage and Stationary	0.24	0.28	0.27	0.25	0.28	0.23	0.32
6	Communication and Other Charge	0.04	0.06	0.07	0.05	0.07	0.07	0.12
Total Ordering Cost		4.19	4.44	4.47	4.20	4.51	4.28	4.57
No of Purchase		8	8	8	8	8	8	8
Ordering Cost Per Order		0.52	0.56	0.56	0.53	0.56	0.54	0.57

APPENDIX-VII

Calculation of Carrying Cost *(Rs. in Million)*

S.N	Particulars	2061/062	2062/063	2063/064	2064/065	2065/066	2066/067	2067/068
1	Storage/Carriage Expenses	5.93	7.91	8.95	9.81	9.86	12.82	13.85
2	Insurance of Godwan	2.61	3.95	3.98	4.51	5.62	9.86	10.62
3	Clerical & Staff Expenses	7.47	7.99	8.13	8.46	8.62	10.97	12.83
4	Interest on Capital Investment	11.1	16.4	13.9	14.3	16.4	25.88	28.8
5	Handling Cost	1.43	3.73	3.83	4.85	4.95	10.82	12.35
6	Warehousing and other Cost	2.29	3.88	3.95	4.05	4.75	8.86	10.58
Total Carrying Cost		30.83	43.86	42.74	45.98	50.2	79.21	89.03
Total Raw Material Requirement (In Rs.)		111.84	164.92	139.89	143.77	164.3	258.8	281.3
Carrying Cost Per Re.		0.28	0.27	0.31	0.32	0.31	0.31	0.32

APPENDIX-VIII

Calculation of Correlation Coefficient of annual requirement and annual Purchase of Raw Materials *(Rs. in Million)*

Year	A. R. (X)	$x = (x - \bar{x})^2$	A. P. (Y)	$y = (y - \bar{y})^2$	% Change
061/062	111.84	4645.79	112.93	6037	-39.95
062/063	164.92	227.41	174.55	258.57	-12.3
063/064	139.89	1608.81	180.90	94.67	-11.8
064/065	143.77	1312.61	136.40	2940.89	-30
065/066	164.30	246.49	174.20	269.94	-14.24
066/067	258.80	6209.44	262.30	5136.59	6.8
067/068	281.61	10324.59	293.10	10500	10
Average	180.73		190.63		
S. D.	63.99		68.85		
C. V.	0.35		0.34		
	$\sum (x - \bar{x})^2 = 24575.14$			$\sum (y - \bar{y})^2 = 25237.66$	

Standard Deviation ($\pm_x$) = $\sqrt{\frac{\sum (x - \bar{x})^2}{N - 1}}$

= $\sqrt{\frac{24575.14}{7 - 1}}$

= 63.99

Standard Deviation ($\pm_y$) = $\sqrt{\frac{\sum (y - \bar{y})^2}{N - 1}}$

= $\sqrt{\frac{25237.66}{7 - 1}}$

= 64.85

Coefficient of Variation (CV) = $\frac{\pm}{\bar{x}}$ = $\frac{63.99}{180.73}$ = 0.35

Coefficient of Variation (CV) = $\frac{\pm}{\bar{y}}$ = $\frac{64.85}{190.63}$ = 0.34

APPENDIX-IX

Calculation of Correlation Coefficient of Actual and Economic Order Size

(Rs. in Million)

Year	A. O. (X)	$x = (x - \bar{x})^2$	No. of Order	E. O. (Y)	$y = (y - \bar{y})^2$	No. of Order
061/062	13.98	74.13	8	20.35	**23.91**	5
062/063	20.62	3.88	8	26.11	**0.76**	6
063/064	17.49	26.01	8	22.34	**8.41**	6
064/065	17.97	21.34	8	22	**10.50**	7
065/066	20.54	4.20	8	24.32	**0.85**	7
066/067	32.35	95.26	8	29.88	**21.53**	9
067/068	35.16	158.00	8	31.7	**41.73**	9
Average	22.59			25.24		6.43
S. D.	7.98			10.37		
C. V.	0.35			0.41		
	$\sum (x - \bar{x})^2$ =382.83			$\sum (y - \bar{y})^2$ = 107.68		

Standard Deviation ($\pm_x$) = $\sqrt{\frac{\sum (x - \bar{x})^2}{N - 1}}$

= $\sqrt{\frac{382.83}{7 - 1}}$

= 7.98

Standard Deviation ($\pm_y$) = $\sqrt{\frac{\sum (y - \bar{y})^2}{N - 1}}$

= $\sqrt{\frac{107.68}{7 - 1}}$

= 10.37

Coefficient of Variation (CV) = $\frac{\pm}{\bar{x}}$ = $\frac{7.98}{22.59}$ = 0.35

Coefficient of Variation (CV) = $\frac{\pm}{\bar{y}}$ = $\frac{10.37}{25.24}$ = 0.41

APPENDIX-X

Calculation Cost of Actual Inventory *(Rs. in Million)*

Year	Annual Requirement	Carrying Cost per Re.'C'	Ordering Cost per Order 'O'	Cost of Actual Inventory
2061/2062	111.84	0.28	0.52	6.12
2062/2063	164.92	0.27	0.56	7.27
2063/2064	139.89	0.31	0.56	7.23
2064/2065	143.77	0.32	0.53	7.07
2065/2066	164.30	0.31	0.56	7.67
2066/2067	258.80	0.31	0.54	9.38
2067/2068	281.30	0.32	0.57	10.17

APPENDIX-XI

Calculation of Correlation Coefficient of Actual & Economic Inventory Cost

(Rs. in Million)

Year	Actual Inventory Cost (X)	$x = (x - \bar{x})^2$	Economic Order Cost (Y)	$y = (y - \bar{y})^2$
061/062	6.12	2.96	5.72	3.84
062/063	7.27	0.32	7.08	0.36
063/064	7.23	0.37	7.01	0.45
064/065	7.07	0.59	6.93	0.56
065/066	7.67	0.03	7.56	0.01
066/067	9.38	2.37	9.35	2.79
067/068	10.17	5.43	10.11	5.90
Average	7.84		6.68	
S. D.	1.41		1.52	
C. V.	0.17		0.23	
	$\sum (x - \bar{x})^2 = 12.08$			$\sum (y - \bar{y})^2 = 13.92$

Standard Deviation ($\pm_x$) $= \sqrt{\frac{\sum (x - \bar{x})^2}{N - 1}}$

$= \sqrt{\frac{12.08}{7 - 1}}$

$= 1.41$

Standard Deviation ($\pm_y$) $= \sqrt{\frac{\sum (y - \bar{y})^2}{N - 1}}$

$= \sqrt{\frac{13.92}{7 - 1}}$

$= 1.52$

Coefficient of Variation (CV) $= \frac{\pm}{\bar{x}} = \frac{1.41}{7.84} = 0.17$

Coefficient of Variation (CV) $= \frac{\pm}{\bar{y}} = \frac{1.52}{6.68} = 0.23$

APPENDIX-XII

Calculation of Correlation Coefficient and Relation between Actual Sales and Closing Stock *(Rs. in Million)*

Year	Actual Sales (X)	$x = (x - \bar{x})^2$	X^2	Closing Stock (Y)	$y = (y - \bar{y})^2$	Y^2	XY
061/062	465.44	18.06	216634	134.4	46.51	18063	62555
062/063	431.94	855.56	186572	114.34	722.53	13073.63	49388
063/064	401.32	3584	161057.74	151.11	97.81	22834	60643
064/065	354.1	11468	125386.81	108.42	1075.84	11754.9	38392
065/066	490.32	848.56	240413.7	128.11	171.87	16412	62814.9
066/067	520.12	3472.74	270524.8	163.01	474.8	26572	84784.76
067/068	565.1	10797.29	319338	189.13	2295.37	35770	106877
Average	461.19			189.13			
S. D.	71.93			28.53			
C. V.	0.16			0.15			
CC	0.77						
PE	0.10						
	$\sum X =$ 3228.34	$\sum (x - \bar{x})^2 =$ 31044	$\sum X^2 =$ 1519927.06	$\sum Y =$ 988.54	$\sum (y - \bar{y})^2 =$ 4884.73	$\sum Y^2 =$ 144479.73	$\sum XY =$ 465455

Standard Deviation ($\pm_x$) $= \sqrt{\frac{\sum (x - \bar{x})^2}{N - 1}}$

$= \sqrt{\frac{431.58}{7 - 1}}$

$= 71.93$

Standard Deviation ($\pm_y$) $= \sqrt{\frac{\sum (y - \bar{y})^2}{N - 1}}$

$= \sqrt{\frac{171.18}{7 - 1}}$

$= 28.53$

Coefficient of Variation (CV) $= \frac{\pm}{\bar{x}}$

$= \frac{71.93}{461.19}$

$= 0.16$

Coefficient of Variation (CV) $= \frac{\pm}{\bar{y}}$

$= \frac{28.53}{189.13}$

$= 0.15$

$$r_{xy} = \frac{N\sum XY - \sum X \times \sum Y}{\sqrt{[N\sum X^2 - (\sum x)^2][N\sum Y^2 - (\sum Y)^2]}}$$

$$= \frac{7 \times 465455 - 3228.34 \times 988.54}{\sqrt{[7 \times 1519927 - (3228.34)^2][7 \times 144479.73 - (988.54)^2]}}$$

$= 0.77$

PE $= 0.6745 \left(\frac{1 - r^2}{\sqrt{N}}\right)$

$= 0.6745 \times \left(\frac{1-(0.77)^2}{2.6547}\right)$

$= 0.6745 \times 0.1538$

$= 0.10$

APPENDIX-XIII

Relation between Actual and Total Closing Stock *Rs. in Million*

Year	Actual Purchase (X)	$x = (x - \bar{x})^2$	X^2	Closing Stock (Y)	$y = (y - \bar{y})^2$	Y^2	XY
061/062	422.1	3601	178168	134.4	46.51	18063	56730
062/063	455.53	7065	207052	114.34	722.53	13073.63	52085
063/064	501.03	357.97	251031	151.11	97.81	22834	75710.64
064/065	434.5	2266.7	188790	108.42	1075.84	11754.9	47108.5
065/066	470.3	13948	221182	128.11	171.87	16412	60250
066/067	523.02	1673.63	273560	163.01	474.8	26572	85275.5
067/068	568.3	7428.72	322964.89	189.13	2295.37	35770	107482.58
Average	482.11			141.22			
S. D.	51.92			28.33			
C. V.	0.11			0.20			
CC	0.92						
PE	0.039						
	$\sum X =$ 3374.77	$\sum (x - \bar{x})^2 =$ 16174	$\sum X^2 =$ 1642747.89	$\sum Y =$ 988.54	$\sum (y - \bar{y})^2 =$ 4884.73	$\sum Y^2 =$ 144479.73	$\sum XY =$ 484624.23

Standard Deviation ($\pm_x$) = $\sqrt{\frac{\sum (x - \bar{x})^2}{N - 1}}$

= 51.92

Standard Deviation ($\pm_y$) = $\sqrt{\frac{\sum (y - \bar{y})^2}{N - 1}}$

= 28.33

Coefficient of Variation (CV) = $\frac{\pm}{\bar{x}}$ = 0.11

Coefficient of Variation (CV) = $\frac{\pm}{\bar{y}}$ = 0.20

$$r_{xy} = \frac{N\sum XY - \sum X \times \sum Y}{\sqrt{[N\sum X^2 - (\sum x)^2][N\sum Y^2 - (\sum Y)^2]}}$$

$$= \frac{7 \times 484624.23 - 3374.77 \times 988.54}{\sqrt{[7 \times 1642747.89 - (3374.77)^2][7 \times 144479.73 - (988.54)^2]}}$$

$$= \frac{56274.74}{61332.18}$$

$$= 0.92$$

$$\text{PE} = 0.6745 \left(\frac{1 - r^2}{\sqrt{N}}\right)$$

$$= 0.6745 \times \left(\frac{1-(0.92)^2}{\sqrt{7}}\right)$$

$$= 0.039$$

APPENDIX-XIV

Relationship between Actual Total Sales and Actual Total Purchase

Rs. in Million

Year	Actual Sales (X)	$x = (x - \bar{x})^2$	X^2	Actual Purchase (Y)	$y = (y - \bar{y})^2$	Y^2	XY
061/062	465.44	18.06	216634	422.1	3601	178168	196462
062/063	431.94	855.56	186572	455.53	7065	207052	196762
063/064	401.32	3584	161057.74	501.03	357.97	251031	201073
064/065	354.1	11468	125386.81	434.5	2266.7	188790	153856
065/066	490.32	848.56	240413.7	470.3	13948	221182	230597
066/067	520.12	3472.74	270524.8	523.02	1673.63	273560	272033
067/068	565.1	10797.29	319338	568.3	7428.72	322964.89	321146
Average	461.19			482.11			
S. D.	71.93			51.92			
C. V.	0.16			0.11			
CC	0.77			0.92			
PE				0.039			
	$\sum X =$ 3228.34	$\sum (x - \bar{x})^2 =$ 31044	$\sum X^2 =$ 1519927.06	$\sum Y =$ 3374.77	$\sum (y - \bar{y})^2 =$ 16174	$\sum Y^2 =$ 1642747.89	$\sum XY =$ 1571929

Standard Deviation ($\pm_x$) $= \sqrt{\frac{\sum (x - \bar{x})^2}{N - 1}}$

$= \sqrt{\frac{31044}{7 - 1}}$

$= 79.93$

Standard Deviation ($\pm_y$) $= \sqrt{\frac{\sum (y - \bar{y})^2}{N - 1}}$

$= \sqrt{\frac{16174}{7 - 1}}$

$= 51.92$

Coefficient of Variation (CV) $= \frac{\pm}{\bar{x}}$

$$= \frac{79.93}{565.1}$$

$$= 0.14$$

Coefficient of Variation (CV) $= \frac{\pm}{\bar{y}}$

$$= \frac{51.92}{482.11}$$

$$= 0.11$$

$$r_{xy} = \frac{N\sum XY - \sum X \times \sum Y}{\sqrt{[N\sum X^2 - (\sum x)^2][N\sum Y^2 - (\sum Y)^2]}}$$

$$= \frac{7 \times 1571929 - 3228.34 \times 3374.77}{\sqrt{[7 \times 1519927.06 - (322834)^2][7 \times 162747.29 - (3374.77)^2]}}$$

$$= \frac{108599}{154670}$$

$$= 0.70$$

$$\text{PE} = 0.6745 \left(\frac{1 - r^2}{\sqrt{N}}\right)$$

$$= 0.6745 \times \left(\frac{1-(0.07)^2}{\sqrt{7}}\right)$$

$$= 0.13$$

APPENDIX-XV

Investment in Inventories in Relation to Total Assets

Year	Ratio (%) = $\frac{Inventories}{Total\ Assets} \times 100$	$x = (x - \bar{x})^2$	Change %
061/062	20	52	
062/063	19	52	
063/064	21.6	31.58	-16.68
064/065	25.89	1.77	-19.86
065/066	23.84	11	7.92
066/067	26.54	0.46	-11
067/068	28.89	2.79	-8.85
Average	27.22		
S. D.	5.03		
C. V.	0.18		
	$\sum (x - \bar{x})^2 =$ 151.6		

Standard Deviation ($\pm$) $= \sqrt{\frac{\sum (x - \bar{x})^2}{N}}$

$= \sqrt{\frac{151.6}{6}}$

$= 5.03$

Coefficient of Variation (CV) $= \frac{\pm}{\bar{x}}$

$= \frac{5.03}{27.22}$

$= 0.18$

APPENDIX-XVI

Inventories Conversion Period of BNTL

Year	Inventory Rs. In Million	COGS Rs. In Million	Days in Year	ICP (X) In Days	$x = (x - \bar{x})^2$
061/062	134.4	238.59	360	203.64	578
062/063	114.34	207.99	360	197	941.88
063/064	151.11	191.96	360	285	3284
064/065	108.42	187.72	360	208.5	368
065/066	128.11	205.51	360	224.75	8.64
066/067	163.01	248.11	360	236	69
067/068	189.13	283.3	360	239	127.92
Average				227.69	
S. D.				29.94	
C. V.				0.13	
					$\Sigma (x - \bar{x})^2 =$ 5377.44

Inventory Conversion Period (ICP) = $\dfrac{Inventory}{\dfrac{Cost\ of\ Goods\ Sold}{Days\ in\ Year}}$

Standard Deviation ($\pm$) = $\sqrt{\dfrac{\Sigma (x - \bar{x})^2}{N - 1}}$

$= \sqrt{\dfrac{5377.44}{7 - 1}}$

$= 29.94$

Coefficient of Variation (CV) = $\dfrac{\pm}{\bar{x}}$

$= \dfrac{29.94}{227.69}$

$= 0.13$

APPENDIX-XVII

Payable Deferral Period of BNTL

Year	A/P (X) Rs. In Million	$x = (x - \bar{x})^2$	COGS Rs. In Million	Days In Year	PDP	Payment Mode	
						Per Year = $\frac{360}{PDP}$ (Y)	
061/062	117.39	310	238.59	360	175	2	0.11
062/063	106.73	799	207.99	360	184	1.96	0.08
063/064	150.82	250	191.96	360	284	1.26	0.17
064/065	109.04	673.92	187.96	360	209	1.72	0
065/066	135.3	0.09	205.51	360	237	1.52	0.02
066/067	154.6	384	248.11	360	224	1.61	0
067/068	173.6	1489.96	283.3	360	219	1.64	0
Average	135		223			1.67	
S. D.	25.51					0.24	
C. V.	0.19					0.15	
		$\sum (x - \bar{x})^2 = 3906.97$					0.38

Payable Diferral Period (PDP) = $\frac{A/P}{\frac{Cost\ of\ Goods\ Sold}{Days\ in\ Year}}$

Standard Deviation ($\pm_x$) = $\sqrt{\frac{\sum (x - \bar{x})^2}{N-1}}$ = $\sqrt{\frac{3906.97}{7-1}}$ = 25.51

Coefficient of Variation (CV) = $\frac{\pm}{\bar{x}}$ = $\frac{25.51}{135}$ = 0.19

Standard Deviation ($\pm_y$) = $\sqrt{\frac{\sum (y - \bar{y})^2}{N-1}}$ = $\sqrt{\frac{0.38}{7-1}}$ = 0.24

Coefficient of Variation (CV) = $\frac{\pm}{\bar{y}}$ = $\frac{0.24}{1.67}$ = 0.15

APPENDIX-XVIII

Inventory Turnover of BNTL

Year	Ratio (Times)	$x = (x - \bar{x})^2$	Change (%)
061/062	1.53	0	-9015
062/063	1.67	0.03	13.17
063/064	1.45	0	0
064/065	1.45	0	3.45
065/066	1.40	0.01	-8.57
066/067	1.52	0	-0
067/068	1.51	1.04	
Average	1.5		
S. D.	0.42		
C. V.	0.28		
		$\sum (x - \bar{x})^2 = 0.04$	

Inventory Turnover (IT) = $\frac{COGs}{Average\ Inventory}$

Standard Deviation ($\pm$) = $\sqrt{\frac{\sum (x - \bar{x})^2}{N - 1}}$

$= \sqrt{\frac{108}{6}}$

$= 0.42$

Coefficient of Variation (CV) = $\frac{\pm}{\bar{x}}$

$= \frac{0.42}{1.50}$

$= 0.28$