CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Inventory management is primarily about specifying the size and placement of stocked goods. Inventory management is required at different locations within a facility or within multiple locations of a supply network to protect the regular and planned course of production against the random disturbance of running out of materials or goods. The scope of inventory management also concerns the fine lines between replenishment lead time, carrying costs of inventory, asset management, inventory forecasting, inventory valuation, inventory visibility, future inventory price forecasting, physical inventory, available physical space for inventory, quality management, replenishment, returns and defective goods and demand forecasting.

Inventory is stores of goods and things. Inventory plays a vital role to achieve the profitability and it plays on the success of the organization. The modern concept of inventory management can be traced to (1915-1922) with several authors acting independently development on economic lot size equation which minimizes. The sum of carrying cost holding cost for where demand was known and constant. In another demand was known and constant. In another words, inventory management is the planning, organizing and control activities focused on the follow of inventory into, through and from the organization.

Inventories constitute the most significant part of current assets of a large majority of a companies is India on as average, inventory are approximately 60 percent of current assets in public limited companies in India. The company want to get competitive gain, the company should manage inventories efficiently and effectively in order to avoid unnecessary inventory in investment.

Inventory form a link between production and sale of a product. The inventory exists in manufacturing and non-manufacturing organization. In manufacturing organization, there are mainly four types of inventories.

- Raw materials
- Work-in-progress
- Finished goods

- Stores and Spare Parts

Raw material is basic inputs that are converted into finished products through the manufacturing process.

Work-in-progress inventories are semi-manufacturing products they represent products that need more work before they become finished products for sales.

Finished goods inventories are these prepared manufacturing products. Which are ready for sales.

Inventory is one of the most valuable assets of all industries. The large part of capital is invested on inventories. If any company cannot manage the inventory properly, such company can't get successful worldwide. So, company should properly manage inventory.

Little or more inventory is needed according to the nature and size of the company. Investment in inventory also involves risk and costs. Therefore, the financial manager should try to maintain optimal sizes of inventory.

1.1.1 Dabur Nepal Pvt. Ltd.

Dabur Nepal Pvt. Ltd. is the first manufacturing base overseas for Dabur Nepal. This is the third largest and most modern manufacturing base for Dabur group. Dabur Nepal Pvt. Ltd. is an Indian Joint Venture Company Promoted by Dabur Indian Pvt. Ltd. It was established in the year 1989 and began its commercial operation in the year 1993. The authorized capital of the company is Rs.140 millions. Dabur Indian has 80% share of the company where as 20% share is with domestic investors. Production of ayurvedic-based personal care, health care and food product and started manufacturing in Dabur product in 1992. The company's factory and registered office is in Rampur, Tokani at Bara District and the corporate is in TNT building at Teenkune, Koteshwore.

Dabur came into Nepal Planning a new business, with targeted local sales of Rs.50 million per annum. The Dabur products commercially branded, quality and value added top of products locally, it should be sold at suitable price and rates for domestic use and export much more countries like India, Bangladesh and other neighboring countries. Dabur Nepal Pvt. Ltd. Is to one able effective utilization of resources, company has set up "Plant for life" 90 million green house project at Banepa in 1996.

The application of the project has a steady supply, endangered medicinal harb sapling equipped with modern climate control. The saplings one sold at cost to farmers in remote areas to grow and harvest with "buy back" guarantee.

The company's various community initiatives, generations of employment and additional for the local people have resulted in improved socio-economic condition. Dabur Nepal Pvt. Ltd. gets Certificate of Hazard Analysis & Critical Control Point **(**HACCP**)** plan verification for manufacturing of fruit juices & Tomato puree in 2002. Won Best Exporter Award of Export Promotion Board, Ministry of Commerce, HMG of Nepal in 2000. Won Overall Excellence Award of Nepal-India Chamber of Commerce and Industries in 2000. Dabur Nepal Pvt. Ltd. produces various types of products that are related to health and personal care.

DNPL is a leading company operating on a private sector of Nepal. It produces various types of products that are related to health and personal care. Today, DNPL produces and sales following types of product:

1. Lal Dant Manjan
2. Binaca Tooth Powder
3. Vatika Hair Oil
4. Vatika Shampoo
5. Amla Hair Oil
6. Special Hair Oil
7. Baby Olive Oil
8. Hajmola Tablet
9. Hajmola Candy
10. Real Fruit Juice
11. Gulcose D Power
12. Kshudhavardhak Churan/ Pachan Churan
13. Chywanprash Parkshep/ DCP Mishran
14. Dantmukta

15. Plastic Containers/ Bottles
16. Taxin Resin
17. Honey
18. Dabur Lal Tooth Paste
19. Babool Tooth Paste
20. Meswak Tooth Paste
21. Vatika Hair Oil (Bulk)
22. SLES 30%
23. Vatika Face Pack
24. Vatika Honey Saffron Soap
25. Anmol Coconut Oil
26. Anmol Shampoo
27. Anmol Sarson Oil
28. Dabur Gulabari
29. Plastic Containers / Bottles / Caps/ plugs**
30. Bee Frames/ Hives/Thermocol Sheet
31. Sanifresh
32. Chirayita – Plant
33. Stevia Powder/Sappling

(Source: Annual Report 2006-07)

1.2 Focus of the Study

Industrialization is an essential part of nation to increase the rate of economic development is Nepal. So, here industrial investment is coverage by Nepalese government. The industries play important role to increase employment and income. A nation can undertake development works through a sound economic development, which is possible with establishment of manufacturing and non-manufacturing industries. These industries provide employment which increases the personal income

and overall increase the national income. Therefore an establishment of different industries helps to solve huge employment problem as well as better are of available resources and can earn foreign country.

1.3 Statement of the Problem

This study is primarily focused on inventory management of Dabur Nepal Pvt. Ltd. And how they are managing their inventory and are the management policy appropriate? Many statistical, financial and accounting tools and technique are available to handle inventory management problem. The specific problems that will be analyzed during this study. They are as follows:

a. How is optimal order size and when should re-order by Dabur Nepal for reducing cost and smooth operation of organization?

b. How is inventory conversion cycle position and inventory position in different time period of Dabur Nepal?

c. How is the relation of total inventory with various inventories and the relation net profit with inventory sales?

1.4 Objectives of the Study

Following are the basic objectives of the study**:**

1. To know the optimal order size of raw material and packaging material.
2. To know inventory conversion cycle position of Dabur Nepal Pvt. Ltd.
3. To know re-order level of Dabur Nepal Pvt. Ltd.
4. To know relation of total inventory with raw material inventory, packaging material inventory, WIP inventory, finished goods inventory, stores and spare parts inventory and current assets, net profit with inventory and sales.

1.5 Limitation of the Study

There will be some limitation regarding this study. So this work has been conducted within the following limitations:

1. The study covers only five period data from 2007 to 2011.
2. The study is limited to the area of inventory management of Dabur Nepal Pvt. Ltd.

3. The study is based on secondary data from company websites.
4. Financial tools and statistical tools are used to analyzing the inventory management of Dabur Nepal Pvt. Ltd.

1.6 Importance of the Study

Inventory management is the important in any manufacturing companies. Without effective and efficient inventory management system, any goal and mission cannot be achieved. Proper inventory managements help to maximize profitability and wealth. Therefore the company should maintain optimal raw material, finished goods and work-in-progress. If cost is slightly changed it effects the overall profitability position of a company. So, company should hold adequate stock of inventory to expand their image and to get more profitability.

Inventory is most important part of the industry/company which is required by every manufacturing company to produce products. So, every manufacturing company keeps efficient, adequate and optimal level of inventory to gain maximum profit and to reduce holding, store keeper cost and other cost. So, a company maintain adequacy inventory within the organization.

1.7 Organization of Study

The research reports will be divided into five chapters, which are as follows:

Chapter 1: Introduction, it will contain background of the study, focus of the study, statement of the problem, objectives of the study, limitation of the study, importance of the study and organization of the study.

Chapter 2: Review of literature which contains conceptual framework of the study, review of foreign and Nepalese researcher, reports, article and books.

Chapter 3: Research methodology contains research design, population and sample, nature and sources of data, data gathering procedure, data period covered and analytical tools.

Chapter 4: Presentation and analysis includes theoretical analysis, data presentation and analysis and major finding of the study.

Chapter 5: Summary, conclusion and recommendations.

CHAPTER TWO

REVIEW OF LITERATURE

Literature review is description of the literature relevant to a particular field or topic. Literature covers everything relevant that is written on a topic: books, journal articles, newspaper articles, historical records, government reports, thesis and dissertation etc. This is often written as part of a post graduated thesis proposal or at the commencement of a thesis. A critical literature review is a critical assessment of the relevant literature.

This chapter deals with review of literature regarding inventory management. Only limited number of studies has been conducted in the field of the inventory management. The literature survey also provides the foundation for developing a comprehensive theoretical framework from which hypothesis can be developed for testing. In this chapter attempts have been made to present preview 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

After the great depression of 1930s and before second Great world war the American economy as well as world economy was plagued by capacity utilization, material shortage, inflation and high interest rates. That situation made the mangers of the organizations pay much attention in inventory. So the various concepts and techniques have been developed in this regard.

In this chapter, various terms, concepts and principles developed by the researchers have been defined as used in this investigation. The terms such as ordering cost, holding cost i.e. capital cost, operational cost (handling cost), spoilage & shortage cost, insurance cost & stock out cost under cost concept and economic order quantity (EOQ), ABC analysis, safety stock calculation, Re-order level calculation & techniques in inventory valuation under technical approach have been discussed in detail.

2.1.1 Inventory Management

Inventory management is primarily about specifying the size and placement of stocked goods. Inventory management is required at different locations within a facility multiple locations of a supply network to protect the regular and planned course of production against the random disturbance of running out of materials or goods. The scope of inventory management also concerns the file lines between replenishment lead time, carrying costs of inventory, asset management, and inventory visibility, future inventory price forecasting physical inventory, available physical space for inventory, quality management, replenishment, returns, defective goods and demand forecasting.

Inventory too many small business owners is one of the more visible and tangible aspects of doing business. Raw materials, goods in process and finished goods all represent various forms of inventory. Each type represents money tied up until the inventory leaves the company as purchased products. Handles all functions related to the tracking and management of materials. This would include the monitoring of material moved into and out of stock room locations and reconciling of the inventory balances. Also may include ABC analysis, lot tracking, cycle counting support etc. Management of the inventories, with the primary objective of determining controlling stock levels within the physical distribution function to balance the need for product availability against the need for minimizing stock holding and handling cost.

Inventory is an idle resource which is useable and has value. The idle resource may be man, 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 and parts and supplies are the forms of inventory (Ahuja, 1993:310).

Raw material inventory provides flexibility in the purchasing of raw materials. It is necessary to buy raw materials in line with its production schedule. Conversely, raw materials inventory may be bloated temporarily because the purchasing department may take the advantage of quantity discounts. The level of raw materials inventories will be influenced by anticipated production, seasonality of production, reliability of sources of supply and the efficiency of scheduling purchase and production

operations. Example of raw materials is flour for Bread Company, sugar for sweet industries etc.

A manufacturing company must maintain a certain amount of inventory during the production, the inventory is known as work in process. Work in process is materials they 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 and obtaining the finished product. Decreasing the production period can increase inventory turnover. One means to accomplishing this is a new technique such as just-in-time inventory management. Another means is to buy items rather than make them.

Finished goods inventory allows the firm flexibility in its production scheduling and its marketing. The level if finished goods inventory is a matter of co-ordination of production and sales. The financial manager can stimulate sales by changing credit terms or by granting credit to marginal risks. But whether the goods remain on the books as inventories or as receivables the financial manager has to finance them. Many times, firms find it desirable to make the sale so that they are on a step nearer to realizing cash.

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

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

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 words, inventory refers to any stock hold by a company for smooth running of production and market operation. It is a kind of current assets in which huge part of working capital is invested. Therefore,

inventory is essential for smooth running of manufacturing as well as trading firms. Lack of inventory affects not only the continuous production of goods but also affects smooth supply of finished goods. A manufacturing company generally holds four kinds of inventories namely, raw materials, work in process, finished goods and spare parts and supplies. The need of inventories is for the transaction motive, precautionary motive and speculative motive.

Management is an art, which is devoted for planning, directing, co-coordinating and controlling different activities to achieve the predetermined goal. Thus, inventory management can be defined as the planning, directing, co-coordinating and controlling of various activities which are concerned with inventory management.

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

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

Generally inventory management covers the function of:

i. Purchasing

ii. Store keeping

iii. Issuing and pricing

2.1.1.1 Purchasing

Purchasing is the phase of materials management. Purchasing means procurement of goods and services from some external agencies. The object of purchase department is to arrange the supply of materials, spare parts and services or semi-finished goods,

required by the organization to produce the desired product from some agency or source outside the organization. The purchased items should be of specified quality in desired quantity at the prescribed time at a competitive price.

Purchasing is the procuring of materials, suppliers, machines, tools and services and required for equipment maintenance and operation of a manufacturing plant by Alford & Beauty. Purchasing function means the procurement by purchase of the proper materials, machinery, equipment and suppliers for stores used in the manufacturer of a product adapted to marketing in the proper quality and quantity at the proper time and at the lowest price, consistent with quality desired by Walters. Purchasing is a managerial activity that goes beyond the simple act of buying. It includes researched development for the proper selection of materials and sources, follow up to ensure timely deliver; inspection to ensure both quantity and quality; to control traffic, receiving, store keeping and accounting operation related to purchased by Westing Fine & Zenz.

Thus purchasing is an operation of market exploration to procure goods and services of desired quality quantity of optimal price and at the desired time.

Purchasing in an enterprise has now become a specialized function. It is experienced that by assigning the purchase responsibility to a specialist, the firm can obtain greater economics in purchasing. Moreover, purchasing involves more than 50% of capital expenditure budgeted by the firm. In modern perspective purchasing is a strategic managerial function and any negligence on it will ultimately result in great loss to the company.

In the organization key person to manage the purchasing is purchase manager. Purchase manager occupies an important position in the organization, his company is very important for the successful purchasing. He/she should be a person having quick decision-making power pleasing personality quality of goods leadership and for sighted approach (Sthapit, Yadav, Tamang, Govinda & Adhikari, 2010:222-223).

A. Objectives of Purchasing

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

a. Procurement of required quality and quantity of materials at the best price not necessarily at the lowest price

b. Procurement of materials which best suit the product and the purposes for which they are intended
c. 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
d. Buying the quality, which is neither too much that involves belonging of the capital nor too little that holds up the regular supply for production
e. Improvement of the product with reference to quality and distribution by means of selection of adequate materials
f. Maintaining continue supply to ensure production schedule at a minimum investment
g. Avoidance of duplication of materials, leading to waste of materials and equipment
h. Maintenance of company competitive position in the market by having company's quality standards in accordance with the demands of the consumers
i. Creation of goodwill for the company through dealings with supplies
j. Developing fullest co-operation and co-ordination maintaining internal relationship among various departments of the company.

B. Purchasing Procedures

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

i. **Purchase requisition:** The initiation of purchase begins with the formal request from the various sections or department to the purchase department to order goods. The request is made in purchase department by the departments needing the goods authorizing the purchase department for procuring 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 the decide 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 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. **Selection of vendors:** On the basis of the studies of market conditions and sources of supplier the purchasing agent selects the vendor keeping in mind the reliability, his price movement history, his delivery record and other service required and his past co-operation. Sometimes supplier is selected out of the list of suppliers registered with the company for the supply of goods or sometimes quotations or price bids or tenders are invited from the prospective suppliers. Through the study of supply and the quality and quantity of goods, a vendor is selected out of the bidders or tenderizer.

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

vi. **Receiving materials:** When goods arrive they are taken delivery and time 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 or quantity, it should be referred to the purchasing department so that discrepancy may be adjusted.

2.1.1.2 Store Keeping

Materials form a high percentage of the cost of production of product. It is therefore necessary to have a close watch in the proper use of the materials. The best method of maintaining materials properly is store keeping. Store keeping is a service function in a manufacturing concern, which deals with the physical storage of goods under the

custodian of well-trained and experienced person termed as storekeeper. Raw materials are usually known as stores and the place where such stores are kept is known as storeroom. Store keeping is that aspect of inventory control, which is concerned with the physical storage of goods. The responsibilities of store keeping management are to receive 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 (Maynard, P. 90).

Storekeeping should be given due place in the organization otherwise the material handling will add to the cost of production. The importance of store keeping has not been properly recognized by the manufacturing organization so far. Many organizations spend lavishly on machines and wages while store keeping is ignored and stores are housed in cramped 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 of short issue. Loss of stock of raw materials, unexpectedly running out of stock and preparation or incorrect vouchers all these lead to theft and pilferage of stock and delay in production.

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

A. Objectives of Store Keeping

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

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

a. Bin cards: A bin card is a quantitative record of receipts, issues and closing balance of a particular item if stores. Separate bin cards are maintained for each item of stores. This card is debited with the quantity of stores received, credited with the quantity of stores issued and a balance of the quantity of stores in taken after every receipt or issue. So, that the balance of item any time may be easily known. To have an up-to-date balance of stores, the principle of 'before touching the item, bin card should be touched' that is before receiving the item in the stores or issuing the item from the stores, entry is made in the bin card, so that up-to-date balance of the item may be known at anytime. This card is maintained by the storekeeper and he is responsible for any difference between the physical stock and the balance shown in this card. These cards are used not only for recording receipts and issues of stores but also assist the storekeeping in exercising stores control.

For each item of stores, minimum quantity, maximum quantity and ordering quantity are stated on the bin card. This is done with a view to have a watch on the balance. So, that requisition for replenishment may be placed as and when necessary (Jain & Narang, 1993:2/14).

b. Store Ledger: This ledger is kept in the costing department and is identical with the bin card except that receipts issues and balanced are shown along with their money values. This contains an account for every item of stores and makes a record of the receipts, issues and the balances, both in quantity and value. Thus, this ledger provides the information for the pricing of materials issued and the money value of any item of each item of stores (Jain & Narang, 1993:2/42).

2.1.1.3 Issuing and Pricing

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

2.1.2 Types of Inventory

Manufacturing firms generally hold four types of inventories, which are as follows:

i) Raw Material

Raw materials are those basic inputs that are converted into finished products through the manufacturing process. Raw material inventories are those units for future production (Pandey, 1995:826). Manufacturing form for smooth running of

production operation holds raw materials inventories. Materials used in factory traditionally classified as direct and indirect materials and part that can be directly identified with the unit cost of finished goods. Indirect materials are generally defined, as the materials used in the manufacturing process, which cannot be identified. They are only the supporting materials of the product (Welsh, Hilton & Gardon, 1990:241). The level of raw material inventories is influenced by anticipated production, reasonability of production, reliability of sources of supply and the efficiency of scheduling, purchasing and production operation (Copel and Thomas, 1982:321). Dabur Nepal Pvt. Ltd. is a manufacturing company so far the production of health and personal care different kinds of materials are used in the production process.

ii) Work-in-process

Work-in-process inventories are semi-manufactured products. They represent products that need more work before they become finished products for sale (Pandey, 1985:826). They include those materials that have gone committed to the production process but have not been converted into finished goods yet (Jain & Narang, 1986: III 109). 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. The level of work in process inventories are strongly influence by the length of production period.

iii) Finished goods

Finished goods inventories are those completely manufactured products which are ready for sale. Stocks of raw materials and work in process facilitate production, while stock of finished goods is required for smooth marketing operations. Thus, inventories serve as a link between the production and consumption of goods (Pandey, 1995:826). In a manufacturing concern, they are the final output of the production process yet (Jain & Narang, 1986: III 109).

Dabur Nepal Pvt. Ltd. has been producing different types of health and personal care of different types of product for smooth market operation.

iv) Spare Parts and Supplies Inventories

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

2.1.3 Need of Holding Inventories

The question of managing inventories arises only when the company holds inventories. Manufacturing inventories involved trying of the company funds and incurrence of storage and holding cost, if it is expensive to maintain inventories, why do companies hold inventories? There are three motives for holding inventories (Starr, & David, 1962:17).

Transactions motive emphasizes the need to maintain inventories to facilitate smooth production and sales operations.

Precautionary motive necessitates holding of inventories to guard against the risk of unpredictable changes in demand and supply forces and other factors.

Speculative motive influences the decision to increase or reduce inventory levels to take advantage of price fluctuations.

A company should maintain adequate stock of materials for a continuous supply to the factory for an uninterrupted production. It is not possible for a company to procure raw materials whenever it is needed. A time lag exists between demand for materials and its supply. Also, there exists uncertainty in procuring raw materials in time on many occasions. The procurement of materials may be delayed because of such factors as strike, transport disruption or short supply. Therefore the firm should maintain sufficient stock of raw materials at a given time of raw materials inventories are quantity discounts and anticipated price increase. The firm may purchase large quantities of raw materials then needed for desired production and sales levels to obtain quantity discounts of bulk purchasing. At times, the firm would like to accumulate raw materials in anticipation of price rise.

Work in process inventory builds up because of the production cycle. Production cycle is the time span between introduction of raw material into production and emergence of finished product at the completion of production cycle. Till production cycle completes, stock of work in process has to be maintained. Efficient firms

constantly try to make production cycle smaller by improving their production techniques.

Stock of finished goods has to be holding because production and sales are not instantaneous. A firm cannot produce immediately when customers demand goods. Therefore, to supply finished goods on a regular basis their stock has to be maintained. Stock of finished goods has also to be maintained for sudden demand from customers. In case the firm's sales are seasonal in nature substantial finished goods inventories should be kept to meet the peak demand. Failure to supply products to Customers, when demanded would mean loss of the firm's sales to competition. "The level of finished goods, inventories would depend upon the coordination between sales and production as well as on production time. If there is close link between sales and production, a small finished goods inventory could be maintained and still customers' needs could be met (Pandey, 1995:827-828).

2.1.4 Objectives of Inventory Management

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

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

Therefore, to maintain the proper inventory or optimal level of inventory in industry is quite significant. But, it is difficult task to the management because the optimal level of inventory always between two points of excessive and inadequate inventories. An inventory management should be (Pandey, 1995:828-829).

i. Ensure a continuous supply of raw material to facilitate uninterrupted production.

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

iii. Maintain sufficient finished goods inventory for smooth sales operation and efficient customer service.

iv. Minimize the carrying cost and time, and

v. Control investment in inventories and keep in at optimum level.

2.2 Classification of Cost

Cost is certainly a considerable factor in purchasing, production and maintaining inventory. To solve cost problem, the decision factors are when to purchase and how much to purchase at a time. The various factors should be composed and are applied to use the mathematical techniques in order to get the optimum and ideal inventory management system to bring the least cost consequence to the company. Lack of adequate knowledge regarding inventory policies to production manager and absence of formal records derives critical situation for economy purchase.

The principle cost involved in maintaining inventory can be classified as:

i. Holding Cost/Carrying Cost

Cost incurred for maintaining a given level of inventory is called carrying cost. Carrying cost varies with inventory size. This behavior is contrary to that ordering cost which decline with increase inventory size. The carrying cost includes the cost incurred in the following activities (B.K., 1994:39):

a) Opportunity cost or cost of capital

b) Warehousing cost

c) Handling cost

d) Clerical and staff

e) Insurance and taxes

f) Deteoriation and obsolesce

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 (Soleman, 1989:181):

Total carrying cost (TCC)= (C%) × (P) × (AI)

Where,

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

P= Price per unit of inventory

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

$AI = \frac{Q}{2} + S$

ii. Ordering Cost

Ordering cost consist of order costs, set up costs or both ordering cost could include preparing and processing the order request, selecting a supplier, checking the stock, preparing the payment and receiving inventory levels. Set up costs refers to modifying the manufacturing process to make different goods. They include personal costs as well as capital equipment costs. Many firms use blanket orders to reduce order costs (Bloomberg and Hanna, 2002:161).

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

i. Requisitioning

ii. Order placing

iii. Transportation

iv. Receiving, inspecting and storing

v. Clerical and staff

Ordering cost increase in proportion to the numbers of orders placed. The clerical and staff costs, however do not have to vary in proportion to the numbers of ordered

placed and one view is that so long as they are committed costs, they need not be reckoned in computing ordering cost. Alternatively, it may be argued that, as the number of the number of orders is increase. The clerical and staffed costs tend to increase. If the number of orders are drastically reduced, the clerical and staff force released now can be used in other departments. Thus, these costs may be included in the ordering costs. It is more appropriate to include clerical and staff costs on a pro-rata basis.

Ordering cost increase with the number of orders; thus the more frequently inventory is acquired, the higher the firms ordering costs. On the other hand, if the firm maintains large inventory levels, there will be few orders placed and ordering cost will be relatively small. Thus, ordering cost decrease with increasing size of inventory (Pandey, 1985:830).

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

i. Cost of placing an order
ii. Requisitioning cost
iii. Transportation/shipping cost
iv. Receiving, inspecting and storage cost
v. Sales tax, customs etc
vi. Clearing and forwarding cost
vii. Insurance of raw-materials
viii. Stationery cost
ix. Bank commission/LC charges etc
x. Telephone/Fax/Postage expenses to follow up
xi. Cost incurred when raw materials are in transit.

Ordering cost increases with the number of orders, thus more frequency in Inventory acquired, higher the firms ordering cost. On the other hands, if the firm maintains large inventories level, there will be a few orders placed and ordering cost will be

relatively small. Thus ordering costs decrease with the inventory size of inventory. The fixed costs associated with ordering inventories as 'O' and we placed 'n'.

Ordering per year, the total ordering cost is given as

Total Ordering Cost (TOC) = (O) × (N)

$$= (O) \times \left(\frac{R}{Q}\right)$$

Where,

TOC = Total ordering cost

O = Fixed cost per order

N = Number of orders placed per year

Q = Inventory quantity for each order

iii. Safety Stock Cost

The third category of inventory cost is the cost of maintaining safety stock. At this point, it should be noted that (TCC) includes the cost of maintaining safety stock, if TCC is using average inventory (AI). In other words,

TCC = (C %) × (P) × (AI)

Where,

C% = Percentage of cost of carrying inventory

P = Price per unit of inventory

AI = Average inventory

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) = (C %) (P) (S)

Now we can calculate the Total Cost of Maintaining Inventory (TCMI) by summing up all the cost. We can get TCMI by combining TCC, TOC and CSS (Pradhan: P 182).

TCMI = TCC + TOC + CSS or

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

Where,

TCMI = Total Cost of Maintaining Inventory

TCC = Total Carrying Cost

TOC = Total Ordering Cost

CSS = Cost of Safety Stock

C% = Percent of cost of carrying inventory

P = Price per unit of carrying inventory

AI = Average inventory

N = Number of orders made during the year

S = Safety stock

O = Cost of placing order.

2.3 Techniques of Inventory Management

In managing inventories the firm's objectives should be in consonance with the wealth maximization principle. To achieve this firm should determine the optimum level if 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 efficiently answer to the following two questions should be sought:

i. How much should be ordered?

ii. When should be ordered?

The first question how much to order, relates to the problem of determining Economic Order Quantity (EOQ) and is answered by analyzing cost of maintaining various levels of inventories. The second question when to order arises because of uncertainty with replenishing time and is a problem of determining the reorder level (Pandey, 1985:829).

2.3.1 Economic Order Quantity (EOQ) (Pandey, 1989:395-396)

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 if inventory given, its forecasted usage, ordering cost and carrying cost, ordering means either the purchase of the item of inventory is known with certainty. This usage is steady throughout the period of time being analyzed. In other words, 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 into 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 an 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 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.

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

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

Where,

A = Annual Demand

O = Ordering Cost per Order

C = Carrying Cost per Unit

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

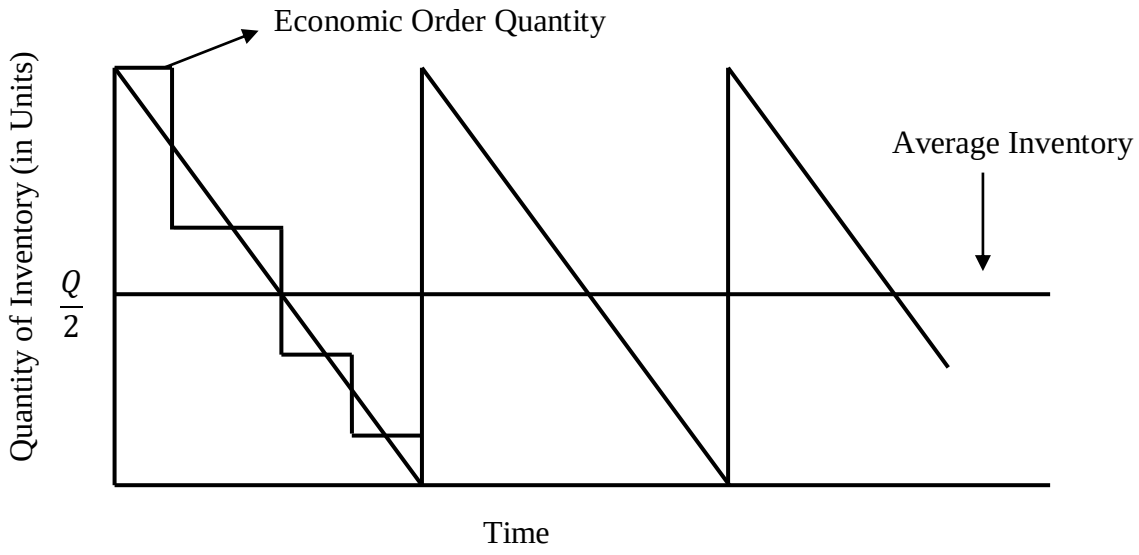
If the usage of an inventory item is perfectly steady over a period of time question of safety stock does not arise. Average inventory (in units) can be expressed as

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

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

Figure 2.1

Economic Order Quantity



Assumption of Economic Order Quantity

The concept of EOQ is the based on following assumption

The demand rate is constant recurring and known for example, demand (or usage) is 100 units a day with no random variation and demand is assumed to continue into the indefinite future.

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 stock out.

Material is ordered or produced in a lot or batch and lot is placed into inventory all at one time.

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.

The item is a single product there is no interaction with other products.

Approaches to set EOQ

The EOQ model can be illustrate by

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

They are explained below,

(a) Mathematical (short-cut) Formula Method

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

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

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

Where,

A = Annual Demand

O = Ordering Cost per Order

C = Carrying Cost per Unit

Illustration

Total requirement (A) = 2000 units

Ordering cost (O) = Rs 80 per order

Carrying cost (C) = Rs 2 per unit

We have,

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

$$= \sqrt{\frac{2\times2000\times80}{2}}$$

= 400 units

(b) The long analytical approach to tabulation method or trial and error approach

The trial and error or analytical approach to resolve the order quantity problem can be illustrated with the help of simple example:

Total annual requirement (A) = 2000 units

Carrying cost (C) = Rs 80 per order

Ordering cost (O) = Rs 2 per unit

Economic order quantity (EOQ) =?

Table 1

Total Cost of various orders

1	No. of orders	1	2	4	5	8	10
2	Order size	2000	1000	500	400	250	200
3	Average inventory	1000	500	250	200	125	100
4	Ordering costs (Rs.)	80	160	320	400	640	800
5	Carrying costs (Rs.)	2000	1000	500	400	250	200
6	Total cost	2080	1160	820	800	890	1000

On the above table 400 units is the economic order quantity where the total cost is least i.e. Rs 800.

Where,

No. of order = $\frac{A}{Q}$

Order size $= \frac{A}{\text{no.of order}}$

Average inventory = $\frac{Order\ size}{2}$

Carrying cost = CCPU × Average inventory

Ordering cost = No. of order × ordering cost per order

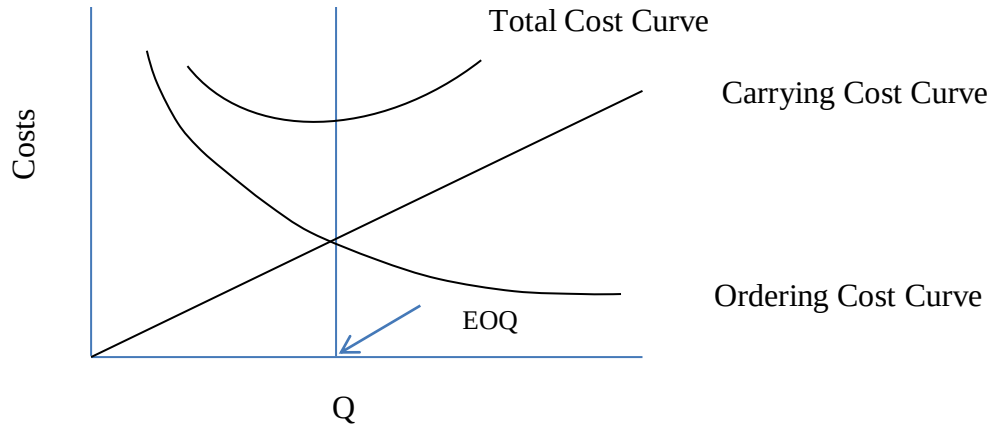
Total cost = Ordering cost + carrying cost

(c) Graphic Approach

The Economic Order Quantity can also be found graphically. The following figure illustrates the EOQ functions. Figure 2.2

Figure No. 2.2

Graphic Approach of EOQ



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

2.3.1.1 Important assumption of Economic Order Quantity Model

Although EOQ is easier technique to solve the problem of how much to purchase at once but it has some limitations/assumptions which are as follows (Elwoods, 1989:150):

i. Average demands of materials are continuous and constant.
ii. The lead time is constant. Although this assumption may be valid in many situations, however lead times are often variable. The result of a variable lead time is that receipt of the order produces excess inventories when lead times are shorter than expected and stocks out situations when lead times are longer than expected. The basic model is not appropriate when lead times are variable. Further the deliveries for all 'Q' items are instantaneous rather than over time.
iii. Independence between inventory items: The EOQ Model assumes that replenishment of one inventory item has no effect on the replenishment and any other inventory item. This assumption is valid items are coupled together by a common production plan.
iv. Purchase price and price parameter are constant.
v. The Economic Order Quantity (EOQ) should be equal to the delivery quantities. If delivers lost are smaller than the average inventories in the EOQ the model is no longer remain valid.

2.3.2 Safety Stock Calculation

The proper amount of safety stock to maintain depends on several things. The great the uncertainty associated with forecasted demand for inventory the greater the safety stock of the firm will wish to carry, all other things remaining the same. Similarly, the greater the uncertainty of lead time to replenish stock, the greater the risk of running all of stock and the more safety stock the firm will wish to maintain all other things being equal. Another factor influencing the safety stock decision is the cost of running out of inventory. The company being out of raw material and inventories results delay in production. How much does it cost? When production closes down temporarily? And where fixed costs are high this cost will also be quite high? The cost of running out of finished goods is customer dissatisfaction. It is because of low

quality, no regular supply of goods & high price. It not only will lose immediate sale but also endanger the future sale, if customers take their business elsewhere. Although this opportunity cost is difficult to measure, it must be recognized by management & should incorporate in to the safety stock decision. The greater the cost of running out of stock, the greater the safety stock will be wished to maintain, all other things being the same.

The cost of carrying additional inventory is very costly to the firm. If it was not the case a firm could maintain whatever safety stock it required to avoid all possibility of running out of inventory. The greater the cost of carrying inventory the more costly it is to maintain a safety stock, all other things being equal. Determination of the proper amount of safety stock involves balancing the probability & cost of a stock out against the cost of carrying enough safety stock to avoid this possibility. Ultimately the question reduces to the probability of inventory stock out management is willing to tolerate (Vanhorne, 1989:449).

Safety stock can be determined using statistical methods in different situations.

1. on the situation when demand rate varies:

Safety stock = Lead time (Maximum demand rate – Average demand rate)

2. On the situation when both demand rate and lead time fluctuate:

Safety stock = (Maximum lead time x Max. demand rate) –
(Average lead time x average demand rate)

3. On the situation lead time varies demand uniform:

Safety stock = (Maximum lead time – Average lead time) x demand rate

2.3.3 Re-order Level

The problem, how much to order is solved by determining the economic order quantity (EOQ). The EOQ discussed above assumes that organization knows with certainty the future demand/requirement of any items, hold the supply of the items instantaneous, unfortunately these assumptions are found to be unrealistic because in real world situation there should be gap between the time of placing order and the receipt of the delivery. Thus, time gap can be due to delay in transportation loading and many other factors, which are beyond control.

If order is placed when the stocks are over then there is always a chance that the firm may face the situation of storage. Another alternative is to place an 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 piling up of inventory for the longer period and if it is placed too late then this may result in shortages. Both these situations are not in the interest of the firm. The problem is known as 'when to order' & is very difficult for any organization. In other words, the choice of appropriate point at which an order to replenish the inventory at which re-order should be placed is known as re-order level or re-order point (Goel, 1992:294).

Three items of information are needed input to determine the re-order point subsystems which are given below:

- **Usage rate:** This is the rate per day at which the items are consumed in production or they are sold to customers.
- **Lead time:** This is length of time between placing an order & receiving the goods.
- **Safety stock level:** This minimum level of inventory may be expressed in terms of several days' production and sales.

Safety stock is necessary for an uncertain demand of the customers. The demand for goods may fluctuate day by day or from week to week, if the actual usage or sales go up & delivery of goods is delayed. The provision of safety stock makes the organization able to face the problem of stock out. Hence, re-order point is calculated as follows:

Re-order point = Lead time x Average usage + Safety stock

2.3.4 Determining Critical Levels

Maximum Stock Level (Jain & Narang 1995:231)

This represents the maximum quantity of an item of material which can be held in stock at any time. Stock should not exceed than this level at any cost. The quantity is fixed so that there may be no over stocking. Over stocking should be avoided because of the following disadvantages:

i. Overstocking of materials unnecessarily blocks working capital which could be profitable lying unutilized somewhere else.
ii. Overstocking of materials will need more go down space so more rent will have to be paid.
iii. There may be loss due to obsolesce on account of overstocking.
iv. There are chances of deterioration in quality because large stocks will require more time before they are consumed.
v. There may be fear of depreciation in market values of the overstocking of material.

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

a. Amount of capital available for maintaining stores
b. Go-down space available
c. Rate of consumption of the material during the lead time
d. The time lag between indenting & receiving of the materials.
e. Possibility of loss in stores by deterioration & evaporation
f. Cost of maintaining stores.

It can be calculated by following formula:

Maximum stock level = Re-order level + Re-order quantity – (Minimum usage × Minimum delivery time)

Minimum Stock Level (Jain & Narang 1995:231)

This presents the minimum quantity of the material which must be maintained in hand all times. The quantity is fixed so that production may not be held up due to shortage of the material. In fixing this level the following factors are taken into consideration:

i. Lead time i.e. time lag between indenting and receiving of the material. It is the time required to replenish the supply.
ii. Rate of consumption of material during the lead time.
iii. Nature of material: Minimum level is not required in case of a special against customer specific order.

It can be calculated by following formula:

Minimum stock level = ROL – (Normal consumption x Normal re-order period)

Where,

ROL = Re-order level

Normal consumption = $\frac{\text{Maximum consumption + Min. consumption}}{2}$

Normal re-order period = $\frac{\text{Max. delivery period + Min.delivery period}}{2}$

Danger Stock Level (Jain & Narang 1995:231)

This represents a level at which normal issues of material be stopped and issues are made only under specific instruction. The purchases officer will make special arrangements to get the materials which reach at their danger levels. So that the production may not stop due to shortage of materials. Danger stock level can be calculated by following formula:

Danger stock level = Average consumption × Max. Re-order period for emergency purchase

2.3.5 Inventory Valuation (Jain & Narang 1996: III 109)

The balance sheet of a concern must show true and fair view of the financial position of the concern for this purpose assets including inventory should be properly value to exhibit a true and fair view. True profits cannot be calculated unless assets are properly valued. Only then balance sheet will exhibit a true and fair view of the financial affairs of the firm

If inventory is valued at a value which is less than the actual value, the profits will be reduced and as a result, shareholders would get fewer dividends. On the other hand, if inventory is valued at which is more than the actual value, the profits would be inflated and the shareholders would receive more dividend, a part of which would, thus, be paid out of capital payment of dividend out of capital would exhaust the capital by and the company would be insolvent. Moreover under-or over-valuation of inventory will not any affect the operating results and financial position of the current period box will also affect these for the next period.

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

A. Specific Identification Method

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

B. First In First Out (FIFO) Method (Goyal & Manmohan, 1999:691)

The first-in, first-out method of material pricing is used most successfully for handling items of some bulk with a relatively high unit cost as it is very easy to identify units belonging to a particular lot.

Under this method, the assumption is that materials are issued from the oldest cost price listed on stock ledger the materials on hand at all times being the most recent purchases. When a requisition for a certain type of material as presented to a store-keeper, he uses the cost price of the first lot of material received will on hand and, if the quantity desired is greater than the units remaining in the first lot, he uses the cost price of the second lot, then of the third and fourth until enough material is obtained to complete the requisition. Though the actual handling of materials in bins and on skelves in accordance with the FIFO method is imaginary in most concerns, this method is handling should be followed in case of materials which are subject to deterioration and obsolescence.

C. Last In First Out (LIFO) Method (Goyal & Manmohan, 1999:692)

The last-in, first-out method, which is frequently known as the 'replacement cost' method, receives its support from the theory that goods sold are those most recently purchased and that goods are issued from the stock in accordance with last-in, first-out principle. Thus cost of the latest materials purchased will be the costs assigned to the first material issued, until they are exhausted, then the price of the preceding lot is used and so on, materials are issued at costs approximating current market prices but inventories tend to be valued at the oldest lots on hand giving a price which is out-of-date with current invoice prices.

The main purpose of the LIFO method is to apply current costs to current sales. The protagonists of this method are of the view that many enterprises maintain at all

compared to an investment fund or a fixed assets and, if this inventory quantity remains unchanged. It is asserted that it should be valued at the cost of the quantity originally purchased while a better matching of cost of goods sold and sales is obtained. If cost of goods sold represents current cost prices on the understanding that sales and production result from current purchases.

D. Weighted Average Cost of Capital (WACC) Method

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

E. Inflation Price Method (Jain & Narang 1996: III 118)

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

F. Higher In First Out (HIFO) Method (Jain & Narang 1996: III 117-118)

This method is based on the assumption that closing stock of material or goods manufactured should always remain at the minimum value. So, lots of the highest costs of materials purchased of goods manufactured are exhausted first. Consequently closing stock is valued at the minimum value of various lots which are not exhausted up to the days of stock taking. This method is not popular and it always under values the stock which amounts to creating a secret reserve. The method is mainly used in case of cost plus contracts or monopoly products as it is helpful in increasing the price of the contract or products.

G. Market Price Method (Jain & Narang 1996: III 119)

Market price either is the replacement price or the realizable price. The replacement price is used in case of items that are held in stock for use in production while realizable price is used in respect of the items that are kept in stock for sale. This method of 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 successfully used for the valuation for obsolete items of stock for a long period.

2.4 Just In Time (JIT) Inventory (Swartley Loush, 1995:61-64)

A recent development in material and parts inventory control is called Just-In-Time (JIT) purchasing and manufacturing. Its primary objectives are to minimize inventory levels and the resulting costs. In this approach, materials and parts are not purchased until needed for production, thereby minimizing inventory holding costs. It is critical to anticipate exactly when the materials and parts will be needed for production so that the acquisition can be reflected in the materials and parts budget for purposes see that preceding chapter for additional discussion of the JIT approach.

2.5 Inventory and the Financial Manager (Vanhorne, 1990:450451)

The inventory control methods give us a means for determining an 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 to inventory control and operation research has many applications to inventory management. Monitoring amounts and tied up in inventories are the important aspect of this.

Although inventory management is not the direct operating responsibility of the financial manager, the investment of funds is 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 and the lower the optimum level of average inventory and the lower the optimal order quantity, all others things hold constant. The EOQ model also can be useful to the financial manager in planning for inventory financing.

When demand or inventory is uncertain the financial manger may try to effect policies that will reduce the average lead time required to receive inventory, once an order is placed. 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 the opportunity cost of funds invested in inventory, the greater the inventory to reduce this lead time. The purchasing department may try to find new vendors that promise quicker delivery, or it may pressure existing vendors to deliver fasting. The production department may be able to deliver finished goods faster by producing a smaller fun. In other case, there is a tradeoff between the added cost

involved in reducing the lead time and the opportunity cost of funds tied up in inventory.

The financial manager is also concerned with the risks involved in carrying inventory. The major risk is that the market value of specific inventories will be less than the value at which they were acquired. Certain types of inventory are subject to obsolesce, whether it is in technology may take and electronic component worthless. A change in style may cause a retailer to sell dresses at substantially reduced prices. Other inventories such as agricultural products are liable to physical deterioration; of course, inventories will have to sell at lower and lower prices, all other things being the same. In other situations, the principle risk is that of fluctuations in market price. Some types of inventory such as copper 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 firms' 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 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 into an analysis of risk, similar to that for capital budgeting. We know that greater the efficiency with which the firm manages its inventory, the lower the required investment and the greater the shareholders wealth, all other things being the same.

2.6 Review of Master's Degree Thesis

Some studies have been made in the subject of inventory management but a few studies have been gone on. Some studies will be reviewed in this chapter.

Pushpa Raj Baral (1994) has also made study regarding Inventory Management: A Case Study of Gandaki Noodles Pvt. Ltd. The main objectives of his study are to highlight the company's policies, objectives, function and activities regarding inventory management. Finally he came to know that factory is following neither economic order quantity model in its purchasing decision not ABC analysis in inventory management.

Radha Kumari Balika (1996), has conducted the study of Hetauda Cement Factory Ltd. She found that Hetauda Cement Factory Ltd. was in the problem of overstocking of raw material and work in process. She suggested this might be due to the inefficient management system of inventories. Due to this fact she concluded that the production and sales plan of the factory was not practicable and realistic.

Kshetry (1998), has suggested that AIC should attempt to use the scientific models like EOQ, reorder point, ABC analysis etc so that inventory problems whether it is overstock, under stock, out of stock will be solved. As a result AIC can deliver the regular supply of chemical fertilizers at the right quantity at reasonable price at the right place.

Singha Raj Basnet (1999) in his degree thesis expressed his view that, in reality Himal Cement Company Limited (HCCL) is not applying the different method or techniques of inventory management. To manage its inventory effectively, a firm should use different tools and techniques lies EOQ, ABC analysis, reorder 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, will run in profit in future.

Krishna Narayan Shrestha (2000) has conducted the study on the topic of Inventory Management of Royal Drug Ltd. His study stated that to achieve the objective of Royal Drug Ltd., the efficient management of inventory is essentials. If the Royal Drug Ltd. applies the scientific techniques of inventory management, certainly it will cope its objectives very successful. He further suggested that, purchase plan should be prepared for different types of raw materials with proper companies coordination and cooperation among the different department like planning, purchasing, storing, producing marketing, selling etc. to avoid the excessive investment on inventory. He also recommended that for purchasing various types of raw materials and inventory, the company should use significant inventory management techniques to minimize total inventory cost i.e. carrying and ordering cost.

Laxmi Pandey (2000) expressed the need of good inventory system to maintain a suitable level of inventory in order to meet corporation's requirement on time. Time

rules for maintaining proper stock of inputs are necessary to know the answer about how much to buy and when to buy. The models, examples and formulas are necessary for every business to reduce unnecessary cot incurred on ordering and carrying cost of the inventory. Moreover, the unnecessary costs involved in ordering and carrying can be reduced to a certain level by the use of models, formulas etc.

Saroj Sigdel (2002) has reported the agriculture Input Corporation (AIC) procures through inviting global tender, negotiation, aid/assistance from donor agencies & countries, and negotiation/ agreement between two governments. However, AIC prefers procurement through inviting global tender as other procedures are less reliable and costly compared to this. AIC is not applying the scientific models of inventory management. They are ordering chemical fertilizers in lots of 1000 to 2000 M. ton without considering EOQ that ease the supply. There is also no evidence of taking generally 3 to 6 months to receive as order after the order placement; Reorder point was also not fixed. Regarding buffer stock, although the AIC have capacious warehouses throughout the country, it remains out of stock in season and over stock in off-season. AIC was also not using ABC analysis.

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 Quantity of collected materials are fluctuating from year to year. The Company is not adopted appropriate EOQ Model in purchasing decision.

Jamuna Shrestha (2008) has conducted a research work on inventory management of manufacturing company (A Study on Inventory Management of J.K. Soap and Chemical Industries Pvt. Ltd.). He set some objectives which are as below:

I. To examine the existing inventory management system followed by the J.K Soap & Chemicals Industries Pvt. Ltd.

II. To analyze the techniques used by the company to determine level of inventory.

III. To identify the optimum level of inventory to reduce inventory management cost.

CHAPTER THIRD

RESEARCH METHODOLOGY

In the previous chapter the introduction, related literatures were reviewed for the purpose of this study. In this chapter, the research methodology presents the plan, procedure and tools used to analyze and interpret the available data.

Research in common parlance refers to a search for knowledge. But a statistical survey or research means the search for knowledge through statistical methods. In this context, research may be defined as the objective and systematic method of finding solution to a problem i.e., systematic collection, recording, analysis, interpretation and reporting of information about various facets of a phenomenon under study. In other words, research refers to the systematic method consisting of enunciating the problem collecting facts or data analyzing the facts critically and reaching conclusions based on them. Research methodology refers to the various sequential steps to be adopted by a researcher in studying a problem with certain object in view. It would be appropriate to mention that research projects are not susceptible to any one complete and inflexible sequence of steps and the type of problems to be studied will determined the particular steps to be taken and their order (Kothari, 1994:18).

For the purpose of achieving the objectives, the following methodology has been adopted which includes research design, nature of data, data gathering procedure and presentation & analysis techniques.

3.1 Research Design

The research design is the plan structure and strategy for investigation of the facts in order to arrive at conclusion. The plan is the overall scheme of program of research. It includes and outlines of what the investigator will do from writing the hypothesis and their operational implications to the financial analysis of data (Kerlinger, 1986). The design of the study is descriptive and also is analytical design will be adopted. A research design is a plan for the collection and analysis of data. Research design consists of important procedure and techniques for guiding, analyzing and evaluating the study. Secondary data will have been used in order to achieve the predetermined objectives of this research.

3.2 Population and Sample

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

3.3 Nature and Sources of Data

Secondary data will be used in this study. Information collected through websites from DNPL. There are many ways of collecting data for presentation in the thesis. The main sources of data used in the presentation are collected from secondary sources. And these sources have been used in the collection of secondary data are as follows:

a. Studying and analyzing the balance sheet

b. Studying and analyzing available unpublished records

c. Reports and financial statement of the factory

3.4 Data Gathering Procedure

Data gathering is very difficult activity of the whole research process but it is most important part of the research. Data gathering consists of obtaining information from somebody's hand. The secondary data are directly obtained from various sources mentioned above for the purpose of data an analysis are taken from websites.

3.5 Period of Study

The study covers the period of five year i.e. FY 2007 to 2011.

3.6 Analytical Tools

Collected information has been presented in suitable forms like tables and figures. For the analysis of collected data various inventory management model have been used whenever necessary. The proposed inventory models are listed below:

a) Economic Order Quantity

The economic order quantity may be defined as that level of inventory order that minimized the total cost associated with inventory management. EOQ can be determined by following way:

I. Formula Method

II. Table Method

III. Graphic Method

i. Formula Method

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

Where,

EOQ = Economic Order Quantity

A = Annual requirement

O = Ordering cost

C = Carrying cost

ii. Table Method

$$\text{Order size} = \frac{\textbf{Annual Requirement}}{\textbf{Number of Order}}$$

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

Total Carrying cost = Carrying cost per unit × Average inventory

Total Ordering cost = Total cost of an order × Number of order

iii. Graphic Method

b) Re-order Level

The re-order level is defined as the level of inventory at which an order should be placed for replenishing the current stock of inventory and it should be appropriate so the cost associated with the inventory will be minimum.

c) Correlation

Correlation analysis is the statistical tool that we can use to describe the degree to which one variable is linearly related to other variables. Two or more variables are said to be correlated if change in the value of one variable appears to be related or linked with the change in the other variables.

$$r = \frac{n \times \sum XY - \sum X \sum Y}{\sqrt{n\sum X^2 - (\sum X)^2}\sqrt{n\sum Y^2 - (\sum YX)^2}}$$

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF DATA

The basic objective of this study is to analyze present practice of inventory management system in DNPL. To achieve the objective, collected data and information are analyzed this chapter by using different tools and techniques of the inventory management.

4.1 Purchasing Procedure Practice in DNPL

DNPL is a manufacturing company. So, purchasing is the first important function of inventory management of the manufacturing company types of raw materials such as sugar and molasses, vegetables oils, herbs, jari booti & raw madhu, chemicals & perfumery compounds and other raw materials for the production of different types of product.

DNPL needs regular supply of different types of raw material for the continuous production operation. Required raw materials for the factory are purchased by using following purchasing procedures.

4.1.1 Collection of Requisition

Purchasing manager of the company collects the purchase requisition slip the store department for all items of regular use.

4.1.2 Decision for Purchase

When the purchase requisition is received by the purchasing manager then he decides what, when and how much to buy. Purchase decision is taken by the consumer needs and wants first of all, feasibility study of consumers, how many consumers buy or not buy the products of the company. On the basis of the feasibility study consumers market nationally and internationally and then taken decision of the purchase.

The level of purchasing of raw materials directly affects the investment on inventory and cost associated with inventory, which ultimately affects the profitability position 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 purchase quantity of material. But in DNPL, EOQ model of inventory management is not in practice.

4.1.3 Selection in Suppliers

DNPL is a subsidiary company of Dabur India Pvt. Ltd. So, the requirements of all materials are purchased from Dabur India Pvt. Ltd. of India. Therefore, DNPL has adopted centralized purchasing procedure.

4.1.4 Purchase Order

In case of centralized purchasing, DNPL purchasing department prepares orders and sends to the DIPL to supply a specific quality and quantity of materials at the stipulated terms at the time and place mentioned.

4.1.5 Receiving and Inspection of Materials

When materials are arrived then they are received and checked by receiving clerk against the order placed by the purchasing department to vendor. After proper checking, materials are delivered to the store department for checking, if any discrepancy is found regarding the quality and quantity. It is immediately sent to the purchasing department to adjust the discrepancy. Since the company is purchasing raw materials from DIPL, there are no discrepancy regarding quality and quantity.

4.2 Store Control Device

The raw materials are received by the purchasing department then all items received by the purchasing department should be passed onto store for protection against deterioration and pilferage. To minimize the cost of holding materials in store all companies generally use different types of controlling devices like Bin cards and store ledger. But the DNPL uses bin cards. A bin card makes a record of the receipt and issues of materials. A bin card is kept for each item store carries. These cards are maintained by the storekeeper and storekeeper is accountable for any different between the physical stock and balance shown in bin card. These cards are used not only for recording receipts and issues of stores but also for assist the storekeeper to control the stock.

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

4.3 Issuing and Pricing

The pricing of the issues can be determined by values as per weighted average method at the lower cost or market price.

4.4 Present Inventory Position of DNPL

4.4.1 Relation between Inventory and Current Assets

Table No. 4.1

Relation between Inventory and Current Assets

Year	Inventory (Rs. in lacs)	Current Assets (Rs. in lacs)	% of Inventory on Total Current Assets	% of deviation on average
2007	4,361.17	11,775.06	37.04	(29.23)
2008	6,174.36	12,824.34	48.15	(8.01)
2009	5,516.98	11,027.51	50.03	(4.41)
2010	7,113.20	10,971.14	64.84	23.88
2011	10,015.01	16,253.00	61.62	17.73
Average	6,636.14	12570.21	52.34	

Source: Annual Report of DNPL, Kathmandu.

Note: % of Inventory on Current Assets = $\frac{\text{Inventory}}{\text{Current Assets}}$

% of deviation on an average = $\frac{\text{\% of Inventory on TotalCA} - \text{Average \% of Inventory on Total CA}}{\text{Average \% of Inventory on Total CA}}$

$\therefore$ The % of the deviation on average brackets is negative figure.

From the above table no. 4.1 indicates that the inventory to current assets ratio from the 2007 to 2011 are 37.04%, 48.15%, 50.03%, 64.84% and 61.62% respectively. And the average percentage of inventory seems 52.34% the study period.

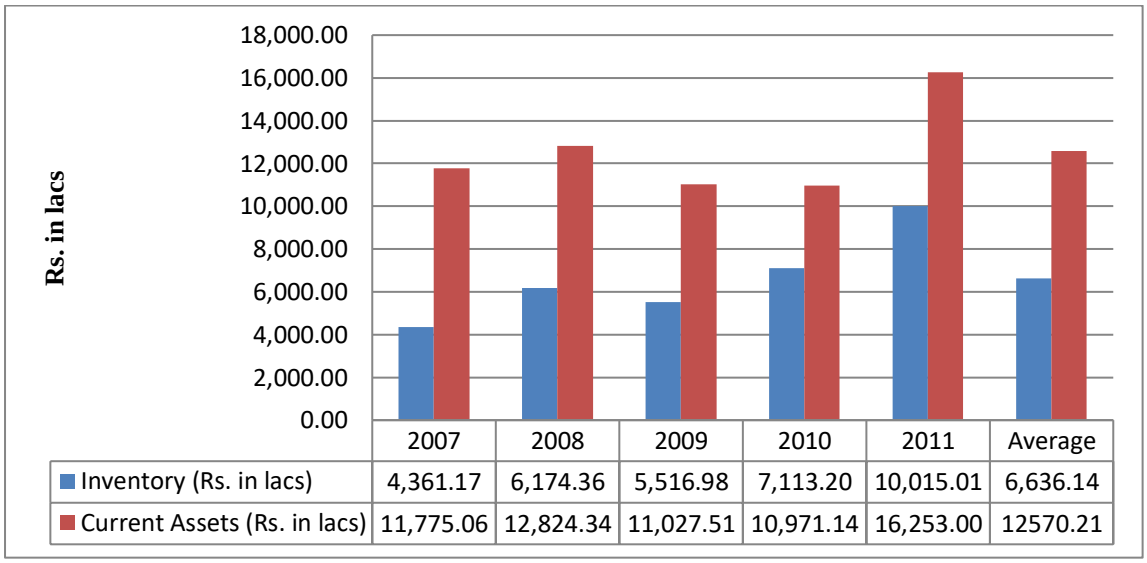
Above table shows the deviation of percentage of inventory in current assets over the study period. The highest positive deviation in inventory on current assets in the 2010, i.e. 23.88 percent and highest negative deviation in inventory on current assets in 2007, i.e. (29.23%) which is compared by overall study period.

From the above analysis if is observed that the share of inventory on total current assets is highest in 2010, i.e. 64.84 percent and lowest in 2007, i.e. 37.04 percent. This result refers that the company has not been adopting an appropriate inventory policy.

The graphic presentation of level of inventory and current assets is as follows:

Figure No. 4.1

Level of Inventory and Current Assets



4.4.2 Relation between Raw Material and Total Inventory

Table No. 4.2

Relation between Raw Material and Inventory

Year	Raw Material (Rs. in lacs)	Inventory (Rs. in lacs)	% of RM on Total Inventory	% of deviation on average
2007	1,576.39	4,361.17	36.15	(24.95)
2008	2,213.09	6,174.36	35.84	(25.59)
2009	3,016.92	5,516.98	54.68	13.51
2010	4,304.62	7,113.20	60.51	25.62
2011	5,372.63	10,015.01	53.65	11.38
Average	3,296.73	6,636.14	48.17	

Source: Annual Report of DNPL, Kathmandu.

Note:

$$\% \text{ of Raw Material on Total Inventory} = \frac{\text{Raw Material}}{\text{Inventory}}$$

$$\% \text{ of deviation on an average} = \frac{\% \text{ of RM on Total Inv.} - \text{Average } \% \text{ of RM on Total Inv.}}{\text{Average } \% \text{ of RM on Total Inventory}}$$

$\therefore$ The % of the deviation on average brackets is negative figure.

DNPL has been using different types of Sugar and Molasses, Vegetables Oils, Herbs, Jari Booti & Raw Madhu, Chemicals and Perfumery Compounds and other raw materials; that constitute the major portion of raw materials on total inventory in DNPL.

From the above table no. 4.2 shows that the raw material on total inventory ratio during the study period is 36.15 percent in 2007, 35.84 percent in 2008, 54.68 percent in 2009, 60.51 percent in 2010 and 53.65 percent in 2011. Whereas average percentage of inventory in whole research period has been 48.17 percent.

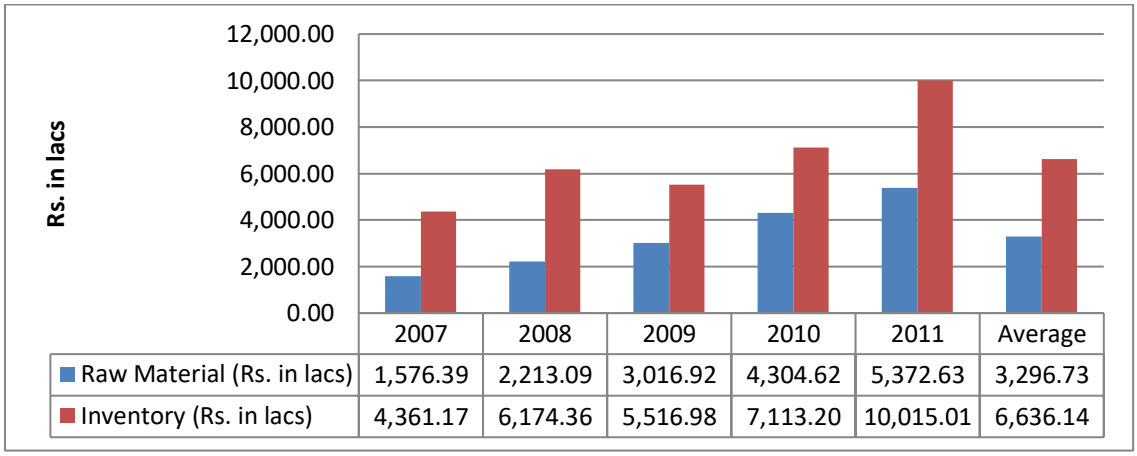
Above table shows the deviation of percentage of raw material in total inventory over the study period. The highest positive deviation in raw material from the average raw material inventory 25.62 percent in the 2010 and the highest negative is (25.59) percent in 2008.

From the above analysis, it is observed that the share of raw material consumption in the company is erratic. The fluctuation in stock of raw material during the study period is very high percentage of raw material on total inventory is highest in 2010, i.e. 60.51 percent and lowest in 2008, i.e. 35.84 percent.

The graphic presentation of level raw material on total inventory is as follows:

Figure No. 4.2

Level of Raw Material on Total Inventory



4.4.3 Relation between Packaging Material and Total Inventory

Table No. 4.3

Relation between Packaging Material and Inventory

Year	Packaging Material (Rs. in lacs)	Inventory (Rs. in lacs)	% of PM on Total Inventory	% of deviation on average
2007	1,252.04	4,361.17	28.71	34.03
2008	1,569.64	6,174.36	25.42	18.67
2009	936.39	5,516.98	16.97	(20.77)
2010	1,334.26	7,113.20	18.76	(12.42)
2011	1,727.71	10,015.01	17.25	(19.47)
Average	1,364.01	6,636.14	21.42	

Source: Annual Report of DNPL, Kathmandu.

Note: % of PM on Total Inventory = $\frac{\text{Packaging Material}}{\text{Inventory}}$

% of deviation on an average = $\frac{\text{\% of PM on Total Inv.– Average \% of PM on Total Inv.}}{\text{Average \% of PM on Total Inv.}}$

∴ The % of the deviation on average brackets is negative figure.

DNPL has been using different types of glass containers, plastic containers/cars/jar, printed packing materials, laminates & lamitubes and other packing materials; that constitute the major portion of raw materials on total inventory in DNPL.

From the above table no. 4.3 refers that the packaging material on total inventory ratio during the study period is 28.71 percent in 2007, 25.42 percent in 2008, 16.97 percent in 2009, 18.76 percent in 2010 and 17.25 percent in 2011. Whereas average percentage of inventory in a overall study period has been 21.42 percent.

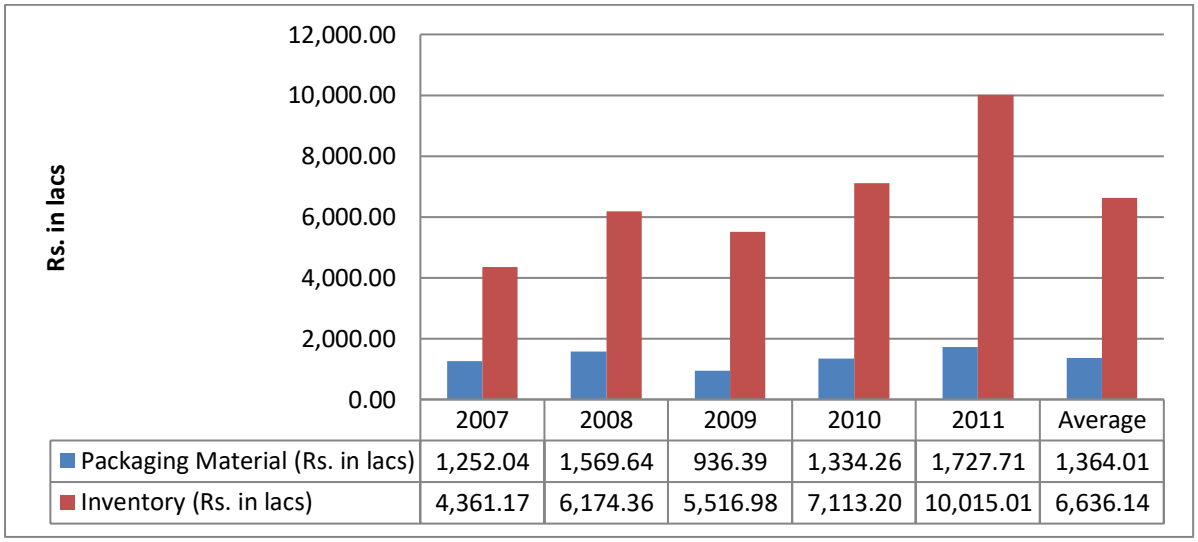
Above table shows the deviation of percentage of packaging material in total inventory over the study period. The highest positive deviation in packaging material from the average raw material inventory 34.03 percent in the 2007 and the highest negative is (20.77) percent in 2009.

From the above analysis, it is observed that the share of packaging material consumption in the company is erratic. This result shows that there is no fixed policy of purchasing of packaging material on total inventory is highest in 2007, i.e. 28.71 percent and lowest in 2009, i.e. 16.97 percent.

The graphic presentation of level raw material on total inventory is as follows:

Figure No. 4.3

Level of Packaging Material on Total Inventory



	2007	2008	2009	2010	2011	Average
Packaging Material (Rs. in lacs)	1,252.04	1,569.64	936.39	1,334.26	1,727.71	1,364.01
Inventory (Rs. in lacs)	4,361.17	6,174.36	5,516.98	7,113.20	10,015.01	6,636.14

4.4.4 Relation between WIP Material and Total Inventory

Table No. 4.4

Relation between WIP Material and Inventory

Year	WIP Material (Rs. in lacs)	Inventory (Rs. in lacs)	% of WIP on Total Inventory	% of deviation on average
2007	55.76	4,361.17	1.28	(47.32)
2008	102.76	6,174.36	1.66	(31.69)
2009	202.58	5,516.98	3.67	51.03
2010	273.33	7,113.20	3.84	58.03
2011	169.88	10,015.01	1.70	(30.04)
Average	160.86	6,636.14	2.43	

Source: Annual Report of DNPL, Kathmandu.

Note: % of WIP on Total Inventory = $\frac{\text{WIP Material}}{\text{Inventory}}$

% of deviation on an average = $\frac{\text{\% of WIP on Total Inv.– Average \% of WIP material on Total Inv.}}{\text{Average \% of WIP material on Total Inv.}}$

∴ The % of the deviation on average brackets is negative figure.

From the above table no. 4.4 refers that the raw material on total inventory ratios are 1.28%, 1.66%, 3.67%, 3.84% and 1.70% from 2007 to 2011 respectively. Whereas the average percentages of WIP materials in total inventory in the overall study period has been 2.43 percent.

Above table imply that the deviation of percentage of WIP material in total inventory over the study period. The highest positive deviation in WIP material from the average WIP is 58.02 percent in the 2010 and the highest negative is (47.32) percent in 2007.

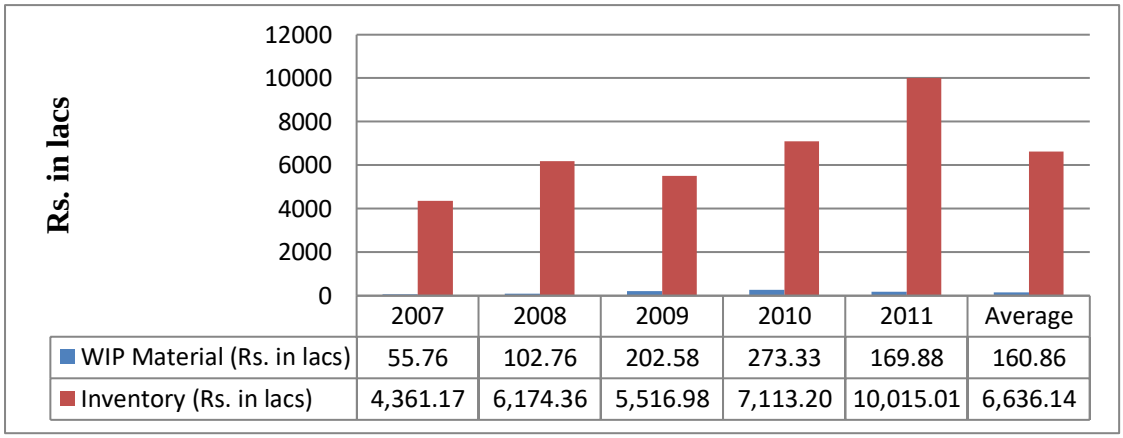
From the above analysis, it is observed that the share of WIP materials of the company is fluctuating during the period. Inventory on WIP material is highest in 2010, i.e. 3.84 percent and lowest in 2007, i.e. 1.28 percent. Such fluctuation in inventory position is not considered as good from the point of view of inventory management. Fluctuation in demand and sales of company products, lack of

appropriate inventory policy and ineffective demand forecast are the main reasons of such fluctuation.

The graphic presentation of level WIP material on total inventory is as follows:

Figure No. 4.4

Level of WIP Material on Total Inventory



4.4.5 Relation between Finished Goods and Total Inventory

Table No. 4.5

Relation between Finished Goods and Total Inventory

Year	Finished Goods (Rs. in lacs)	Inventory (Rs. in lacs)	% of FG on Total Inventory	% of deviation on average
2007	1,476.98	4,361.17	34.22	72.22
2008	2,288.87	6,174.36	30.07	51.33
2009	1,361.09	5,516.98	24.67	24.16
2010	529.52	7,113.20	7.44	(62.56)
2011	296.99	10,015.01	2.97	(85.05)
Average	1,190.69	6,636.14	19.87	

Source: Annual Report of DNPL, Kathmandu.

Note:

% of Finished Goods on Total Inventory = $\frac{Finished\ Goods}{Inventory}$

% of deviation on an average = $\frac{\%\ of\ \text{FG}\ on\ Total\ Inv. - Average\ \%\ of\ \text{FG}\ on\ Total\ Inv.}{\text{Average \% of FG on Total Inv.}}$

∴ The % of the deviation on average brackets is negative figure.

From the above table no. 4.5 shows that the finished goods on total inventory ratio from 2007 to 2011 are 34.22%, 30.07%, 24.67%, 7.44%, and 2.97% respectively. Whereas average percentage of finished goods on total inventory in the overall study period has been 19.87 percent.

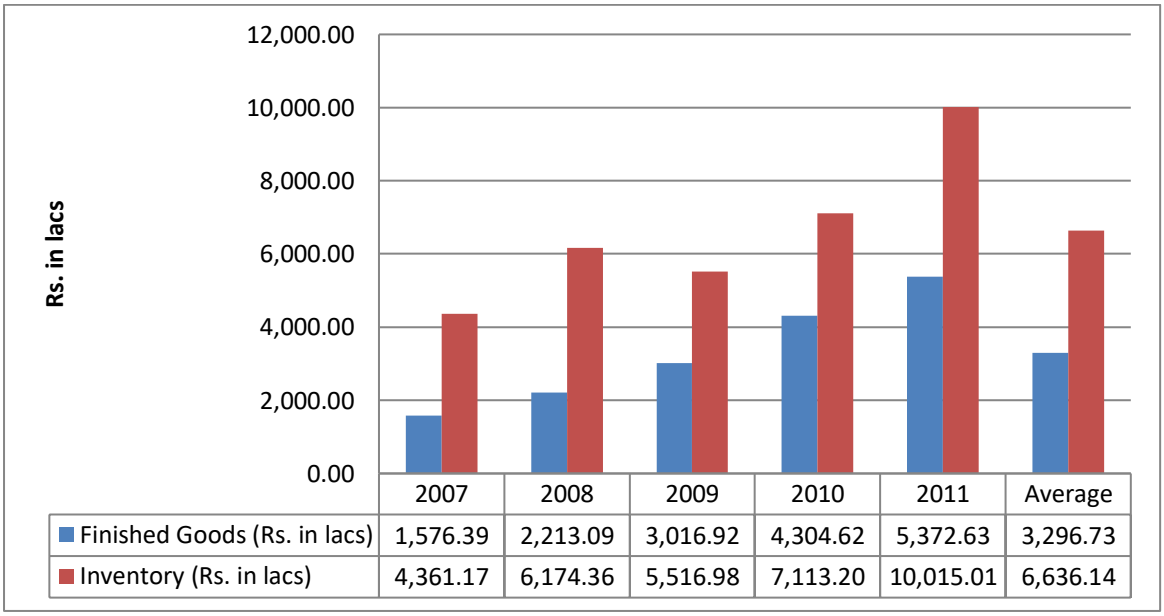
Above table shows the deviation of percentage of finished goods in total inventory over the study period. The highest positive deviation in finished goods from the average finished goods inventory 72.22 percent in the 2007 and the highest negative is (85.05) percent in 2011.

From the above analysis, it is observed that the share of finished goods is highest in 2007, i.e. 34.22 percent and lowest in 2011, i.e. 2.97 percent. The production rate is decreasing trend.

The graphic presentation of level finished goods on total inventory is as follows:

Figure No. 4.5

Level of Finished Goods on Total Inventory



	2007	2008	2009	2010	2011	Average
Finished Goods (Rs. in lacs)	1,576.39	2,213.09	3,016.92	4,304.62	5,372.63	3,296.73
Inventory (Rs. in lacs)	4,361.17	6,174.36	5,516.98	7,113.20	10,015.01	6,636.14

4.4.6 Proportion of Stores and Spares Parts on Total Inventory

Table No. 4.6

Proportion of Stores and Spares Parts on Total Inventory

Year	Stores and Spares Parts (Rs. in lacs)	Inventory (Rs. in lacs)	% of Stores and Spares Parts on Total Inventory	% of deviation on average
2007	286.01	4,361.17	5.08	49.57
2008	206.55	6,174.36	3.35	(40.11)
2009	277.14	5,516.98	3.66	4.87
2010	273.96	7,113.20	3.85	10.32
2011	150.41	10,015.01	1.50	(57.02)
Average	238.81	6,636.14	3.49	

Source: Annual Report of DNPL, Kathmandu.

Note: % of Stores and spare parts on total inventory = $\frac{\text{Stores and spare parts}}{\text{Total inventory}}$

% of deviation on an average =

$$\frac{\text{\% of Stores and spare parts on total inv.} - \text{Average \% of Stores and spare parts on total inv.}}{\text{Average \% of Stores and spare parts on total inv.}}$$

∴ The % of the deviation on average brackets are negative figure.

From the above table no. 4.6 shows that the proportion of stores and spares parts on total inventory ratio from 2007 to 2011 are 5.08%, 3.35%, 3.66%, 3.85% and 1.50% respectively. Whereas average percentage of inventory in a overall study period has been 3.49 percent.

Above table shows the deviation of percentage stores and spares parts on total inventory over the study period. The highest of positive deviation on average is in year 2007 i.e. 49.57 percent and highest negative deviation has been in year 2011 i.e. (57.02) percentage.

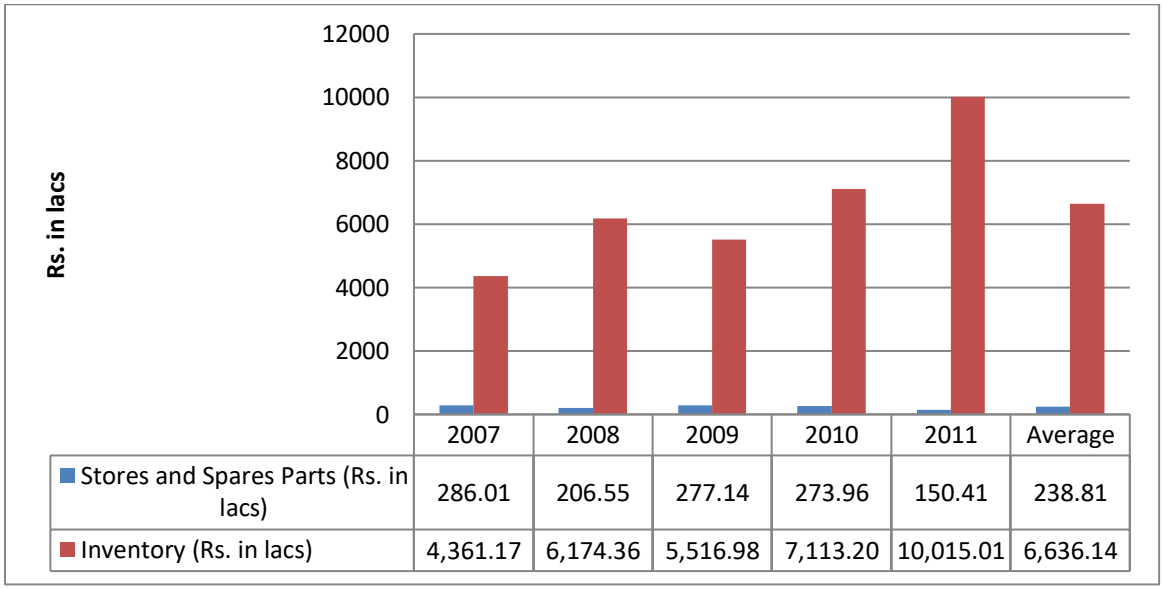
From the above analysis, it is observed that the share of stores and spares parts uses the company is irregular during the study period. Since the company's production is

totally dependent on stores and spare parts, it previously fluctuates over the period. Total inventory on stores and spare parts is highest in 2007, i.e. 2.08 percent and lowest in 2011, i.e. 1.50 percent.

The graphic presentation of level raw material on total inventory is as follows:

Figure No. 4.6

Level of Stores and Spare Parts on Total Inventory



4.4.7 Position and Relation of Raw Material and Finished Goods

Table No. 4.7

Position and Relation of Raw Material and Finished Goods

Year	Raw Material (Rs. in lacs)	% of deviation on average RM	Finished Goods (Rs. in lacs)	% of deviation on average FG
2007	1,576.39	52.70	1,476.98	24.04
2008	2,213.09	(33.60)	2,288.87	92.23
2009	3,016.92	(9.48)	1,361.09	14.31
2010	4,304.62	29.16	529.52	(55.53)
2011	5,372.63	61.21	296.99	(75.06)
Average	3,296.73		1,190.69	

Source: Annual Report of DNPL, Kathmandu.

Note:

% of deviation on an average RM = $\frac{\text{RM – Average RM}}{\text{Average RM}}$

% of deviation on an average FG = $\frac{\text{FG – Average FG}}{\text{Average FG}}$

∴ The % of the deviation on average brackets is negative figure.

From the above table no. 4.7 shows that the position and relation of raw material and finished goods from the 2007 to 2011. Above the table, it is observed that the average value of raw material is Rs. 3,296.73 lacs and average value of finished goods is Rs. 1,190.69 lacs. Above table shows that the percentage of deviation raw material and finished goods over the study period.

The highest positive deviation from the average raw material is 52.70 percent in 2007 and the highest positive deviation from average finished goods is 92.23 percent in 2008. The highest negative deviation from an average raw material is (33.60) percent in 2008 and the highest negative deviation from an average finished goods is (75.06) percent in 2011.

The above analysis shows that the investment of RM and FG was fluctuating during the study period. This indicates the company has not been following any system of keeping inventory as well as production.

The correlation between raw materials and finished goods has been observed to be (0.86), which is shown in Appendix I.

4.4.8 Relation between Sales and Net Profit

Table No. 4.8

Relation between Sales and Net Profit

Year	Sales (Rs. In lacs)	% of deviation on average Sales	Net Profit (Rs. In lacs)	% of deviation on average NP
2007	21,988.33	(17.98)	532.94	(13.87)
2008	24,474.95	(8.71)	440.81	(28.76)
2009	27,199.52	1.46	14.78	(97.61)
2010	27,667.66	3.21	943.60	52.49
2011	32,709.66	22.01	1,161.86	87.76
Average	26808.02		618.80	

Source: Annual Report of DNPL, Kathmandu.

Note:

% of deviation on an average Sales = $\frac{\text{Sales} - \text{Average Sales}}{\text{Average Sales}}$

% of deviation on an average Net Profit = $\frac{\text{Sales} - \text{Average Net Profit}}{\text{Average Net Profit}}$

∴ The % of the deviation on average brackets is negative figure.

The above table no.4.8 shows that the relation between sales and net profit from the 2007 to 2011. From the above table, it is observed that the average sales and net profit during the study period are Rs. 26,808.02 lacs and 618.80 lacs respectively. Similarly, the above table shows the percentage deviation of sales and net profit over the study period. The highest positive deviation from the average sales 22.01 percent in 2011 and the highest positive deviation from an average net profit is 87.76 percent in 2011. Similarly, the highest negative deviation from an average sales (17.98) percent in 2007 and the highest negative deviation from an average net profit (97.61) percent in 2009.

From the above analysis, it is observed that in 2007 sales was Rs. 21,988.33 lacs and in the year, the company incurred Rs. 532.84 lacs profit and from the 2008 sales was Rs. 24,474.94 lacs and in the year, the company incurred Rs. 440.81 lacs profit.

Similarly, in the 2009, 2010 and 2011 sales was Rs. 27.199.52 lacs, 27.667.66 lacs and 32.709.66 lacs increased and net profit was Rs. 14.78 lacs, 943.60 lacs and 1,161.86 lacs increased by profit.

The correlation between sales and net profit observed to be 0.53, which is shown in Appendix II. Therefore there is significant relationship between sales and net profit. Therefore, it is concluding that the change in sales results in the change of net profit.

4.4.9 Relation between Inventory and Net Profit

Table No. 4.9

Relation between Inventory and Net Profit

Year	Inventory (Rs. in lacs)	% of deviation on average Inventory	Net Profit (Rs. in lacs)	% of deviation on average NP
2007	4,361.17	(34.28)	532.94	(13.87)
2008	6,174.36	(6.96)	440.81	(28.76)
2009	5,516.98	(16.86)	14.78	(97.61)
2010	7,113.20	7.19	943.60	52.49
2011	10,015.01	50.92	1,161.86	87.76
Average	6,636.14		618.80	

Source: Annual Report of DNPL, Kathmandu.

Note:

% of deviation on an average Inventory = $\frac{\text{Inventory} - \text{Average Inventory}}{\text{Average Inventory}}$

% of deviation on an average NP = $\frac{\text{NP} - \text{Average NP}}{\text{Average NP}}$

∴ The % of the deviation on average brackets is negative figure.

The above table no.4.9 shows that the relationship between inventory and net profit from the 2007 to 2011. From the above table, it is observed that the average inventory and net profit during the study period are Rs. 6,636.14 lacs and 618.80 lacs respectively. Similarly, the above table shows the percentage deviation of inventory and net profit over the study period. The highest positive deviation from the average inventory 50.92 percent in 2011 and the highest positive deviation from an average

net profit is 87.76 percent in 2011. Similarly, the highest negative deviation from an average inventory (34.28) percent in 2007 and the highest negative deviation from an average net profit (97.61) percent in 2009.

From the above analysis, it is observed that inventory and net profit were fluctuating during the study period. Therefore there is no specific policy of investment on inventory and inventory management system.

The correlation between inventory and net profit observed to be 0.80, which is shown in Appendix III. Therefore there is positive and low degree of between inventory and net profit.

4.5 Ratio analysis of DNPL

Ratio analysis is the process of determining and interpreting numerical relationship between any two figures of financial statements. Inventory ratio analysis of any organization may help to know the efficiency of management of finished goods inventory turnover ratio is also known as stock turnover ratio or sales stock ratio. This ratio measures turnover of stocks in terms of time. The higher the turnover betters the efficiency.

4.5.1 Relation between Sales and Inventory

Table No. 4.10

Inventory turnover ratio

Year	Sales (Rs. in lacs)	Inventory (Rs. in lacs)	ITR (times)	% of deviation on average ITR
2007	21,988.33	4,361.17	5.04	19.71
2008	24,474.95	6,174.36	3.96	(5.94)
2009	27,199.52	5,516.98	4.93	17.10
2010	27,667.66	7,113.20	3.89	(7.60)
2011	32,709.66	10,015.01	3.23	(23.28)
Average	26808.02	6,636.14	4.21	

Source: Annual Report of DNPL, Kathmandu.

Note:

$$\text{ITR} = \frac{\text{Sales}}{\text{Inventory}}$$

$$\text{\% deviation on an average ITR} = \frac{\text{ITR} - \text{Average ITR}}{\text{Average ITR}}$$

∴ Above the tables in brackets are negative figure.

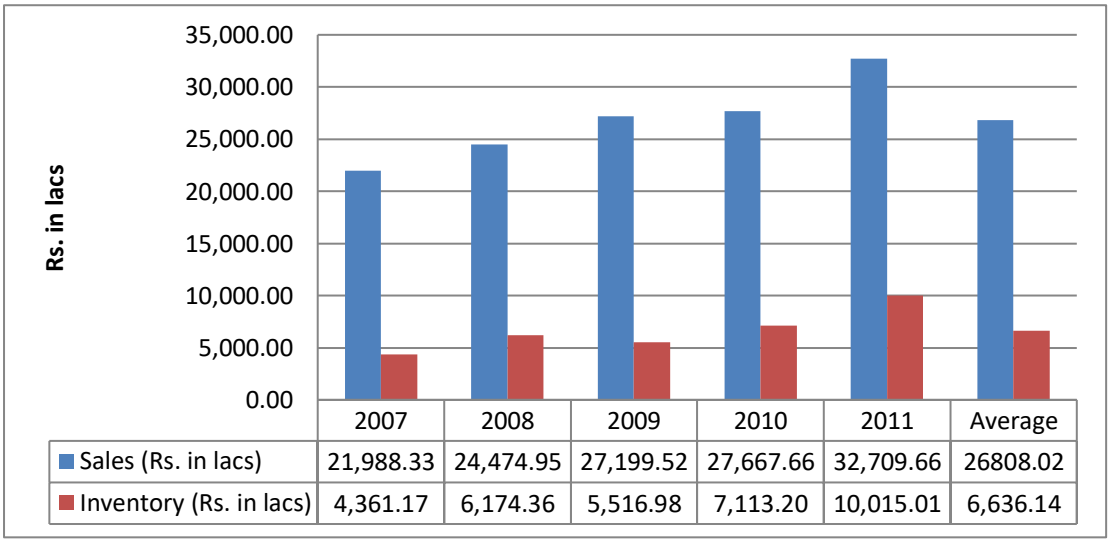
The above table no.4.10, it is observed that in 2007 the inventory turnover ratio is highest i.e. 5.04 times and in this year the highest positive deviation from the average inventory turnover ratio is 19.71 percent. So, in this year, low level inventory is kept in the company due to fast consumption and sales of raw materials and finished goods. In the 2009, 2010 and 2011, the inventory turnover ratios is the lowest, i.e. 3.96, 3.89 and 3.23 times. Similarly, in these years, the highest negative deviation from the average of inventory turnover ratio is (5.94) percent, (7.60) percent and (23.28) percent. Which indicates the slow consumption of raw material or low utilization of raw materials, WIP materials and low sales of finished goods.

The correlation between inventory and sales has been to be i.e. positive observed to be 0.76, which is shown in Appendix IV. Therefore there is significant relationship between inventory and sales. Therefore, it is observed that changes in inventory emulate from change in sales.

The graphic presentation of inventory turnover ratio is as follows:

Figure No. 4.7

Inventory Turnover Ratio



	2007	2008	2009	2010	2011	Average
Sales (Rs. in lacs)	21,988.33	24,474.95	27,199.52	27,667.66	32,709.66	26808.02
Inventory (Rs. in lacs)	4,361.17	6,174.36	5,516.98	7,113.20	10,015.01	6,636.14

4.5.2 Relation between Raw Material and Raw Material Consumed

Table No. 4.11

Raw Material Turnover Ratio

Year	Cost of RM Consumed (Rs. in lacs)	Cost of Average RM (Rs. in lacs)	RM Turnover Ratio (times)	% of deviation on average RM turnover ratio
2007	10,146.54	1,244.36	8.15	57.34
2008	11,828.94	1,894.74	6.24	20.46
2009	12.732.52	2,615.01	4.87	(5.98)
2010	12,608.39	3,659.70	3.45	(33.40)
2011	15.499.78	4,838.63	3.20	(38.22)
Average			5.18	

Source: Annual Report of DNPL, Kathmandu.

Note:

Cost of average RM = $\frac{\text{Opening Stock of RM + Closing Stock of RM}}{2}$

RM turnover ratio = $\frac{\text{Cost of RM Consumed}}{\text{Cost of Average RM}}$

% deviation on an average RM turnover ratio = $\frac{\text{RM turnover ratio – Average RM turnover ratio}}{\text{Average turnover ratio}}$

$\therefore$ The % of the deviation on average brackets is negative figure.

Raw Material turnover ratio is essential to compare the turnover of different kinds of materials to find out the slow moving items of assist the management to avoid capital locked up in such items.

From the above table no. 4.11, it is observed that the average raw material turnover ratio is 5.18 times. In 2007 and 2008, the raw material turnover ratio is highest, i.e. 8.15 times and 6.24 times and in these and highest positive deviation from on an average of RM turnover ratio is 57.34 percent and 20.46 percent.

So, in these years low level of raw materials. In the 2010 and 2011, the raw material turnover ratios are lowest, i.e. 3.45 times and 3.20 times respectively. Similarly, in

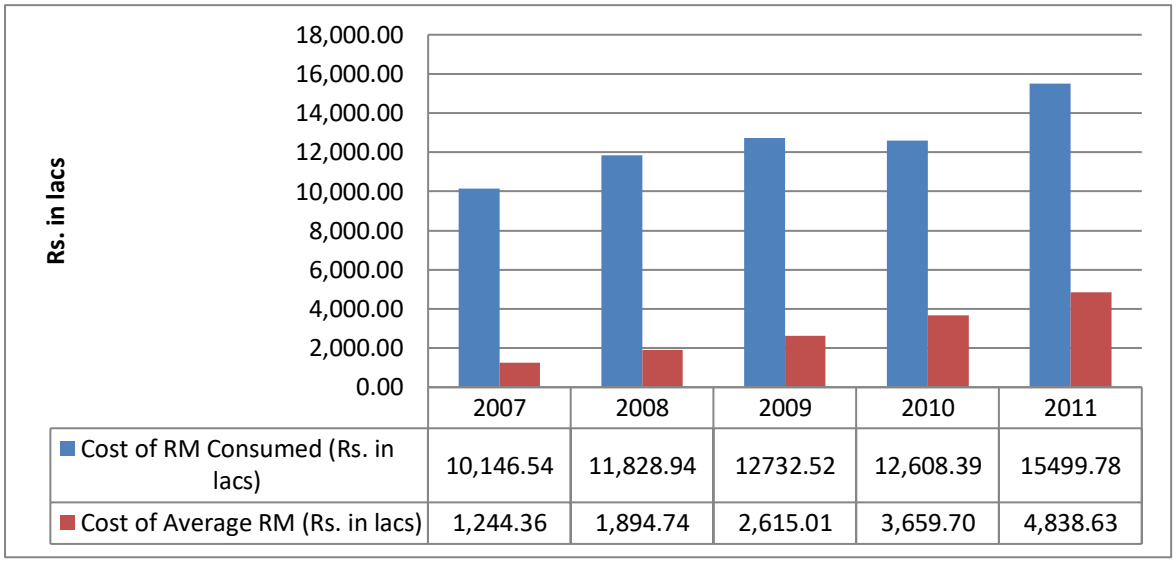
these year, the highest negative deviation from the average of RM turnover ratio (33.40) percent and (38.22) percent respectively. This indicates the slow consumption or low utilization of raw materials.

The correlation between cost of raw material consumed and cost of average RM has been observed to be 0.88 i.e. positive, which is shown in Appendix V. Therefore, there was positive and low degree of correlation between cost of raw material consumed and cost of average raw material.

The graphic presentation of RM turnover ratio is as follows:

Figure No. 4.8

RM Inventory Turnover Ratio



	2007	2008	2009	2010	2011
Cost of RM Consumed (Rs. in lacs)	10,146.54	11,828.94	12732.52	12,608.39	15499.78
Cost of Average RM (Rs. in lacs)	1,244.36	1,894.74	2,615.01	3,659.70	4,838.63

4.5.3 Relation between Packaging Material and Packaging Material Consumed

Table No. 4.12

Packaging Material Turnover Ratio

Year	Cost of PM (Rs. in lacs)	Cost of Average PM (Rs. in lacs)	PM turnover ratio (times)	% of deviation on average PM turnover ratio
2007	5,793.56	2,168.39	2.67	(44.49)
2008	5,958.06	1,273.44	4.68	(2.70)
2009	6,612.43	1,253.02	5.28	9.77
2010	7,082.93	1,076.85	6.58	36.80
2011	7,426.44	1,530.99	4.85	0.83
Average			4.81	

Source: Annual Report of DNPL, Kathmandu.

Note:

Cost of average PM = $\frac{\text{Opening Stock of PM + Closing Stock of PM}}{2}$

PM turnover ratio = $\frac{\text{Cost of PM Consumed}}{\text{Cost of Average PM}}$

% deviation on an average PM turnover ratio = $\frac{\text{PM turnover – Average PM turnover ratio}}{\text{Average PM turnover ratio}}$

∴ The % of the deviation on average brackets is negative figure.

From the above table no. 4.12, it is observed that the average packaging material turnover ratio is 4.81 times, which is calculated by taking average of overall study period. In the 2009 and 2010, the packaging material turnover ratio is highest, i.e. 5.28 times and 6.58 times and in these and highest positive deviation from the average of PM turnover ratio is 9.77 percent and 36.80 percent respectively.

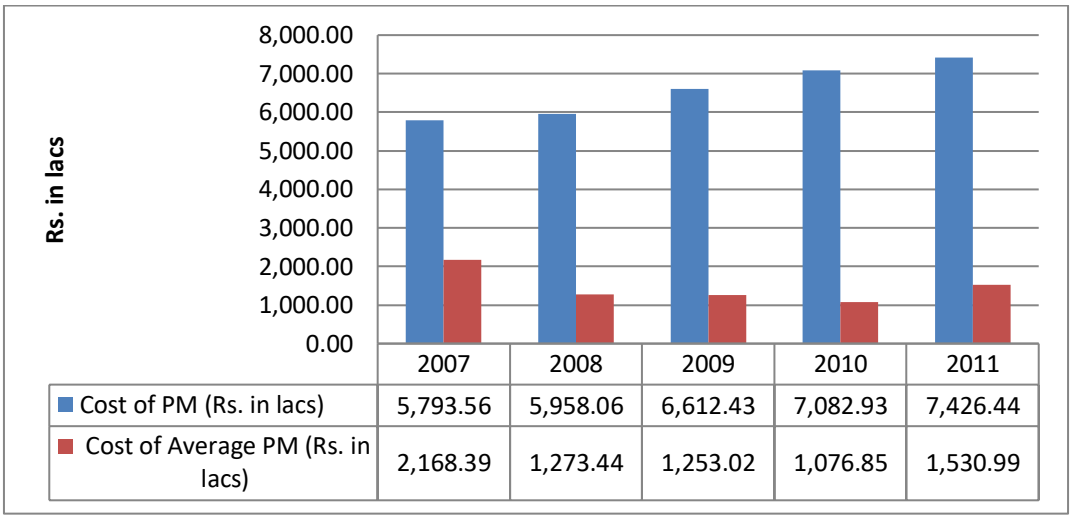
So, in these years low level of packaging materials inventory is kept in the company and fast moving the packaging materials. In the 2007, the packaging material turnover ratio is lowest i.e. 2.67 times. Similarly, in these year, the highest negative deviation from the average of PM turnover ratio (44.9) percent, which indicates the slow of packaging or low utilization of packaging material.

The correlation between cost of packaging material consumed and cost of average PM has been observed to be (0.48) i.e. negative, which is shown in Appendix VI. There was significant and negative relationship between cost of packaging material consumed and cost of average packaging material.

The graphic presentation of PM turnover ratio is as follows:

Figure No. 4.9

Packaging Material Inventory Turnover Ratio



	2007	2008	2009	2010	2011
Cost of PM (Rs. in lacs)	5,793.56	5,958.06	6,612.43	7,082.93	7,426.44
Cost of Average PM (Rs. in lacs)	2,168.39	1,273.44	1,253.02	1,076.85	1,530.99

4.6 Inventory Management Techniques

4.6.1 Economic Order Quantity (EOQ)

Economic Order Quantity EOQ) is an important concept for purchase of raw materials or goods to determine optimal order quantity for particular item of inventory. It helps to establish the most economic balance between the quantities to be ordered which minimizes the total cost. (i.e. Ordering Cost + Carrying Cost)

In courses of inventory management, here we are going to determining the EOQ of raw material and packaging material of Dabur Nepal Private Limited of different time period from year 2007 to 2011. In course of making different kinds of products in Dabur Nepal Private Limited. It has categorized its major materials in to two parts; one is raw material and next is packaging material. Raw material includes Sugar, Malases, Vegetables Oils, Herbs, Jari Booti, Raw Madhu, Chemicals, Perfumery, Compounds and other raw material. And similarly packaging material includes Glass Containers, Plastic Containers, Printed Packaging materials, Laminates, Lamitues and other packaging material.

4.6.1.1 Economic Order Quantity (EOQ) of Raw Material

I. For Year 2007

The Economic Order Quantity of raw material of Dabur Nepal Pvt. Ltd. For 2007 is calculated by using mathematical approach, trial & error approach and graphic method which are as follows:

a. Mathematical/Formula Method

Annual requirement (A) = 21,489 tones

Ordering cost (O) = Rs. 151,250 per order

Carrying cost (C) = Rs. 860 per tones

By using the EOQ formula:

$$EOQ = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2 \times 21{,}486 \times 151{,}250}{860}} = 2{,}749 \text{ tones}$$

$$\text{No. of order} = \frac{A}{EOQ} = \frac{21{,}489}{2{,}749} = 7.89 \approx 8 \text{ times}$$

The above calculation shows the economic order size is 2,749 tones where the combination of carrying cost and ordering cost are minimum. So, if company wants to minimize the inventory cost the company should place order of 2,749 tones at a time or place orders in a year.

b. Trial and Error Method (Table Method)

Table No. 4.13

Trial and Error Method of EOQ of 2007

No. of Order	Order size (tones)	Average inventory (tones)	Ordering cost (Rs.)	Carrying cost (Rs.)	Total cost (Rs.)
1	21,489	10,745	151,250	9,240,700	9,391,950
4	5,372	2,686	605,000	2,309,960	2,914,960
8	2,686	1,343	1,210,000	1,154,980	2,364,980
10	2,149	1,075	1,512,500	924,500	2,437,000
12	1,791	896	1,815,000	770,560	2,585,560

Source: Annual Report of DNPL, Kathmandu.

Where,

Order size = $\frac{\text{Total requirement}}{\text{No.of order}}$

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

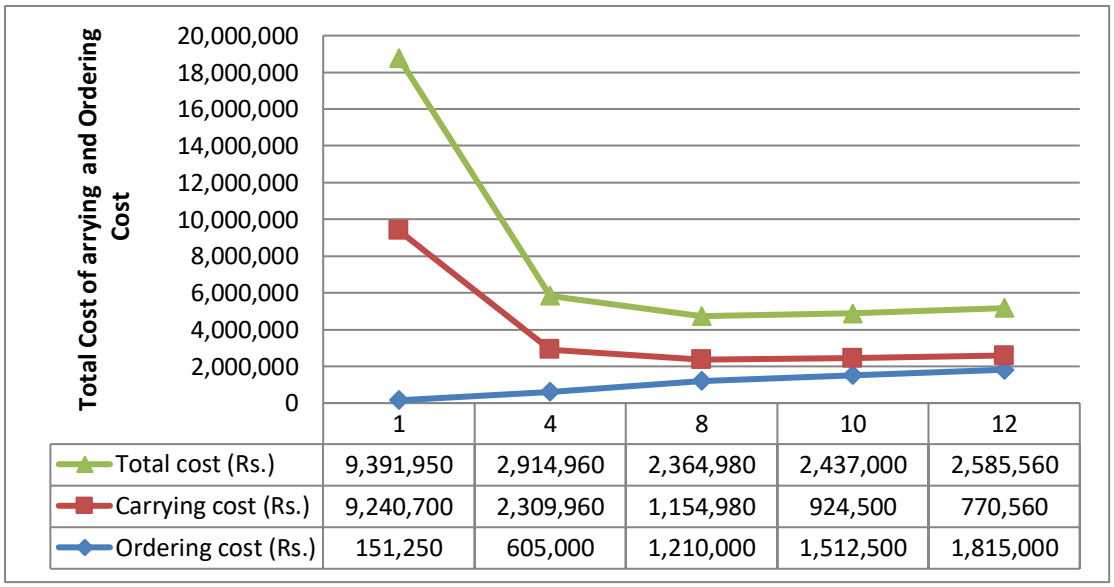
Ordering cost = No. of order × Ordering cost per order

Carrying cost = Carrying cost per tones × Average inventory

The above the table shows the order size, average inventory, ordering cost, carrying cost and total cost at different no. of order. According to the above table if the company places orders 8 orders in a year with 2,686 tones he can reduce cost otherwise his cost will be increased.

c. Graphic Method

Figure No. 4.10



	1	4	8	10	12
Total cost (Rs.)	9,391,950	2,914,960	2,364,980	2,437,000	2,585,560
Carrying cost (Rs.)	9,240,700	2,309,960	1,154,980	924,500	770,560
Ordering cost (Rs.)	151,250	605,000	1,210,000	1,512,500	1,815,000

II. For Year 2008

The calculation of economic order quantity of raw material of Dabur Nepal Pvt. Ltd. For 2008 is calculated by using mathematical approach, trial & error approach and graphic method are as follows:

a. Mathematical/Formula Method

Annual requirement (A) = 24,397 tones

Ordering cost (O) = Rs. 150,560 per order

Carrying cost (C) = Rs. 746 per tones

By using the EOQ formula:

$$EOQ = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2 \times 24{,}397 \times 155{,}560}{746}} = 3{,}189.79 \approx 3190 \text{ tones}$$

$$\text{No. of order} = \frac{A}{EOQ} = \frac{24{,}397}{3{,}190} = 7.65 \approx 8 \text{ times}$$

The above calculation shows that the economic order quantity of raw material is 3,190 tones where the combination of carrying cost and ordering cost are minimum. So, if company wants to reduce the inventory cost the company should place order of 3,190 tones or place 8 times in a year.

b. Trial and Error Method (Table Method)

Table No. 4.14

Trial and Error Method of EOQ of 2008

No. of Order	Order size (tones)	Average inventory (tones)	Ordering Cost (Rs.)	Carrying Cost (Rs.)	Total Cost (Rs.)
1	24,397	12,199	9,100,454	155,560	9,256,014
4	6,099	3,050	2,275,300	622,240	2,897,540
8	3,050	2,440	1,137,650	1,244,480	2,382,130
10	2,440	1,220	910,120	1,555,600	2,465,720
12	2,033	1,017	758,682	1,866,720	2,625,402

Source: Annual Report of DNPL, Kathmandu.

Where,

$$\text{Order size} = \frac{\text{Total requirement}}{\text{No.of order}}$$

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

Ordering cost = No. of order × Ordering cost per order

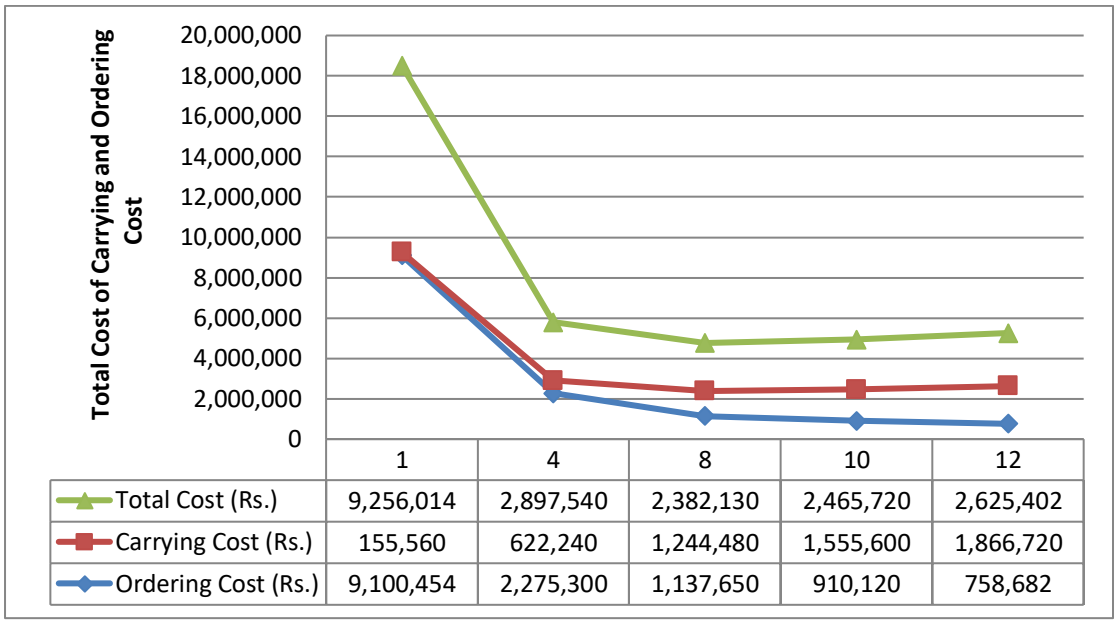
Carrying cost = Carrying cost per tones × Average inventory

The above table shows the order size, average inventory, ordering cost, carrying cost and total cost at different no. of order. According to the above table if the company

places orders 8 times in a year with 3,050 tones where the company can reduce total cost otherwise cost will be increased.

c. Graphic Method

Figure No. 4.11



	1	4	8	10	12
Total Cost (Rs.)	9,256,014	2,897,540	2,382,130	2,465,720	2,625,402
Carrying Cost (Rs.)	155,560	622,240	1,244,480	1,555,600	1,866,720
Ordering Cost (Rs.)	9,100,454	2,275,300	1,137,650	910,120	758,682

II. For Year 2009

The calculation of economic order quantity of raw material of Dabur Nepal Pvt. Ltd. For 2009 is calculated by using mathematical approach, trial & error approach and graphic method are as follows:

a. Mathematical/Formula Method

Annual requirement (A) = 26,964 tones

Ordering cost (O) = Rs. 160,580 per order

Carrying cost (C) = Rs. 667 per tones

By using the EOQ formula:

$$EOQ = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2 \times 26{,}964 \times 160{,}580}{667}} = 3{,}630 \text{ tones}$$

$$\text{No. of order} = \frac{A}{EOQ} = \frac{26{,}964}{3{,}630} = 7.48 \approx 7 \text{ times}$$

The above calculation shows that the economic order quantity of raw material is 3,603 tones where the combination of carrying cost and ordering cost are minimum. So, if

company wants to reduce the inventory cost the company should place order of 3,603 tones at a time place 7 orders in a year.

b. Trial and Error Method (Table Method)

Table No. 4.15

Trial and Error Method of EOQ of 2009

No. of Order	Order size (tones)	Average inventory (tones)	Ordering cost (Rs.)	Carrying cost (Rs.)	Total cost (Rs.)
1	26,964	13,482	9,005,976	160,580	9,166,556
4	6,741	3,371	2,251,828	642,320	2,894,148
7	3,852	1,926	1,284,642	1,124,060	2,408,702
10	2,696	1,348	900,464	1,605,800	2,506,264
12	2,247	1,124	750,832	1,926,960	2,677,782

Source: Annual Report of DNPL, Kathmandu.

Where,

Order size = $\frac{\text{Total requirement}}{\text{No.of order}}$

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

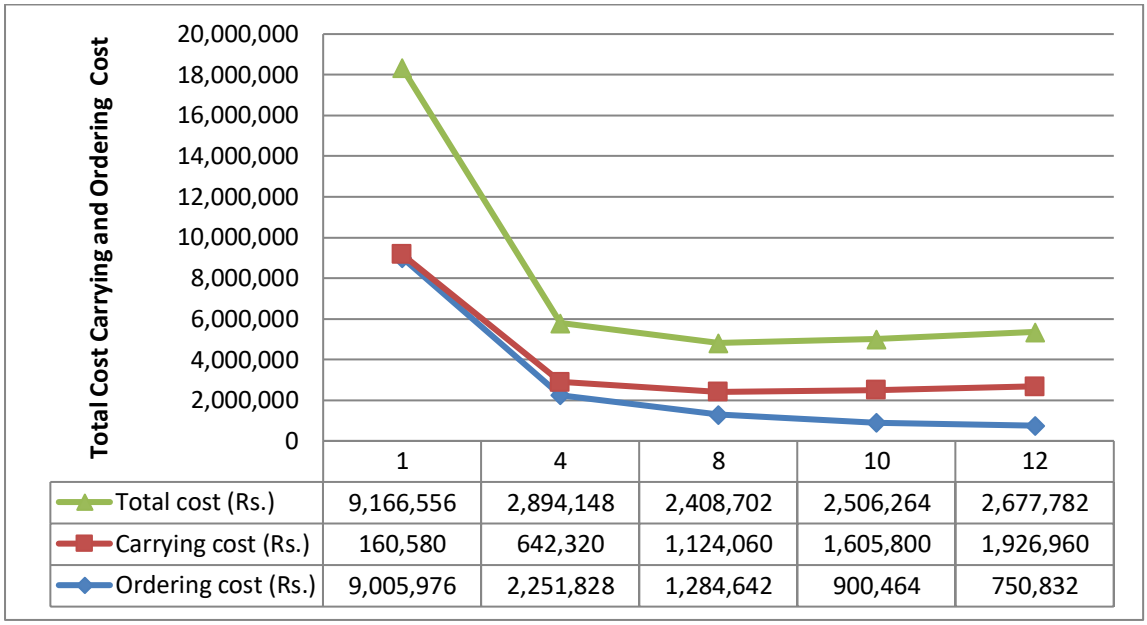
Ordering cost = No. of order × Ordering cost per order

Carrying cost = Carrying cost per tones × Average inventory

The above table shows the order size, average inventory, ordering cost, carrying cost and total cost at different no. of order. According to the above table if the company places orders 7 orders in a year with 3,852 tones where the company can reduce total cost otherwise cost will be increased.

c. Graphic Method

Figure No. 4.12



	1	4	8	10	12
Total cost (Rs.)	9,166,556	2,894,148	2,408,702	2,506,264	2,677,782
Carrying cost (Rs.)	160,580	642,320	1,124,060	1,605,800	1,926,960
Ordering cost (Rs.)	9,005,976	2,251,828	1,284,642	900,464	750,832

IV. For Year 2010

The calculation of economic order quantity of raw material of Dabur Nepal Pvt. Ltd. For 2010 is calculated by using mathematical approach, trial & error approach and graphic method which are as follows:

a. Mathematical/Formula Method

Annual requirement (A) = 26,167 tones

Ordering cost (O) = Rs. 170,150 per order

Carrying cost (C) = Rs. 676 per tones

By using the EOQ formula:

$$EOQ = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2 \times 26{,}167 \times 157{,}150}{676}} = 3{,}629 \text{ tones}$$

$$\text{No. of order} = \frac{A}{EOQ} = \frac{26{,}167}{3{,}629} = 7.21 \approx 7 \text{ times}$$

The above calculation shows the economic order size is 3,629 tones where the combination of carrying cost and ordering cost are minimum. So, if company wants to minimize the inventory cost the company should place order of 3,629 tones at a time or place 7 orders in a year.

b. Trial and Error Method (Table Method)

Table No. 4.16

Trial and Error Method of EOQ of 2010

No. of Order	Order size (tones)	Average inventory (tones)	Ordering cost (Rs.)	Carrying cost (Rs.)	Total cost (Rs.)
1	26,167	13,084	8,844,784	170,150	9,014,937
4	6,542	3,271	2,211,196	680,600	2,891,796
7	3,738	1,869	1,263,444	1,191,050	2,454,494
10	2,617	1,309	884,884	1,701,500	2,586,384
12	2,181	1,091	737,516	2,041,800	2,779,316

Source: Annual Report of DNPL, Kathmandu.

Where,

Order size = $\frac{\text{Total requirement}}{\text{No.of order}}$

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

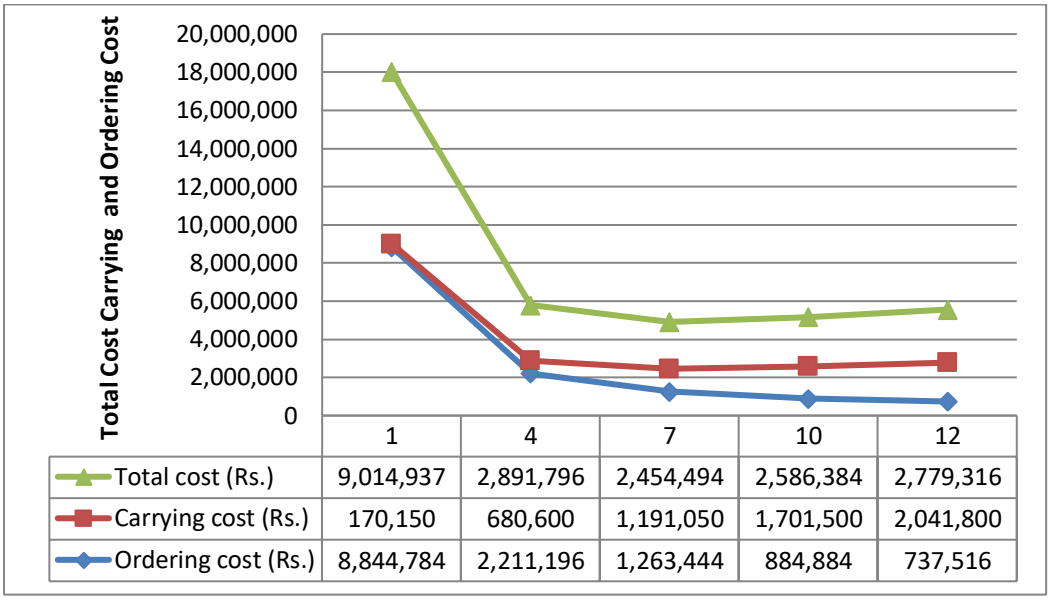
Ordering cost = No. of order × Ordering cost per order

Carrying cost = Carrying cost per tones × Average inventory

The above table shows that the order size, average inventory, ordering cost, carrying cost and total cost at different no. of order. According to the above table if the company places orders 7 orders in a year with 3,738 tones where the company can minimize total cost otherwise his cost will be increased.

c. Graphic Method

Figure No. 4.13



	1	4	7	10	12
Total cost (Rs.)	9,014,937	2,891,796	2,454,494	2,586,384	2,779,316
Carrying cost (Rs.)	170,150	680,600	1,191,050	1,701,500	2,041,800
Ordering cost (Rs.)	8,844,784	2,211,196	1,263,444	884,884	737,516

V. For Year 2011

The Economic Order Quantity of raw material of Dabur Nepal Pvt. Ltd. For 2011 is calculated by using mathematical approach, trial & error approach and graphic method which are as follows:

a. Mathematical/Formula Method

Annual requirement (A) = 32,826 tones

Ordering cost (O) = Rs. 180,560 per order

Carrying cost (C) = Rs. 497 per tones

By using the EOQ formula:

$$EOQ = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2 \times 32{,}826 \times 180{,}560}{497}} = 4{,}884 \text{ tones}$$

$$\text{No. of order} = \frac{A}{EOQ} = \frac{32{,}826}{4{,}884} = 6.72 \approx 7 \text{ times}$$

The above calculation shows the economic order size is 4,884 tones where the combination of carrying cost and ordering cost are minimum. So, if company wants to minimize the inventory cost the company should place order of 4,884 tones at a time or place 7 orders in a year.

b. Trial and Error Method (Table Method)

Table No. 4.17

Trial and Error Method of EOQ of 2011

No. of Order	Order size (tones)	Average inventory (tones)	Ordering cost (Rs.)	Carrying cost (Rs.)	Total cost (Rs.)
1	32,826	16,143	8,157,261	180,560	8,337,821
4	8,207	4,104	2,039,688	722,240	2,761,928
7	4,689	2,345	1,165,465	1,263,920	2,429,385
10	3,289	1,642	816,074	1,805,600	2,621,674
12	2,736	1,368	679,896	2,166,720	2,846,616

Source: Annual Report of DNPL, Kathmandu.

Where,

Order size = $\frac{\text{Total requirement}}{\text{No.of order}}$

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

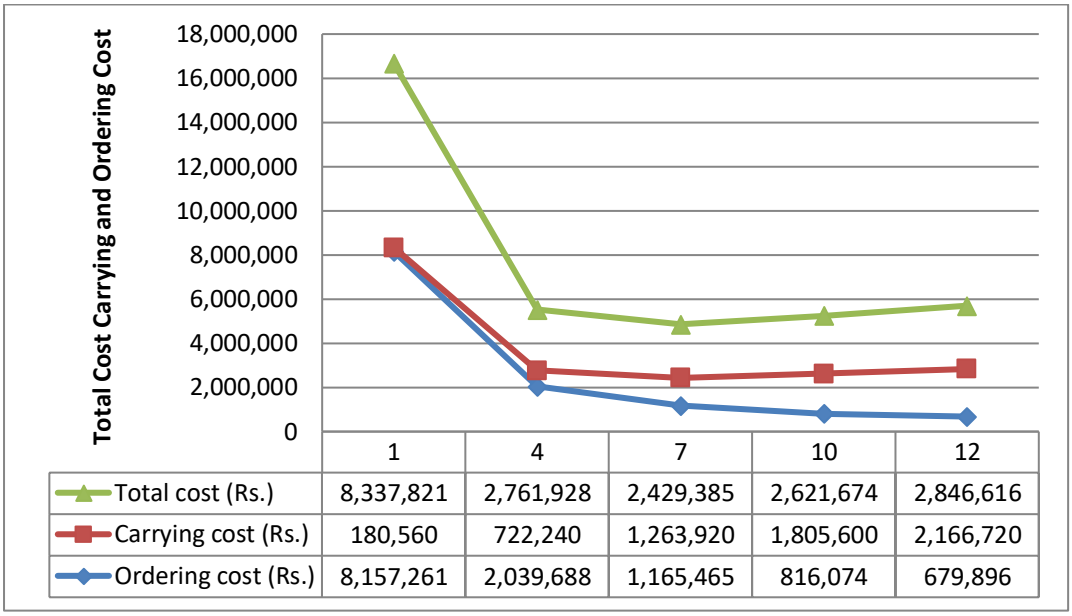
Ordering cost = No. of order × Ordering cost per order

Carrying cost = Carrying cost per tones × Average inventory

The above the table shows the order size, average inventory, ordering cost, carrying cost and total cost at different no. of order. According to the above table if the company places orders 7 orders in a year with 4,689 tones where the company can reduce total cost otherwise his cost will be increased.

c. Graphic Model

Figure No. 4.14



4.6.1.2 Economic Order Quantity of Packaging Material of Total Study Period

EOQ of packaging material of Dabur Nepal Pvt. Ltd. of different time period from year 2007 to 2011 are presented in following table.

Table No. 4.18

Economic Order Quantity of Packaging Material of Total Study Period

Year	EOQ (In lacs pcs)	No. of order (in times)
2007	701	4.89≈5
2008	742	4.88≈5
2009	836	4.68≈5
2010	917	4.52≈5
2011	974	4.51≈5

Source: Appendix VII

The above table shows that the order size and numbers of order of packaging material over the different time period from 2007 to 2011. The detail calculations are shown in Appendix VII.

The above table shows the economic order quantity of packaging material from 2007 to 2011 are 701 lacs pcs, 742 lacs pcs, 836 lacs pcs, 917 lacs pcs and 974 lacs pcs respectively. And similarly the no. of order is 5 times for all year where the combination of carrying cost and order in cost are minimum. So, if company wants to minimize the inventory cost the company should place the order according to economic order quantity.

4.6.2 Re-ordering Point

Re-ordering Point is that level of inventory where the firm places an order to supplier for procuring additional inventory equal to economic order quantity when the inventory reaches the re-order point. In course of inventory management process, re-ordering point is one important tool or technique for controlling cost and smoothly operation of company without scarcity of any require material for producing goods and services.

A) Raw Material

The reaches try to analyze the re-order point of raw material of Dabur Nepal Pvt. Ltd. On the basis of lead time, safety stock lead time kept by company as well as daily usage rate by company throughout 5 years i.e. year 2007 to 2011 which are as follows:

Table No.4.19

Re-order point of Raw Material

Year	Usage Rate (in tones)	Lead time (in days)	ROP without Safety Stock (in tones)	Safety stock (in tones)	ROP with Safety Stock (in tones)
2007	27.80	2	55.60	$\sqrt{55.60}$ = 7.46	63.06
2008	31.56	2	63.12	$\sqrt{63.12}$ = 7.94	71.06
2009	34.88	2	69.76	$\sqrt{69.76}$ = 8.35	78.11
2010	33.85	2	67.70	$\sqrt{67.70}$ = 8.23	75.93
2011	42.47	2	84.94	$\sqrt{84.94}$ = 9.22	94.16

Source: Annual Report of DNPL, Kathmandu.

Where,

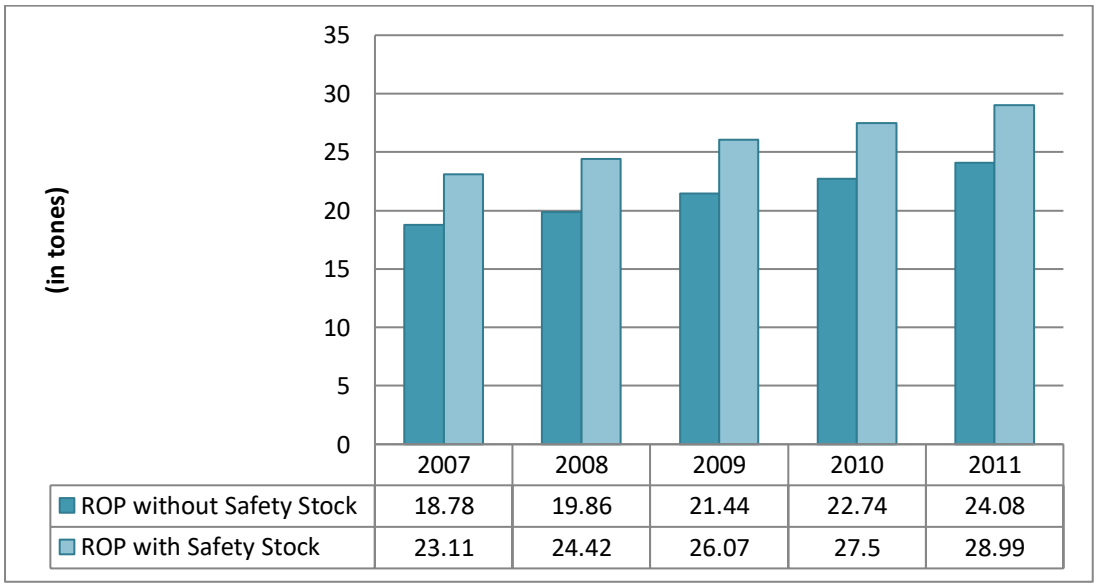
Usage rate = $\frac{\text{Annual requirement}}{\text{Days in year}}$

Safety stock lead time = root of average consumption during lead time

The above table shows that usage rate, lead time, safety stock lead time and re-orders point with safety stock and without safety sock. The re-order point raw material without safety stock from 2007 to 2011 are 55.60 tones pcs, 63.12 tones pcs, 69.79 tones pcs, 67.70 tones pcs and 84.94 tones pcs respectively and similarly the re-order point of raw material with safety stock are 63.06s tones pcs, 71.06 tones pcs, 78.11 tones pcs, 75.93 tones pcs and 94.16 tones pcs respectively. For more detail the graphic presentation are as follows:

Figure No. 4.15

The graphic presentation re-ordered point of raw material



B) Packing Material

The reaches try to analyze the re-order point of packing material of Dabur Nepal Pvt. Ltd. On the basis of lead time, safety stock lead time kept by company as well as daily usage rate by company throughout 5 years i.e. year 2007 to 2011 which are as follows:

Table No. 4.20

Re-order point of Packing Material

Year	Usage Rate (pcs in lacs)	Lead time (in days)	ROP without Safety Stock (pcs in lacs)	Safety stock (pcs in lacs)	ROP with Safety Stock (pcs in lacs)
2007	9.39	2	18.78	$\sqrt{18.78}$ = 4.33	23.11
2008	9.93	2	19.86	$\sqrt{19.86}$ = 4.56	24.42
2009	10.72	2	21.44	$\sqrt{21.44}$ = 4.63	26.07
2010	11.37	2	22.74	$\sqrt{22.74}$ = 4.76	27.50
2011	12.04	2	24.08	$\sqrt{24.08}$ = 4.91	28.99

Source: Annual Report of DNPL, Kathmandu.

Where,

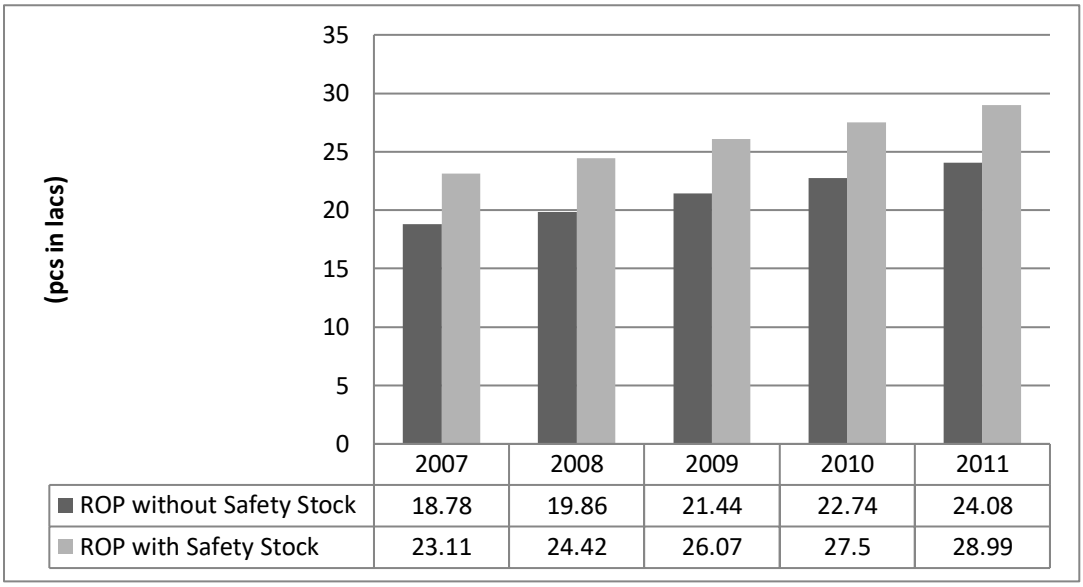
Usage rate = $\frac{\text{Annual requirement}}{\text{Days in year}}$

Safety stock lead time = Square root of average consumption during lead time

The above table shows that usage rate, lead time, safety stock lead time and re-orders point with safety stock and without safety sock. The re-order point raw material without safety stock from 2007 to 2011 are 18.78 pcs in lacs, 19.86 pcs in lacs, 21.44 pcs in lacs, 22.74 pcs in lacs and 24.08 pcs in lacs respectively and similarly the re-order point of packaging material with safety stock are 23.11 pcs in lacs, 24.42 pcs in lacs, 26.07 pcs in lacs, 27.50 pcs in lacs and 28.99 pcs in lacs respectively. For more detail the graphic presentation are as follows:

Figure No. 4.16

The graphic presentation re-ordered point of packing material



4.7 The Major Findings of the Study

On the basis of the data presentation and their financial and statistical analysis of Dabur Nepal Pvt. Ltd. the major findings related to this study are given below:

1. Relation between Inventory and Current Assets

The overall study period there is positive relationship between inventory and current assts. Both are increasing from 2007 to 2008 and then reduced in year 2009 and 2010 but not reduced the amount of inventory in year 2010.

The highest and lowest percentage of inventory on current assets within 5 year seems 64.84 percent and 37.04 percent in year 2010 and 2007 respectively. That means company has not been adopting an appropriate inventory policy.

2. Relation between Raw Material and Total Inventory

The relationship between raw material and inventory seems positive. The amount of raw material is increasing during the whole period. But increase of inventory has been increasing up to 2008 reduced in year 2009 and slowly increasing. The highest positive deviation between raw material and inventory has been in year 2010 i.e. 25.62 percent and highest negative deviation is in year 2008 that is 25.59 percent.

3. Relation between Packaging Material and Inventory

By the help of percentage of deviation on average, there is positive deviation between packaging material and inventory from 2007 to 2010. And then negative deviation within the study period. The highest deviation on average is in year 2007 i.e. 34.03 percent and highest negative deviation i.e. 20.77 percent in year 2009.

4. Relation between WIP Material and Inventory

From the percentage of WIP on total inventory, the highest ratio shows in year 2010 i.e. 3.84 percent and lowest i.e. 1.28 percent in year 2007. Similarly, in year 2007, 2008 and 2011, there is negative deviation an average and 2009 and 2010 seems positive deviation from the overall study period. There is fluctuation in inventory position.

5. Relation between Finished Goods and Total Inventory

From the percentage of the deviation on average there is positive deviation from 2007 to 2009 and there negative deviation up to 2011. The highest positive deviation is in year 2007 i.e. 72.22 percent and highest negative deviation in year 2011 i.e. 85.05 percent. Similarly, from the percentage of inventory on total inventory view the highest percentage has in year 2007 that is 34.22 percent and lowest in year i.e. 2.97 percent.

6. Proportion of Stores and Spare Parts on Total Inventory

The highest positive deviation on average between spare parts and inventory 49.57 percent in the 2007 and highest percentage of stores and spare parts on total inventory in year 2007 i.e. 5.08 percent and lowest is 2011 i.e. 1.50 percent. So, it is observed that the shares of stores and spare parts uses the company is irregular during the period.

7. Position and relation of Raw Material and Finished Goods

Raw material discontinuously increasing during the study period and situation of finished goods is not regularly. It is increased upto 2008 and continuously decreasing during the periods. This means the investment of RM is increasing trend and the investment in FG is fluctuation.

8. Relation between Sales and Net Profit

During the study periods, the sale of the company is increasing during the periods but the position of net profit is not satisfactory within the 2009. It is decreasing continuously and after 2009 it is highly increasing upto 2010.

9. Relation between Inventory and Net Profit

The inventory has been slowly increasing during the study period. The situation of net profit is not this way, it is fluctuating in the year 2009, the net profit is highly decreased.

10. Ratio Analysis

- **Inventory Turnover Ratio**

  During the study periods, the highest inventory turnover ratio seems in year 2007 i.e. 5.04 times and lowest is in 2011. The high inventory turnover ratio is the sign of efficient inventory management where as low inventory turnover after indicates either the firm is holding obsolete stock of inventory or it lacks the efficient system of inventory management.

- **Raw material Turnover Ratio**

  During the overall study, the highest RM turnover ratio has shown in year 2008 i.e. 8.15 times and lowest 3.2 times in year 2011. low RM turnover ratio indicates the company is holding excessive stock of RM whereas high RM turnover ratio is the sign of efficient RM management.

- **Packaging Material Turnover Ratio**

  The packaging material turnover ratio is increasing upto 2010 and then reduced in year 2011. The highest packaging material turnover ratio is 6.58 times in year 2010 and lowest in year 2007 i.e. 2.67 times.

11. EOQ of Raw Material

Year	EOQ
2007	2,779 tones
2008	3,190 tones
2009	3,603 tones
2010	3,629 tones
2011	4,884 tones

12. EOQ of Quantity of Packaging Material

Year	EOQ
2007	701
2008	742
2009	836
2010	917
2011	974

13. ROP of Raw Material

Year	Without Safety Stock	With Safety Stock
2007	55.60 tones	94.80 tones
2008	63.12 tones	107.62 tones
2009	69.76 tones	118.94 tones
2010	37.70 tones	115.42 tones
2011	84.94 tones	144.82 tones

14. ROP of Packaging Material

Year	Without Safety Stock	With Safety Stock
2007	18.78 pcs in lacs	32.02 pcs in lacs
2008	19.86 pcs in lacs	33.86 pcs in lacs
2009	21.44 pcs in lacs	36.56 pcs in lacs
2010	22.74 pcs in lacs	33.87 pcs in lacs
2011	24.06 pcs in lacs	41.06 pcs in lacs

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

Overall development cannot be imagined without development private enterprises in Nepal. In Nepal, most of government enterprises are collapse due to corruption. Therefore, private enterprise should be established by liberalization and privatization. Among the private enterprise Dabur Nepal Pvt. Ltd. is the manufacturing company. It is the third largest and most modern manufacturing base for Dabur group. Dabur Nepal Pvt. Ltd. is an Indian Joint Venture Company promoted by Dabur Indian Pvt. Ltd. It was established in the year 1989 and begins its commercial operation in the year 1993. It produces the ayurvedic goods. Ayurvedic products have no any side effects. So, such products are becoming for our health to become healthy.

Dabur come Nepal with new business with targeted huge quantity of sales. Dabur products are branded quality, value added and with reasonable price. If produces product not only domestic use but also export purpose. It is exported goods many more countries such as India, Bangladesh and other neighbouring countries of Nepal. After establishing Dabur Nepal Pvt. Ltd. It creates high rate of employment opportunities as well raises the national income of the country and it also helps for the development of economy. Dabur Nepal Pvt. Ltd. uses the local resources which are easily available.

The objectives of DNPL to produce qualitative products for the health of human beings. It produces such product these are useful for human beings.

The basic objectives of the study is to analyze the position of the inventory such as RM, WIP, FG, spare parts, turnover ratio and their relationship to each other. It also identifies the problem face DNPL in the management of inventory.

Under this study, I have tried to cover the various inventories of DNPL and covering 5 years data. During the research work, several literature, thesis, books and journal have been studied. I also visited the website concerning with the DNPL.

I also gathered the required data which are necessary for this study. Different financial and statistical tools and techniques are used for analyzing data such as ratio, EOQ, correlation, average RPL and other necessary tools are used for this study.

5.2 Conclusion

Nepal is agriculture country whereas the industry sector is a child situation. In such situation to develop the economy, there should be establishment of industry for economic development of country. In this way, private should be promoted by the Nepalese government. To recover, the consumer demand of goods to maintain the quality of product by the effectively and efficiency. There need the for better inventory system to maintain suitable level of inventory and also cost of the DNPL. Although this suggestion may not be enough they certainly suggests the areas that can be improve and required attenuation to bring some improvement in inventory of DNPl.

From the analysis of secondary data are following conclusion:

- DNPL is the subsidiary company of Dabur India Pvt. Ltd. with holds 80% share of DNPL is used to take the centralized purchasing procedure. Therefore, required raw material (Sugar and Molasses, Vegetables Oils, Herbs, Jari Booti & Raw Madhu, Chemicals and Perfumery Compounds) and packaging material (glass containers, plastic containers/cars/jar, printed packing materials, laminates & lamitubes) are imported from DIPL of India.
- Inventory constitutes the higher than that of other items of current assets. The average percentage of inventory on current assets is 52.34 percent. The highest positive deviation in inventory on current assets in the 2010, i.e. 23.88 percent and highest negative in 2007, i.e. (29.23%) which is compared by overall study period. It is observed that the share of inventory on total current assets is highest in 2010, i.e. 64.84 percent and lowest in 2007, i.e. 37.04 percent. This result refers that the company has not been adopting an appropriate inventory policy.
- In DNPL, inventory includes raw materials, packaging materials, WIP materials, finished goods and stores and spare parts. The average percentage of RM on total inventory in the overall study period is 48.17 percent. The percentage of raw material on total inventory is highest in 2010, i.e. 60.51 percent and lowest in 2008, i.e. 35.84 percent. The highest positive deviation in raw material from the average raw material inventory 25.62 percent in the 2010 and the highest negative is (25.59) percent in 2008. It is observed that the share of raw material consumption in the company is erratic. The fluctuation

in stock of raw material during the study period is very high. Defective purchasing policy and poor planning of raw materials may be responsible factors for such fluctuation.

- The average percentage of PM on total inventory in the overall study period is 21.42 percent. The percentage of packaging material on total inventory is highest in 2007, i.e. 28.71 percent and lowest in 2009, i.e. 16.97 percent. The highest positive deviation in packaging material from the average packaging material inventory 34.03 percent in the 2007 and the highest negative is (20.77) percent in 2009. The share of packaging material in the company is erratic. This results shows that there is no fixed policy of purchasing packaging material.
- The average percentages of WIP materials in total inventory in the overall study period have been 2.43 percent. The highest positive deviation in WIP material from the average WIP is 58.02 percent in the 2010 and the highest negative is (47.32) percent in 2007. It is observed that the share of WIP materials of the company is fluctuating during the period. Inventory on WIP material is highest in 2010, i.e. 3.84 percent and lowest in 2007, i.e. 1.28 percent. Such fluctuation in inventory position is not considered as good from the point of view of inventory management. Fluctuation in demand and sales of company products, lack of appropriate inventory policy and ineffective demand forecast are the main reasons of such fluctuation.
- The average percentage of finished goods on total inventory in the overall study period has been 19.87 percent. The highest positive deviation in finished goods from the average finished goods inventory 72.22 percent in the 2007 and the highest negative is (85.05) percent in 2011. It is observed that the share of finished goods is highest in 2007, i.e. 34.22 percent and lowest in 2011, i.e. 2.97 percent. The production rate is decreasing trend in the production of finished goods. Fluctuation of demand and sales of the company are the main reason for such situations.
- The average percentage of inventory in an overall study period has been 3.49 percent. The highest of positive deviation on average is in year 2007 i.e. 49.57 percent and highest negative deviation has been in year 2011 i.e. (57.02) percentage. Total inventory on stores and spare parts is highest in 2007, i.e.

2.08 percent and lowest in 2011, i.e. 1.50 percent. It is observed that the share of stores and spares parts uses the company is irregular during the study period. Since the company's production is totally dependent on stores and spare parts, it previously fluctuates over the period.

- It is observed, that the average value of raw material is Rs. 3,296.73 lacs and average value of finished goods is Rs. 1,190.69 lacs. The highest positive deviation from the average raw material is 52.70 percent in 2007 and the average finished goods is 92.23 percent in 2008. The highest negative deviation from an average raw material is (33.60) percent in 2008 and average finished goods is (75.06) percent in 2011. The above analysis shows that the investment of RM and FG was fluctuating during the study period. This indicates the company has not been following any system of keeping inventory as well as production. The correlation between raw materials and finished goods has been observed to be (0.86). There is significant relationship between RM and FG and it is observed that changes in stock of raw material are directly related to the change in stock of finished goods.
- The average sales and net profit during the study period are Rs. 26,808.02 lacs and 618.80 lacs respectively. The highest positive deviation from the average sales 22.01 percent in 2011 and average net profit is 87.76 percent in 2011. Similarly, the highest negative deviation from an average sales (17.98) percent in 2007 and average net profit (97.61) percent in 2009. The correlation between sales and net profit observed to be 0.53. Therefore there is significant relationship between sales and net profit. Therefore, it is concluding that the change in sales results in the change of net profit.
- The average inventory and net profit during the study period are Rs. 6,636.14 lacs and 618.80 lacs respectively. The highest positive deviation from the average inventory 50.92 percent in 2011 and average net profit is 87.76 percent in 2011. Similarly, the highest negative deviation from an average inventory (34.28) percent in 2007 and average net profit (97.61) percent in 2009. Therefore there is no specific policy of investment on inventory and inventory management system. The correlation between inventory and net profit observed to be 0.80. Therefore there is positive and low degree of between inventory and net profit.

- The average inventory turnover ratioInventory turnover ratio is highest i.e. 5.04 times in years 2007 and lowest i.e. 3.23 in years 2011. In this year the highest positive deviation from the average inventory turnover ratio is 19.71 percent in year 2007 and higher negative (23.28) percent in year 2011. Which indicates the slow consumption of raw material or low utilization of raw materials, WIP materials and low sales of finished goods. The correlation between inventory and sales has been to be i.e. positive observed to be 0.76. Therefore there is significant relationship between inventory and sales.
- The average raw material turnover ratio is 5.18 times. The highest positive deviations from on an average of RM turnover ratio are 57.34 percent in year 2007 and highest negative (38.22) percent in year 2011 respectively. This indicates the slow consumption or low utilization of raw materials. The correlation between cost of raw material consumed and cost of average RM has been observed to be 0.88 i.e. positive. Therefore, there was positive and low degree of correlation.
- The average packaging material turnover ratio is 4.81 times. The highest positive deviation from the average of PM turnover ratio is 36.80 percent in year 2010 and highest negative ratio is (44.49) percent in year 2007 respectively, which indicates the slow of packaging or low utilization of packaging material. The correlation between cost of packaging material consumed and cost of average PM has been observed to be (0.48) i.e. negative. There was significant and negative relationship between cost of packaging material consumed and cost of average packaging material.
- EOQ is increasing similar during the study period. In the 2007 to 2011 the EOQ of RM is increasing i.e. 2,779 tones, 3,190 tones, 3,603 tones, 3,629 tones and 4,884 tones and similarly PM is increasing i.e. 701 lacs, 742 lacs, 836 lacs, 917 lacs and 974 lacs are respectively.
- Re-ordering Point is one important tool or technique for controlling cost and smoothly operation of company without scarcity of any require material for producing goods and services. in the 2007 to 2011 the ROP with safety stock of raw material not similar i.e. 6.06 tones, 71.06 tones, 78.11 tones, 75.93 tones and 94.16 tones and PM i.e. 23.11 pcs in lacs, 24.42 pcs in lacs, 26.07 pcs in lacs, 27.50 pcs in lacs and 28.99 pcs in lacs respectively.

5.3 Recommendation

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

i. This study is a small part to fulfill the partial requirement of master degree. Analyzing available data some findings were extracted. Based on the major findings it may be appropriate to make some suggestion may not be adequate and could give very easily negative reflection. But it is hoped that these suggestion will help improving to the management of the corporation.

ii. The corporation should determine objectives clearly from top to operational level; it will help to run organization effectively in same course the specific and clear objectives of inventory management increases efficiency of inventory management and helps to reduce investment in inventory.

iii. The company should be the scientific tools and techniques of inventory management like economic order point, ABC analysis, Re-order point and so on. It will help to solve the problems of inventory management such as over stocking, under stocking or out of stock.

iv. The company should make plan of various inventory of Dabur Nepal Pvt. Ltd. like Raw Material inventory, Packaging Material inventory, Work-In-Process inventory and Finished Goods inventory. Such inventory plan helps to organization to smooth operation and reduce cost in course of inventory management.

v. Accounting provides valuable information to decision makers. This can serve to the management function like planning function, controlling function and organizing function. If costs are properly classified and keep record of all transaction, would give more information and certainly enhance the efficiency of Dabur Nepal Pvt. Ltd.

vi. Dabur Nepal Pvt. Ltd. is one private organization so his prime goal is to maximize his profit but coming in present his objectives may not be only

value maximization, he should also fulfill his social responsibility like environment pollution control, quality control and so on.

vii. Purchasing plan should be prepared for different types of raw materials, packaging materials and WIP materials with the proper co-operation and coordination among the planning, purchasing, storing, production, marketing and sales department to avoid excessive investment on inventory.

viii. To avoid problems of overstocking, DNPL should consider on following are target sales should be realistic, within the capacity of being fulfilled and demand should be forecasted with appropriate technique.

ix. The company should follow the systematic cost, cost classification system and determine the carrying cost and ordering cost. The optimum relationship carrying cost and ordering cost the company to reduce the cost.

x. Inventory should not treat as a reason for investment rather it should be planned coordinating factor between sales and production.

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APPENDIX I

Correlation between Raw Material (RM) and Finished Goods (FG)

(Rs. In millions)

Year	RM (X)	FG (Y)	X^2	Y^2	XY
2007	157.64	147.70	24,850.37	21,815.29	23,283.43
2008	221.31	228.89	48,978.12	52,390.63	50,655.65
2009	301.69	136.11	91,016.86	18,529.93	41,063.03
2010	430.56	52.95	185,295.81	2,803.70	22,792.86
2011	537.26	29.70	288,648.47	882.09	15,956.62
Total	$\sum X$ = 1648.36	$\sum Y$ = 595.35	$\sum X^2$ = 638,789.47	$\sum Y^2$ = 96,448.64	$\sum XY$ =153,752.42

Where,

n = 5

$\sum X$ = 1648.36

$\sum Y$ = 595.35

$\sum X^2$ = 638,789.47

$\sum Y^2$ = 96,448.64

$\sum XY$ =153,752.42

We have,

$$r = \sqrt{\frac{n.\sum XY - \sum X.\sum Y}{\sqrt{n\sum X^2 - (\sum X)^2}\sqrt{n\sum Y^2 - (\sum Y)^2}}}$$

$$= \sqrt{\frac{5 \times 153,752.42 - 1,648.36 \times 595.35}{\sqrt{5 \times 638,789.47 - (1,648.36)^2}\ \sqrt{5 \times 96,448.64 - (595.35)^2}}}$$

$\therefore r = -0.86$

APPENDIX II

Correlation between Sales and Net Profit (NP)

(Rs. In million)

Year	Sales (X)	NP (Y)	X^2	Y^2	XY
2007	2,198.83	53.29	4,834,853.37	2,839.82	117,175.65
2008	2,447.50	44.08	5,990256.25	1,943.05	107,885.80
2009	2,719.95	1.48	7,398,128.00	2.19	4,025.53
2010	2,766.77	94.36	7,655,016.23	8,903.81	261,072.42
2011	3,270.97	116.19	10,699,224.74	12,500.12	380,054.00
Total	$\sum X$ = 13,404.2	$\sum Y$ = 309.4	$\sum X^2$ = 36,577,498.59	$\sum Y^2$ = 27,188.99	$\sum XY$ = 870,213.4

Where,

n = 5

$\sum X$ = 13,404.2

$\sum Y$ = 309.4

$\sum X^2$ = 36,577,498.59

$\sum Y^2$ = 27,188.99

$\sum XY$ = 870,213.4

We have,

$$r = \sqrt{\frac{n.\sum XY - \sum X.\sum Y}{\sqrt{n\sum X^2 - (\sum X)^2}\sqrt{n\sum Y^2 - (\sum Y)^2}}}$$

$$= \sqrt{\frac{5 \times 870,213.4 - 13,404.2 \times 309.4}{\sqrt{5 \times 36,577,498.59 - (13,404.2)^2}\sqrt{5 \times 27,188.99 - (309.4)^2}}}$$

$\therefore r = 0.53$

APPENDIX III

Correlation between Inventory (Inv.) and Net Profit (NP)

(Rs. In million)

Year	Inv. (X)	NP (Y)	X^2	Y^2	XY
2007	436.12	53.29	190,200.70	2,839.82	23,240.80
2008	617.44	44.08	381,232.20	1,943.05	27,216.80
2009	551.70	1.48	304,372.90	2.19	816.50
2010	711.32	94.36	505,976.10	8,903.81	67,120.20
2011	1,001.50	116.19	1,003,002.30	12,500.12	116,364.30
Total	$\sum X$ = 3,318.08	$\sum Y$ = 309.4	$\sum X^2$ = 2,384,478.20	$\sum Y^2$ = 27,188.99	$\sum XY$ = 234,758.60

Where,

n = 5

$\sum X$ = 3,318.08

$\sum Y$ = 309.4

$\sum X^2$ = 2,384,478.20

$\sum Y^2$ = 27,188.99

$\sum XY$ = 234,758.60

We have,

$$r = \sqrt{\frac{n.\sum XY - \sum X.\sum Y}{\sqrt{n\sum X^2 - (\sum X)^2}\sqrt{n\sum Y^2 - (\sum Y)^2}}}$$

$$= \sqrt{\frac{5 \times 234{,}758.60 - 3{,}318.08 \times 309.4}{\sqrt{5 \times 2{,}384{,}478.20 - (3{,}318.08)^2}\ \sqrt{5 \times 27{,}188.99 - (309.4)^2}}}$$

$\therefore r = 0.80$

APPENDIX IV

Correlation between Inventory (Inv.) and Sales

(Rs. In millions)

Year	Inv. (X)	Sales (Y)	X^2	Y^2	XY
2007	436.12	2,198.83	190,200.70	4,834,853.37	958,953.74
2008	617.44	2,447.50	381,232.20	5,990256.25	1,511,184.40
2009	551.70	2,719.95	304,372.90	7,398,128.00	1,500,596.42
2010	711.32	2,766.77	505,976.10	7,655,016.23	1,968,058.84
2011	1,001.50	3,270.97	1,003,002.30	10,699,244.74	3,325,816,46
Total	$\sum X$ = 3,318.08	$\sum Y$ = 13,364.02	$\sum X^2$ = 2,384,478.20	$\sum Y^2$ = 36,577,498.59	$\sum XY$ = 9,174,609.00

Where,

n = 5

$\sum X$ = 3,318.08

$\sum Y$ = 13,364.02

$\sum X^2$ = 2,384,478.20

$\sum Y^2$ = 36,577,498.59

$\sum XY$ = 9,174,609.00

We have,

$$r = \frac{n.\sum XY - \sum X.\sum Y}{\sqrt{n\sum X^2 - (\sum X)^2}\sqrt{n\sum Y^2 - (\sum Y)^2}}$$

$$= \frac{5 \times 9{,}174{,}609.00 - 3{,}318.08 \times 13{,}364.02}{\sqrt{5 \times 2{,}384{,}478.20 - (3{,}318.08)^2}\sqrt{5 \times 36{,}577{,}498.59 - (13{,}364.02)^2}}$$

$\therefore r = 0.76$

APPENDIX V

Correlation between Raw Material (RM) and Raw Material Consumed (RMC)

(Rs. In millions)

Year	RM (X)	RMC (Y)	X^2	Y^2	XY
2007	1,014.65	124.44	1,029,514.62	15,485.31	126,263.05
2008	1,182.89	189.47	1,399,228.75	35,898.88	224,122.17
2009	1,273.25	261.50	1,621,165.56	68,382.25	332,954.88
2010	1,260.84	365.97	1,589,717.51	133,934.04	461,429.61
2011	1,549.98	483.86	2,402,438.00	234,120.50	749,973.32
Total	$\sum X$ = 6,281.61	$\sum Y$ = 1,425.24	$\sum X^2$ = 8,042,064.44	$\sum Y^2$ = 487,820.98	$\sum XY$ = 1,894,474.03

Where,

n = 5

$\sum X$ = 6,281.61

$\sum Y$ = 1,425.24

$\sum X^2$ = 8,042,064.44

$\sum Y^2$ = 487,820.98

$\sum XY$ = 9,174,609.00

We have,

$$r = \sqrt{\frac{n.\sum XY - \sum X.\sum Y}{\sqrt{n\sum X^2 - (\sum X)^2}\sqrt{n\sum Y^2 - (\sum Y)^2}}}$$

$$= \sqrt{\frac{5 \times 1{,}894{,}474.03 - 6{,}281.61 \times 1{,}425.24}{\sqrt{5 \times 487{,}820.98 - (6{,}281.61)^2}\sqrt{5 \times 8{,}042{,}064.44 - (1{,}425.24)^2}}}$$

$\therefore r = 0.88$

APPENDIX VI

Correlation between Packaging Material (RM) and Packaging Material Consumed (PMC)

(Rs. In millions)

Year	PM (X)	PMC (Y)	X^2	Y^2	XY
2007	579..36	216.84	335,658.01	47,019.59	125,628.42
2008	959.81	127.34	354,989.56	16,215.48	75,870.45
2009	661.24	125.30	437,238.34	15,700.09	82,853.37
2010	708.29	107.69	501,674.72	11,597.14	76,275.75
2011	742.64	153.10	551,514.17	23,439.61	113,698.18
Total	$\sum X$ = 3,287.34	$\sum Y$ = 730.27	$\sum X^2$ = 2,181,074.80	$\sum Y^2$ = 113,971.91	$\sum XY$ = 474,326.17

Where,

n = 5

$\sum X$ = 3,287.34

$\sum Y$ = 730.27

$\sum X^2$ = 2,181,074.80

$\sum Y^2$ = 113,971.91

$\sum XY$ = 474,326.17

We have,

$$r = \frac{n.\sum XY - \sum X.\sum Y}{\sqrt{n\sum X^2 - (\sum X)^2}\sqrt{n\sum Y^2 - (\sum Y)^2}}$$

$$= \frac{5 \times 474{,}326.17 - 3{,}287.34 \times 730.27}{\sqrt{5 \times 2{,}181{,}074.80 - (3{,}287.34)^2}\sqrt{5 \times 113{,}971.91 - (730.27)^2}}$$

$\therefore r = -0.48$

APPENDIX VII

Calculation of EOQ of Packaging Materials from 2007 to 2011.

For year 2007

Annual requirement (A) = 3,427 tonnes

Ordering Cost (O) = Rs. 60,180 per orders

Carrying Cost (C) = Rs. 840 per tones

By applying formula:

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

$$= \sqrt{\frac{2 \times 3{,}427 \times 60{,}180}{840}}$$

= 701 tonnes

$$\text{No. of Order} = \frac{Annual\ requirement}{EOQ}$$

$$= \frac{3{,}427\ tonnes}{701\ tonnes}$$

$$= 4.89 \cong 5 \text{ times}$$

For year 2008

Annual requirement (A) = 3,624 tonnes

Ordering Cost (O) = Rs. 60,200 per orders

Carrying Cost (C) = Rs. 791 per tones

By applying formula:

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

$$= \sqrt{\frac{2 \times 3{,}624 \times 60{,}200}{791}}$$

= 742 tonnes

No. of Order $= \frac{Annual\ requirement}{EOQ}$

$= \frac{3{,}624\ tonnes}{742\ tonnes}$

$= 4.88 \cong 5$ times

For year 2009

Annual requirement (A) = 3,911 tonnes

Ordering Cost (O) = Rs. 60,790 per orders

Carrying Cost (C) = Rs. 681 per tones

By applying formula:

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

$= \sqrt{\frac{2 \times 3{,}911 \times 60{,}790}{681}}$

= 836 tonnes

No. of Order $= \frac{Annual\ requirement}{EOQ}$

$= \frac{3{,}911\ tonnes}{836\ tonnes}$

$= 4.68 \cong 5$ times

For year 2010

Annual requirement (A) = 4,150 tonnes

Ordering Cost (O) = Rs. 65,840 per orders

Carrying Cost (C) = Rs. 650 per tones

By applying formula:

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

$$= \sqrt{\frac{2 \times 4{,}150 \times 65{,}840}{650}}$$

= 917 tonnes

$$\text{No. of Order} = \frac{Annual\ requirement}{EOQ}$$

$$= \frac{4{,}150\ tonnes}{917\ tonnes}$$

$$= 4.52 \cong 5 \text{ times}$$

For year 2011

Annual requirement (A) = 4,393 tonnes

Ordering Cost (O) = Rs. 68,200 per orders

Carrying Cost (C) = Rs. 632 per tones

By applying formula:

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

$$= \sqrt{\frac{2 \times 4{,}393 \times 68{,}200}{632}}$$

= 974 tonnes

$$\text{No. of Order} = \frac{Annual\ requirement}{EOQ}$$

$$= \frac{4{,}393\ tonnes}{974\ tonnes}$$

$$= 4.51 \cong 5 \text{ times}$$