

CHAPETER - I

INTRODUCTION

1.1 Background of the Study

Inventory is the stock of materials or product, which the industries maintain in the organization. In this industrial age every organization has its own inventory system. There are various methods of inventory management and control. When the materials are purchased by an organization they have to be stored until they are put into the production process. When the production process is over the finished product have to be stored again until they are sold. Thus, inventory involves high amount of cost in terms of occupying the space and blocking the capital. However, we cannot avoid inventories, because with out inventory it may effect even badly by creating obstacles on continuous production and ultimately on supply requirements. So inventory should be maintained in appropriate quantity so as to avoid both under-stock and over-stock situation, for this, proper inventory management is necessary. It is because; the 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.

Inventory management involves the planning of the optimal level, of inventories and control of inventory cost, supported by an appropriate organization structure, which is staffed by trained persons and directed by top management. It involves both financial dimensions as well as physical dimensions and these dimensions are interrelated and cannot be looked in isolation (Agrwal, 1995).

Inventory management is primarily concerned with minimizing cost of investment in inventory, cost of maintain desired level of inventory and minimizing total cost of inventory.

Both the physical as well as financial dimensions of inventory should be effectively managed thus, real task of top management lies in formulation the plans and policy that will lead to optimal investment in inventory for attainment of desired objectives.

Inventory control also deserves special attention as over-investment in inventories results shortage of cash for other purpose like payment of maturing liabilities carrying of account receivable and expansion of fixed assets similarly the consequences of less investment in inventories are loss of regular customs. They don't find selection of varieties and burden of unnecessary cost of operation due to shortages of raw materials. And, also over investment on inventory creates the problem of over capitalization and low investment creates situation of under capitalization these both situation is not desirable.

Therefore inventory control involves the inventory decision models and determines the optimum investment inventory, so it is a topic of considerable and wide spread interest.

1.1.1 Introduction of the Companies

1.1.1.1 Introduction of “Herbs Production and Processing Company Limited”

Different kinds of public enterprises are operating in Nepal. Among them "Herbs Production and Processing Company Limited" is one of the public enterprises, established to produce the different kinds of the medicine and perfumery oil, it processes the herbs, which are collected from the Himalayan region.

Due to the variation of climate and geographical structure of the country, Different kinds of medicinal and aromatic plants are found in the country. They are valuable forest resources. It has had a good recognition in the

Indian market since ancient time. The highest peak of the world, Mt. Everest and a series of Himalayan ranges found in the country are symbolic of the existence of the valuable medicinal and aromatic plants. During the past days, the country had significant role in trading of crude herbs till the date about 700 varieties have been identified. The major thrust of the nation is to process the natural resources domestically balancing their depletion in nature with regeneration the inception of herbs production and processing company limited in 1981AD as an undertaking of the then HMG/Nepal. After thorough research and dedication of the national core of scientists under the department of medicinal plants, this company was founded.

HPPCL is the first company in the country to harness the rich treasure of herbs and aromas for processing production medicine extracts essential oils for drugs and perfumery industries within the country and abroad. The painstaking research on selected herbs resources and flora of the country by modern scientific methods results the introduction of the production of selective medicinal extracts and essential on a commercial scale. At present, the company is capable of exporting indigenous products like Sugandha kokila oil and Jatamasi oil as well as the exotic varieties such as palmorosa oil, Citronella oil, Lemongrass oil and some crude drugs to neighboring and third countries.

This company was established in 1981AD at Koteshwor with authorized capital five crore and paid-up capital two crore seventy-five lakh and seventeen thousand. There are 198 employees in HPPCL. Among them 23 employees are in officer level and 145 employees are in assistant level.

These raw materials for the production of the different kinds of perfumery oil are either purchased directly or taken from the cultivated area. There are no specific methods for the collection of different kinds of raw materials.

1.1.1.2 Introduction of “National Trading Limited”

Different kinds of public enterprises are operating in the country among them "National Trading Limited" is one of the public enterprise. National Trading Limited is non- manufacturing public enterprise.

National Trading Limited was established in 2018 B.S. in the public sector as an undertaking of the then HMG of Nepal. Now it has seventeen branch offices.

National Trading Limited is operating public service oriented as well as profit oriented. National Trading Limited is non-manufacturing public enterprise. It imports finished goods like; (machine parts, manufacturing goods and other luxury goods) and daily usage goods from international market as well as purchase from national market on the basis of customer's demands. National Trading Limited mainly imports goods from China, India, Switzerland, Russia and Bangladesh.

At the time of establishment government provided subsidy annual so it was in good condition. Later on, due to the frequent change in the government policy after the restoration of democracy in 2046, NTL was affected badly. So it is getting towards insolvency like other public enterprises.

1.2 Statement of the Problem

Financial performances of Nepalese enterprises are quite dismal and have not been able to contribute towards the generation of surplus there could be many factors for the failure of the PEs i.e. lack of integration of activities, mismanagement, less utilization of capacity, lack of motivated skilled employees and mismanagement of inventory. One of the main causes for failure of the enterprises might be related to inventory management and control. So, to address the problem, the study intent proper inventory management of the PEs.

The study covers the following research questions.

1. What types of inventory policy has been adopted by HPPCL and NTL?
2. What are the techniques being used to manage the inventory by HPPCL and NTL?
3. How do both companies manage the Inventory?
4. How do both companies control the cost?

1.3 Objectives of the Study

This study tries to focus on the role of comprehensive inventory management and control in improving the performance, of HPPCL & NTL. Apart from the main objectives, the following specific objectives have been proposed.

-) To assess the inventory policy adopted by HPPCL & NTL.
-) To examine the techniques being employed to manage the inventory by these enterprises.
-) To assess the types of inventory maintained in HPPCL and National Trading Limited.
-) To provide suggestions and recommendations on the basis of above study and findings.

1.4 Needs of the Study

Every organization cannot be success with out proper management of inventory, proper inventory reduce cost and increase profit and maintain sound level of stock also.

A firm cannot achieve its goals unless inventories are controlled effectively and capital is allocated efficiently. Therefore study on inventory management is inevitable. According to I.M Panday "Inventory is the most important thing but large inventory is the evil for the company".

Inventory is the current assets playing vital role for the organization. Many Nepalese public enterprises have poor inventory management systems so that they cannot be run successfully. When market demand is high at that period, if there is lack of proper inventory there will be few production and cannot supply regularly. Some times due to over stock level inventory hold unnecessary current assets. So that excessive as well as inadequate inventories are not desirable. Inadequate inventories cause obstacles in smooth production as well as in market operation.

In this competitive age organization should be conscious about own product. They should try to give quality, durable and cheap price for product to the customer. So that it is necessary to public enterprises to run smoothly, efficiently as well as profitably. So that in this situation, the management and control system of inventory play a prime role even to the manufacturing public enterprise thus, it is very important to know how the PEs utilizes its inventory to fulfill its objectives.

1.5 Limitation of the Study

The study confines only to budgeting inventory management and profit of public enterprise. The following factors have limited the scope of the study.

-) The main concern of this study is to cover the present managerial status in terms of their inventory planning as well as profit planning. So, this study is naturally confined to the planning aspect.
-) The secondary data and trend have been analyzed based on last five-year period.
-) Analysis is concentrated in some managerial, financial and accounting aspect and does not cover the other aspects of the selected enterprises (HPPCL and NTL).

1.6 Organization of the Study

The overall study work has divided into five chapters.

Chapter – I Introduction

The first chapter consists of the introduction of the study, Statement of problems, objectives of the study, and needs of the study and organization of the study.

Chapter – II Review of Literature

The second chapter is review of literature consists of reviews of different dissertations. It's finding and recommendations and the Conceptual framework.

Chapter – III Research methodology

The third chapter is research methodology consisting of research design, nature and scope of data, population and sample size, data collection procedure and data analytical tools.

Chapter – IV Data Presentation and Analysis

The fourth chapter is presentation and analysis of data based on facts and figures gathered by different methods i.e. EOQ, targeted and actual production, targeted and annual sales and major findings.

Chapter – V Summary, Conclusion and Recommendations

The fifth chapter is last chapter which includes summary, conclusion and recommendation.

Bibliography and appendixes are also included at the end.

CHAPETER - II

REVIEW OF LITERATURE

2.1 Theoretical Framework

2.1.1 Inventory

The stock of different types of consumable goods held by organization is called inventory. Inventory is the indispensable item for all types of organization. Inventories are vital elements in the efforts of the industry and firm, inventories may be durable or endurable.

In the context of manufacturing or trading enterprises, most of the public enterprises have been facing the problem of effective management of inventory. We know large proportion of the total capital will be invested in the inventory. Which is a vital element on the effort of the firm to achieve desired sales level.

Management is the function consists of planning, organizing, directing, coordinating and controlling of different activities that is done to achieve predetermined goal of the organization. Hence, inventory management can be defined as the function to plan, organize, direct, coordinate and control of inventory as per the requirement of the organization.

"Inventory management involves the planning of the optimal level of inventories and control of inventory cost. Supported by an appropriate organization structure, which is staffed by trained persons and directed by top leveled management. It involves both financial dimension as well as physical dimension and these dimensions are interrelated and cannot be looked in isolation" (Hampton, 1990).

Every organization associates with inventory as their nature. The majority of the company's inventory represents a substantial investment. Thus, the goal of

the wealth maximization is related to the efficiency with which inventory is managed. Consequently, the financial manager has an important role to control inventory. The financial manager should see that only an optimum amount is invested in inventory. He / she should be familiar with the inventory control techniques and ensures that inventory is managed well. In other words inventory management can be defined as the planning policies that will be helpful to maintain optimum level of inventory investment of achievement of desired goal (De Bose, 1980).

(i) Raw Material

Raw materials are those basic inputs. Which are generally purchased from outside and converted into finished goods through this production process? According to I .M Pandey "Raw materials are those basic inputs that are converted in to finished product through the manufacturing process. Raw material inventories are those unite have been purchased and stored for future production." And raw material is very important factor of production in a manufacturing organization. It is the first and the most important element production, which covers nearly 60% of cost of production. In this study for HPPCL Raw Herbs and Essence oil are the raw materials.

(ii) Work in Progress

Industries generally have work in progress inventories if they involve in production activities. These types of inventories consist of all the items, of finished product, which are accurately on the production cycle. In other words, work in progress is semi-finished product, which helps in the smooth production process. It includes those materials that have not been completed such item are component and subassemblies that are not ready to sale. It is difficult to identify which are semi-finished goods, because the same materials might be work in progress for on organization where as finished for another organization. It depends upon the nature of production.

(iii) Finished Goods

Finished goods inventory is those manufactured products that are ready to sale or that satisfies the anticipated demand of customer in future. According to I.M Pandey, "finished goods inventories are those completely manufactured product which are ready to sale. Stocks of raw material and work in progress facilitate production while stock of finished goods is required for smooth marketing operation"

(iv) Supplies Store and Spare Parts

Supplies maintain a forth kind of inventory supplies, which are indirect inputs in process of production. A forth kind of inventory of supplies includes office and cleaning materials do not directly involves in to production but is necessary for the production process. Unusually these supplies are small part of the total inventory and do not invoice significant investment.

2.2 Objective of Inventory Management

Inventory management is challenging management for these days. Both excessive and inadequate inventories are not desirable. These are two danger points within which the firm should operate. The objective of inventory management is to keep optimum level of inventory for smooth production and sales operation as well as to maintain minimum investment in inventory so as to minimize cost or to maximize profit. Every firm should maintained adequate inventory to insure an adequate supply of materials to the customer. Inventory management plays a crucial role in any manufacturing or non-manufacturing company. So, aim of the inventory management should be determined and maintained at an optimum level of inventory management. The aim of the inventory management is to avoid excess inventory for smooth production, sale operations, and efficient customer service and centralize in investment.

1. To maintain optimum level of inventory for efficient, smooth production and sales operation.

2. To control excess investment in inventories and keep it an optimum level.
3. To minimize carrying, ordering and other indirect cost.
4. To minimize the cost and time.
5. Risk of spoilage and obsolescence of inventory must be avoided.
6. Information about availability of stock should be made continuously available to management.

2.3 Need of Holding Inventory

The questions of managing inventories arise only when the company holds inventories. Maintaining inventories involves tying of the company's fund and incur race of storage and handling costs if it expenses to maintain inventories, why do companies hold inventories? There are three general motives for holding inventories (Starr& Miller, 1962).

The Transaction Motive

This emphasizes the need to maintain inventories to facilitate smooth production and sales operation.

The Precautionary Motive

This necessities holding of inventories to guard against the risk of unpredictable change in demand and supply forces and other factors.

The Speculative Motive

Which influence the decision in increase or reduce inventory levels to take advantage from price fluctuations.

A company should maintain adequate stock of material for 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. In addition, there exists uncertainty in procuring of material because of factors such as strike, transport disruption and

short supply. Therefore the firm should maintain sufficient stock or raw materials at a given time to streamline production.

Some Purposes of Holding Inventories are as follows:-

-) To maintain optimum level of inventory for efficient smooth production and sales operation.
-) To maintain minimum investment in inventory.
-) To maintain adequate accountability inventory assets.
-) To ensure an adequate supply of material, stores spare etc. minimize stock out, shortage and avoid costly interruption in operation.
-) To maintain the quantity of finished product.

According to Adam & Ebert, the fundamental reason for carrying inventories is that it is physically impossible and economically impractical for each stock to arrive exactly where it is needed. Even if it were physically possible for a supplier to deliver raw materials every few hour for example. It could still be probably expensive. The manufacturer must therefore keep extra needed in the conversion process. Other reason for carrying inventories is summarized below.

2.4 Evils for Excess Inventory

Inventory being a vital element for the organization, but it is harmful to hold excess quantity. Some of the evils are:

1. Excess inventory covered the huge amount of capital. Which could be invested in operations that are more profitable?
2. Excess inventory adds to the cost of carrying, ordering, factory staff remuneration, space equipment and personnel, insurance, taxes, pilferage etc.
3. Excess inventory invites risk of deterioration and obsolescence.
4. Price levels of inventories change sometimes, which may be unfavorable.
5. Maintenance and packaging, repairing cost automatically increase.

2.5 Factor Affecting Inventory Management

Inventory planning is the way to determine the requirement of raw materials, spare parts and other items that are necessary to meet production need. Taking of sufficient working capital, lead-time, re-ordering system also affects in production system. Schedule of purchase and sale in proper manner. It helps in production system & selling system. Some of the factors which influencing inventories planning are given below.

1. Working capital.
2. Store keeping or inventory control management.
3. Total lead-time.
4. Techniques used to determine for cost.
5. Store capacity.
6. Supply of item.
7. Demand of the product.
8. Price trend and rigidity.
9. Credit Policies.
10. Import\ Export Policies.
11. Available information.
12. Information about substitute product.
13. Plant utilization.
14. Technology availability.
15. Business cycle.
16. Rejection cycle.
17. State of health of nation economy.
18. Foreign exchange regulation.
19. International market condition.
20. Corporate objectives.
21. Communication system.
22. Delegation power.
23. Location of plant and location of suppliers.

2.6 Inventory Cost

Cost incurred for maintaining given levels is called carrying cost. (B.K.1994)
Carrying cost varies with inventory size. Because of Second World War, American economy as well as world economy plagued by capital utilization, material shortage, inflation balance of cost lie heart of all the production and inventory control problems. Some of the factors which influencing inventories cost are given below.

1. Material cost.
2. Ordering costs.
3. Safety stock cost.
4. Cost of funds tied up in inventory.
5. Cost of running out of goods.
6. Carrying cost.

1. Material Costs

These are the costs of purchasing of the goods plus transportations and handling. This may be calculated by adding the purchase price (less any discount). The delivery charges and the sales tax (if any).

2. Procurement / Ordering Cost

These are variable costs of placing of orders of the goods. Each separate shipment involves certain expenses connected with requesting and receiving materials. Examples of these are typing of the order and inspection of goods after they arrive. The fewer the orders the lower the order cost will be for the firm. Ordering cost will be for the firm. Ordering cost can be calculated by the following formula.

$$\text{Ordering Cost} = \frac{A}{Q} \times O$$

Where, A = Annual Requirement

Q = Order Size

O = Ordering cost per order

3. 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 word if (TCC) is using average inventory (AI), in other word $(TCC) = (C\%) \{P\} \{AI\}$

Where, C % = Percentage of cost for carrying inventory

P = price per unit of inventory.

AI = Average inventory

Account for maintaining safety stock, however for some reasons the cost of maintaining safety stock may be needed to calculate separately. 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 cost of maintaining inventory {TCMI} by summing up the cost we get TCMI by combining TCC, TOC, and CSS total cost of maintaining inventory. {Pradhan, 1992}

$TCMI = TCC + TOC + CSS$

Or $TCC = \{(C\%) (P) (AI)\} + \{(O) *(N) + [(C\%)(P)(S)]\}$

Where,

TCMI = Total cost of maintaining inventory.

TCC = Total carrying cost.

TOC = Total ordering cost.

CSS = Cost of safety stock.

C% = % of cost of carrying.

P = Price per unit of inventory.

AI = Average inventory.

O = Cost of placing order.

N = Number of times to be ordered per year.

S = Safety stock.

4. Cost of Funds Tied up in Inventory

Whenever the firm commits its resources to inventory, it is using funds that might be available for other purposes. A portion an inventory is financed by trade credit from supplies and involves on costs. If the firm buys inventories on terms net 30, the inventories may be sold before the firm must pay its suppliers the balance of the inventory must be financed from the firm's general funds and involves a cost. If the firm is considering an expansion of inventories and plans to borrow to obtain funds, they will have to pay interest on the additional debt. If the firm finances additional inventory through the sale of common stock, an opportunity cost is involved. The firm has lost the use of funds for other, profit-making process. Whatever the sources of funds, inventory has a cost in terms of financial resources, excess inventories represents an unneeded cost.

(5) Cost of Running out of Goods

Whenever a firm incurs shortage of production, it incurs cost. If the firm is unable to fill an order the firm losses its regular customer. If the firm runs out of raw materials, it may force a costly shutdown of the production process. Adequate inventory helps reduce additional costs and lost revenues due to shortages.

(6) Carrying Cost

These are the expenses of storing goods. Once the goods have been accepted, they become a part of the firm's inventories. These costs refer to cost related to holding of inventory over a given time period. Total carrying costs vary in proportion to the value of inventory; usually they are computed from the following formula.

Carrying Cost = Average Inventory \times Carrying Cost per unit

Symbolically,

$$\text{Carrying Cost} = \frac{Q}{2} \times (\text{Carrying Cost per unit})$$

The following are example of different kinds of carrying costs.

- i. Storage cost
- ii. Insurance
- iii. Obsolescence and spoilage
- iv. Damage of theft

i. Storage Cost

Maintenance of inventory means store cost. These costs include expenditures made on inventory staff, insurance of items and expenditures on providing various facilities like floor, space, racks, bins and containers, materials handling equipment and other provisions for safe and proper storage items (Goal, 1985).

ii. Insurance

In spite of best precaution, firm must protect themselves against such hazards as fire of accident in the warehouse. Larger amounts of inventory require larger amount of insurance.

iii. Obsolescence and Spoilage

When firm hold goods, they expose themselves to the possibility that the goods will not be saleable when the time arrives. Obsolescence is the cost of being unable to sell goods because of current market factors deriving from changes in styles, tastes or other factors. If market a product is no longer wanted, the firm must sell it at a fraction of its value or destroy it. Spoilage occurs when a product is not saleable because of deterioration during storage, such as foods that rot, plants that die, garments that are attacked by moths, candles that discolor or the chemical that decompose.

iv. Damage or Theft

Although a firm makes every effort to protect goods against damage and safeguard item against pilferage, goods are damaged and stolen. A portion of these expenses is not covered by insurance and are losses to the firm. In some business, particularly retail stores and producing luxury product such as alcoholic beverages, damage and theft may constitute major carrying cost.

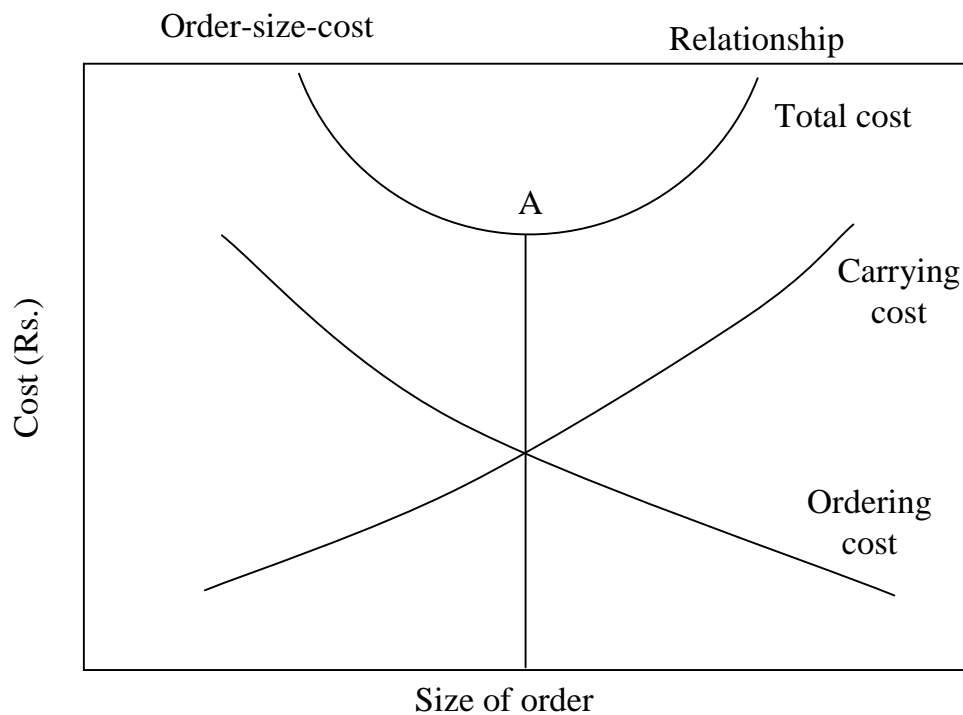
2.7 Technical Framework

Technical formation includes the question, which reduces the cost and increase in profitability. The problem, which is common to all, is how much to estimate and execute inventory policies. How much should they buy at a time? How low should they let inventory to fall before they replenish it? From whom they should buy and how should they ensure for getting items? But it is not possible to answer the entire questions. It has been possible to answer these varied question or problems faced by the business units (Adam, 1993).

2.7.1 Inventory Model

We have already discussed about the different forms of costs then lets see how the production manager attack the problem fixed unit of given items of lowest price or produced for stock at a given time. The large quantity purchase enables the management to reduce the order placing cost incurred in a given period. Buying a bulk of items also makes it possible to take advantages of quantity discount and lower handling cost. We have that the procurement cost decreases, the carrying cost will increase. This is the cost trade off between the two. If we add the cost graphically, we will obtain the total cost curve. The optimal order quantity is the point at which annual total cost is at a minimum. The purchase of large increased size of the average inventory maintained which is shown below (Magee, 1995).

Figure 2.1
Order-Size-Cost Relationship



Since order placing cost are largely independent of the size of the order. Ordering cost goes down as the order size is increased because fewer order are placed to reduce the inventory cost.

To illustrate the relationship between those costs let us consider the case of printing press that needs 1000 tons of newsprint. Of the process of orders from the manufacture in quantities of 100 tons at time means that ten orders must be placed where as only two orders are needed for an order size of 500 tons. As consequences inventories cost such as storage, insurance and interest, which very with inventory level will be lower and are economic that belongs to large orders such as quantity discount. Lower order cost and lower receiving cost. A balance must be stock between the inventory carrying costs. Will reflect a compromise and accommodation between the two cost patterns. This compromise occurs at the lowest point in the cost curve "A" shown in figure 1.

2.7.2 Economic Order Quantity

The EOQ is an important concept in the purchase of equipment as well as in the storage of goods and transit inventories. It attempts to establish the most economic balance between the carrying costs and ordering costs determining the quantities to be ordered. The economic order quantity is that inventory level, which minimizes the total of ordering and carrying, costs. The question of how much to be ordered can be solved by the EOQ technique. It always tries to balance the ordering cost and holding cost. The relationship between the ordering costs and carrying costs is called cost factor.

In our analysis we wish to determine the optimal order quantity for a particular time of inventory given, its forecasted usage ordering cost and carrying cost. Ordering means either the purchase of the items or the production. Assume, for the moment that the usage of a particular items of inventory is known with certainty. This usage is steady throughout the period of time being analyzed. In other words, if usage is 2,600 items for a six months period, 100 items would be used each week. Although, EOQ, model can be modified to take account for increasing and decreasing overtime. We shall not get into these types of complexity.

We assume that ordering cost 'O' is constraint regardless of the size of the order. In the purchase of materials or other items these costs represent the clerical costs involved in packing an order as well as certain cost of receiving and checking the goods once they arrive. For finished goods inventories, ordering cost involve scheduling a production run for in transit inventories, ordering cost are likely to involve nothing more than record keeping. The total ordering cost for a period is simply the number of orders for that period of items multiply by the cost per order or A/Q Carrying cost per period 'C' represent the cost of inventory storage, handling 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 numbers of unit of inventory multiply by the carrying cost per unit or $C (Q/2)$.

If the usage of on inventory items is perfect steady over a period of time question of safety does not arise. Where average inventory in units can be expressed as $Q/2$ total inventory cost then are the carrying cost plus ordering cost or $T = CQ/2 + OA/Q$.

$$\text{Optimum Quantity (Q)} = \sqrt{\frac{2AO}{C}}$$

Where,

Q = Optimum quantity

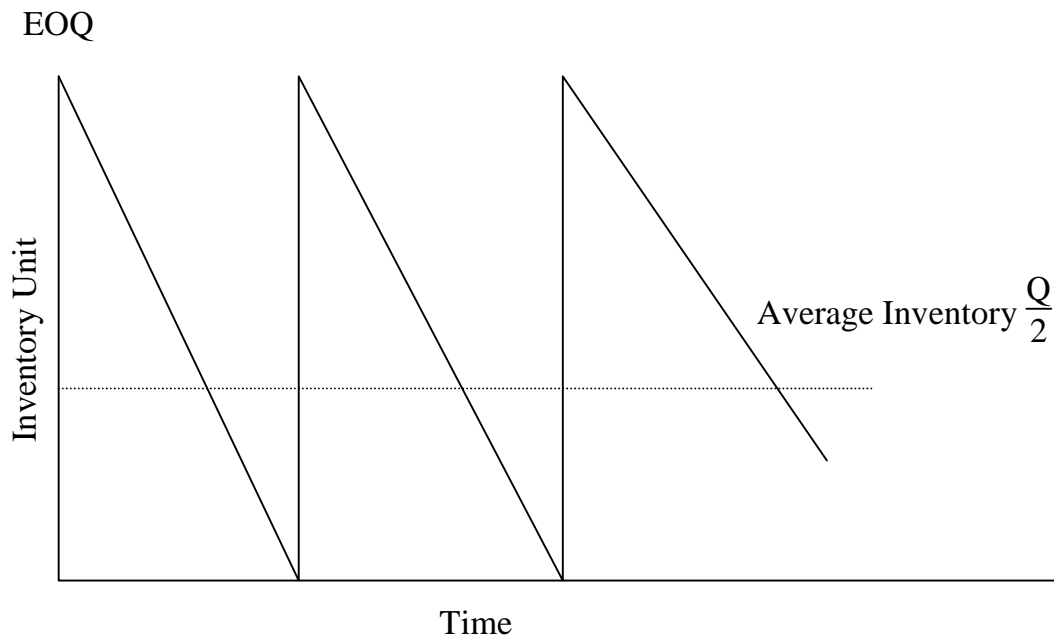
A = Annual requirement

O = Ordering cost

C = Carrying cost

It indicated that Q is the quantity (in unit) order and is assumed to be constant for the period. This problem is to illustrate in this figure although the quantities demanded, is a step function. We assume for analytical purpose that can be approximated by a straight line. We see the zero inventories always indicate that further inventory must be ordered.

Figure 2.2
Graphic Inventory Model



EOQ can be determined by three approaches

-) Formula approach,
-) Trail and error approach and
-) Graphical approach

Formula Approach

This method, we calculate EOQ by following formulas.

From Economic Order Quantity Statement, we have

Total ordering cost = Total carrying cost

Total ordering cost = Number of orders × Ordering cost per order

$$= \frac{\text{Annual Requirement}}{\text{Order Size}} \times \text{Ordering Cost Per Order}$$

Symbolically,

$$\text{Total Ordering Cost} = \frac{A}{Q} \times O = \frac{AO}{Q}$$

Again, Total Carrying Cost = Average Quantity × Carrying Cost Per Unit

$$= \frac{\text{Ordering size}}{2} \times \text{Carrying Cost Per Unit}$$

Symbolically,

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

Now, we have

$$\frac{AO}{Q} = \frac{QC}{2} \dots \text{Total Ordering Cost} = \text{Total Carrying Cost}$$

$$\text{OR, } Q^2C = 2AO$$

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

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

Where,

EOQ = Economic Order Quantity

A = Annual Requirement

O = Ordering cost per unit

C = Carrying cost

Trial and Error Approach

By this method we can calculate EOQ following steps:

Table 2.1

Calculation of EOQ by Trial and Error Method

Step 1	To estimate number of order
Step 2 Order size	To find out order size Order Size = $\frac{\text{Annual Requirement}}{\text{No. of order}}$
Step 3 Average Quantity	To find out the average quantity Average Quantity = $\frac{\text{Order Size}}{2}$
Step 4 Carrying cost	To find out the Carrying Cost Average Quantity \times Carrying Cost Per Unit
Step 5 Ordering cost	To find out the ordering cost Number of Orders \times Ordering Cost Per Order
Step 6 Total cost	To find out the Total Cost Carrying Cost + Ordering Cost

This approach indicates from which point has the minimum total cost, when the Ordering cost is equal to carrying cost. For example if

Carrying cost per unit (C) = Rs.20

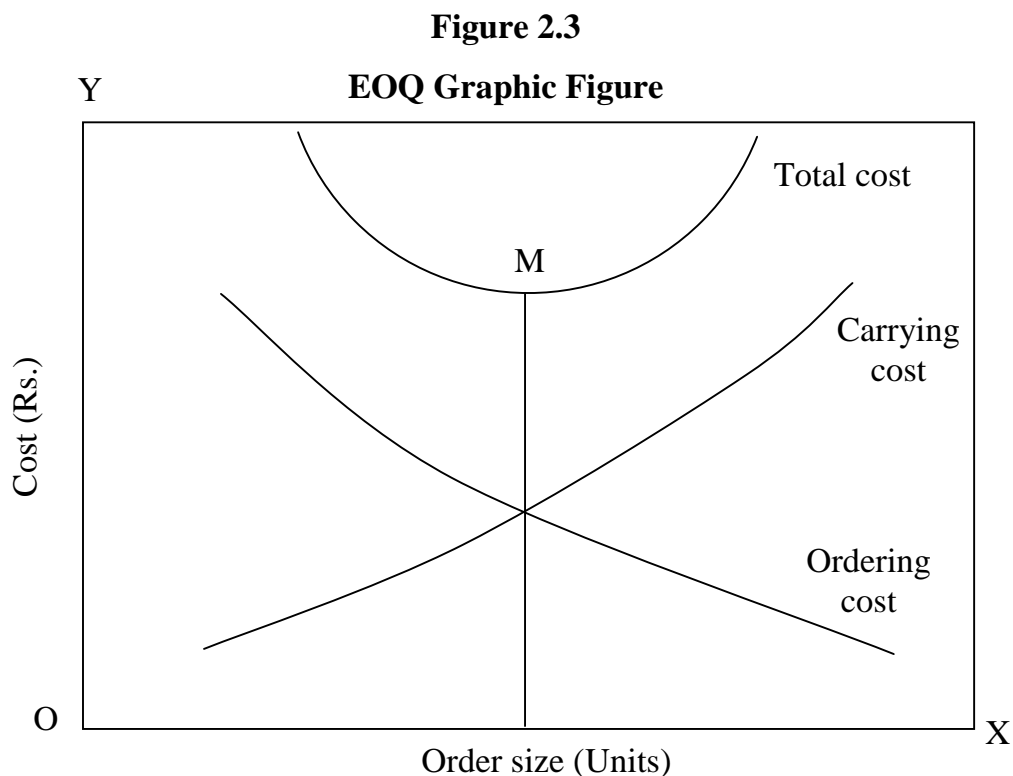
Ordering cost per order (O) = Rs.25

1	Order size	2000	1000	500	200	100	50
2	Average inventory	500	250	125	50	25	12.5
3	No. Of orders	1	2	4	10	20	40
4	Carrying cost (Rs.)	10000	5000	2500	1200	500	250
5	Ordering cost (Rs.)	25	50	100	250	500	1000
6	Total cost	10025	5050	2600	1450	1000	1250

Above table indicate the 100 units is the economic order quantity where both ordering and carrying cost is Rs.500. Total cost is Rs.1000. This point is minimum than other level.

Graphic Approach

Total ordering cost curve is increased with the no of orders increase but it reduces the carrying and vice-versa. Addition of ordering cost curve and carrying cost curve represent the total cost. The point where the total cost curve is minimized represents the EOQ.



In the above figure, OX shows order size and OY shows the total cost if order size is increasing no. of order is decreasing, so the ordering cost curve is decrease and just opposite carrying cost curve is increasing. The total cost is the summation of carrying and ordering cost. Total cost is minimized at M.

Although EOQ is easier, techniques to solve the problem of how much to purchase at once but it has limitations/assumptions they are:

-) Uniformity of demand,
-) Instantaneous supply,
-) No consideration over discount factor and
-) Stable demand

Generally, inventory management covers the function of:

-) Purchasing
-) Store keeping
-) Issuing and Pricing

2.7.2.1 Purchasing

According to Jain and Narang, “ Purchasing is the most important function of material management as the moment an order is placed for the purchase of materials, a substantial part of the company’s finance is committed which affects cash flow position of the company,” Purchase management plays important role in the manufacturing companies. According to Gupta and Rajput, the process of inventory management begins with purchasing. Firm should purchase raw materials, supplies at the right time with good quality of right quantity and with cost effectiveness.

Purchase management should be effective otherwise, it hampers in the quality of production and cost of the product. Scarcity of raw materials also hampers in production; so, purchasing department should take greater responsibilities. The department should analyze the existing procurement policy and should tune with the overall organizational objectives and policies. Efficiency of any business depends upon having materials, supply and equipment available in good price. Purchasing, therefore, should be carefully planned for effective inventory management.

Objective of Purchasing are:

According to L. N. Gupta, “The reasonability of the purchasing department is to buy materials of the right quality at the right time, at the right price from the right source with delivery at the right place.”

The following are the main objectives of the purchasing:

-) Procurement of required quality and quantity of materials at their best price, not necessary the lowest price.
-) Procurement of materials, which best suit the product and the purpose for which they are intended.
-) Purchasing for the time ultimately been a schedule, sufficiently in advance of the demand of the production department so that the production work shall not suffer due to lack of materials.
-) Buying the quantity, which in neither too much that involves belonging of capital nor too little that holds up the regular supply for production.
-) Improvement of product with reference to quality and the distribution by means of selection of adequate materials.
-) Maintaining continuous supply to insure production schedule at a minimum investment.
-) Avoidance of duplication of materials, leaving to waste of materials and equipment.
-) Maintenance of company competitive position in the market by the customer having company's quality standards in accordance with the demand of customer.
-) Creation of goodwill for the company through dealing with suppliers.
-) Developing, full-operation and co-ordination and maintenance of internal relationship among various department of the company.

The main objective of the purchasing should be uninterrupted and smooth production to provide regular service to the customers at possible cost.

2.7.2.2 Store Keeping

The best method of maintaining materials properly is store keeping. Store keeping is the 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 unauthorized removal, to

issue the materials in the right quantities at the right time in the right place and provide these services promptly and at least cost.

“Store keeping refers to the safe custody of all materials stocked in stores for which the store keeper acts as a trustee. It simply means that the materials are to be stored in stores in such a manner that there is least possibility of theft, fire, damage and they may be easily located and issued whenever required for use.

Store keeping embraces all the activities right from the receipt of supplies of raw materials, spare parts, equipment, their proper storage and issue to used department. This also includes the storage of finished product before dispatch to dealers. These activities involve maintenance of proper records of all the transactions.

The importance of store keeping has not been properly recognized by the manufacturing organizations so far. Many organizations spend lavishly on machines and wages while store keeping is ignored and stores are not in proper place and condition. Storekeepers are also not paid attention in comparison to others in similar status. All these causes are responsible for wrong or short issue. Loss of stock of raw materials unexpectedly running out of stock and preparation or correct vouchers all these lead to theft and pilferage of stock and delay in production.

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

Objectives of store keeping are

The Major objectives of store keeping may be stated as follows.

-) Receiving, handling and issuing goods economically and efficiently
-) Using the storage available space and labor effectively.

-) Protection of all goods in stores against all losses from fire, theft and obsolesce.
-) Minimizing the investment on inventories.
-) Maintaining regular supply of raw materials at all items when properly authorized.
-) Facility ordering of required materials
-) Minimizing the inventory holding cost

To achieve the above objectives, a firm generally used bin card and store ledger as a store controlling devices.

2.7.2.3 Issuing and Pricing

Pricing the inventory is one of the most interesting and it widely matters in accounting process. Many organizations are interested in the various methods of pricing inventories because it has a direct effect on the income. Inventory valuation approach is important in the aspect of income tax problem. One method of inventory valuation may lead to lower tax liability than other inventory valuation method. There are many methods of inventory valuation but most significant method is cost and other method is the lower of cost or market. Both methods give different results.

2.7.3 Re-Order Point

The problem, how much to order is solved by determining the economic order quantity. The economic ordering discussed above assumptions but sometimes these are found to be unrealistic because in real word situation there should be gap between the time of placing order and the receipt of the delivery. This 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 other is always a chance that the firm may suffer the situation of shortage. Another alternative is to place the

order before the stock is completely exhausted i.e. to order 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 shortage. Both these situations are not in the interest of the firm. The problem is known as 'what to order' and is very important for the organization in other words the choice of appropriate point at which an order to replenish the inventory is of great significance. The level of inventory at which re-order should be placed is known as re-order and re-order point (Goal, 1992). To determine the re-order level under certainty, following factors should be taken into account.

-) The time intervening between the date of order of goods and the arrival of supplies,
-) The average quantity consumed within stipulated time period and
-) The margin of safety.

The ordering level revised from time to time on consideration of the exigencies relating to supplies of a demand of goods. (Goyal, 1993).

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

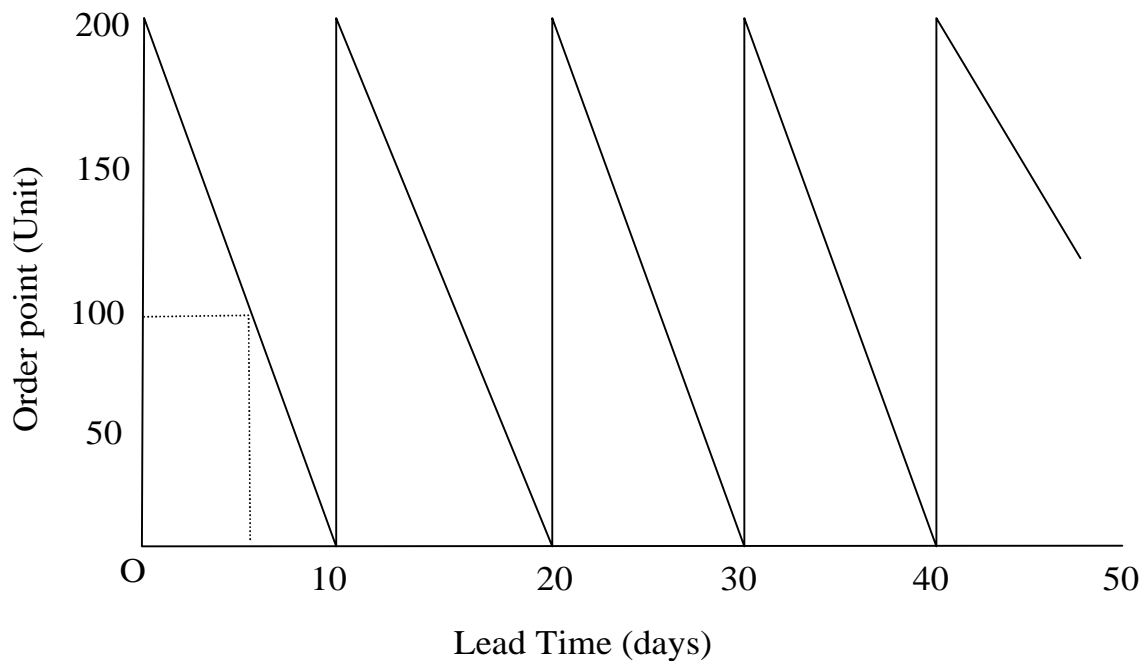
Re-Ordering Point is Calculated as following formulas:

Re-order Level = Lead time \times Daily Consumption

Re-order Level = Maximum Consumption \times Maximum Lead Time

Re-order Level = Minimum Level + (Lead Time \times Daily Consumptions)

Figure 2.4
Re-ordering Point Under Certainty



Safety Stock

In our example, the re-order point is computed under the assumption of certainty. It is difficult to predict usage and lead-time accurately. The demand for material may fluctuate for day by day or from week to week. Similarly, the delivery time may be different from the normal lead-time. If the actual usage increase or the delivery of inventory is delayed, the firm can face a problem of stock out. The stock out can prove to be costly for the firm. Therefore, in order to guard against the stock out, the organization with a policy of safe guarding their interest. These uncertainties maintain the level inventory at some desired minimum level. This minimum level of inventory to cover some unforeseen and uncalled for situation is known as 'safety.' Alternatively a safety stock can also be defined as the average stock available in inventory when the fresh supply arrives.

Factors affecting choice of Safety Stocks are:

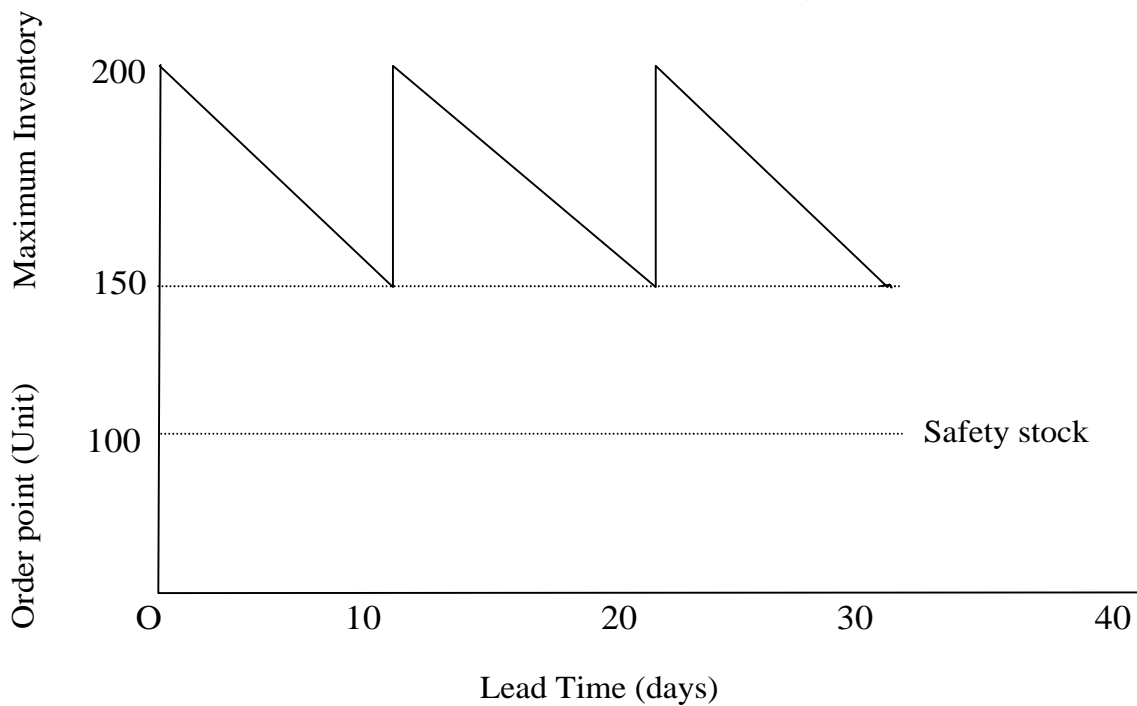
-) Uncertainty in demand,
-) Degree of insurance of any item,

-) Uncertainty in lead time and
-) Size of the batch

Assume in the previous example the reasonable expected stock out is 10 units per day. Thus safety stock is maintained which is as follows:

$$\begin{aligned} \text{Re-order Point} &= \text{Safety Stock (Daily Consumption} \times \text{Lead Time)} \\ &= 5 \text{ days (20 units} + 10 \text{ units)} \\ &= 150 \text{ units} \end{aligned}$$

Figure 2.5
Re-order Point Under Uncertainty



I) Situation, where demand rate varies

$$\text{Safety Stock} = (\text{Lead Time}) \times (\text{Maximum Demand Rate} - \text{Average Demand Rate})$$

II) Incases where both lead time & demand are fluctuating:

$$\text{Safety Stock} = (\text{Maximum Lead Time} \times \text{Maximum Demand Rate}) - (\text{Average Lead Time} \times \text{Average Demand})$$

III) Incase of Lead Time Varies & Demand Rate is Uniform

$$\text{Safety Stock} = (\text{Maximum Lease Time} - \text{Average Lead Time}) \times \text{Demand Rate}$$

The proper amount of safety stock to maintain depends on several things. The greater the cost of varying 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 and cost of a stock-out against the cost of carrying enough safety stock to avoid this possibility. Ultimately, the questions reduce to the probability of inventory stock out that management is willing total rate (Goyal, 1992).

Stock Level

This stock keeps tracks of the goods help by the firms the issuance of goods and the arrival of orders. It is prepared for recording as well as accounting of goods in stock. Thus, this stock helps to maintain the record of inventory at appropriate level.

For simplicity the stock level are divided in following headings.

Maximum Stock Level

The maximum level represents that level of stock above which the stock should not be allowed to rise. This level is to be fixed keeping in mind unnecessary blocking of capital in stocks.

The quality is fixed so that there may be on over stocking. It is computed as:

$$\text{Maximum Stock Level} = \text{Reorder Level} - (\text{Minimum Usage} - \text{Minimum Delivery Time}) + \text{Re-order Quantity}$$

The maximum stock level of fixed by taking in to account the following factors:

-) Amount of capital available for maintaining stocks,
-) Go-down space available,

-) Rate of consumption of the material during the lead-time,
-) The time lag between indenting and receiving of the material,
-) Possibility of loss in stores by deterioration and evaporation and
-) Cost of maintaining stock

Minimum Stock Level

It is that level below which the inventory of any item should not be allowed to fall. It is known as safety stock. The main object of fixing this level is to avoid unnecessary delay or amputation of production due to shortage of materials.

It is computed as follows:

$$\text{Minimum Stock Level} = \text{Re-ordering Level} - (\text{Normal Consumption} \times \text{Normal Re-order Period})$$

In fixing this level the following factors are making into consideration.

-) Lead time, i.e. time lag: between indenting and receiving of material,
-) Is the time required replenishing the supply?
-) Rate of consumption if material during the lead-time and
-) Nature of the material: minimum level is not required in cost of a special material, which is required against customer specific order.

Danger Stock Level

Generally this level is fixed below the minimum level and represents the stage where immediate steps are taken for getting stock replenished. In some cases, danger level of stock is fixed above the minimum level but below the re-ordering level (Sahajahan, 1997).

It is computed as follows:

$$\text{Danger level} = \text{Normal Consumption} \times \text{Maximum Energy Period}$$

Average Stock Level

It is the average level of stock that should be maintained throughout the year. Average stock is the cost of storage departments (Sahajahan, 1999).

It is computed as follows:

$$\text{Average Stock Level} = \frac{1}{2} (\text{Maximum} \times \text{Minimum})$$

2.7.4 ABC Inventory Analysis

In a large manufacturing company where stocks of direct materials and component parts consist of thousands of different items, companies find it useful to divide materials, parts, supplies and finished goods into sub-classifications for purposes of inventory control. Many business firms have introduced a system of analyzing stocks by value categories known as "ABC analysis". Under this method, inventory items are ranked according to investments in each item in the inventory. The large value items are grouped together into one class for inventory control purposes. The lowest value items are grouped into another class and those items which are of intermediate value are grouped into a "middle" classification. High value items are labeled "Class A", middle value

items, "Class B", and low value items, "Class C". This division reflects the concept that it is uneconomical to spend the same effort on all items. As the items are classified in the important of their relative value, this approach is known as proportional value analysis (PVA). As in most activities, a small part of the total inventory makes up greater part of the total investment (Magee, 1985).

The firm keeps various items in inventory. All items in the inventory cannot be treated easily. They are differing in value and can follow a selective control system. A selective control system is the ABC analysis. The group "A" item

consists of highest rupee value item. "B" item consists of middle rupee value and "C" item consists of lowest rupee value item (Pandey, 1973).

All items in stock are listed in order of descending values showing quantity held and the corresponding value of the materials (See Table 2). The percentage given in Table 2 is only guidelines and is subject to change according to prevailing circumstances and choice of management. Table shows that only 20% of the items represent 72% of the total costs.

Table 2.2
Stock Analysis under ABC

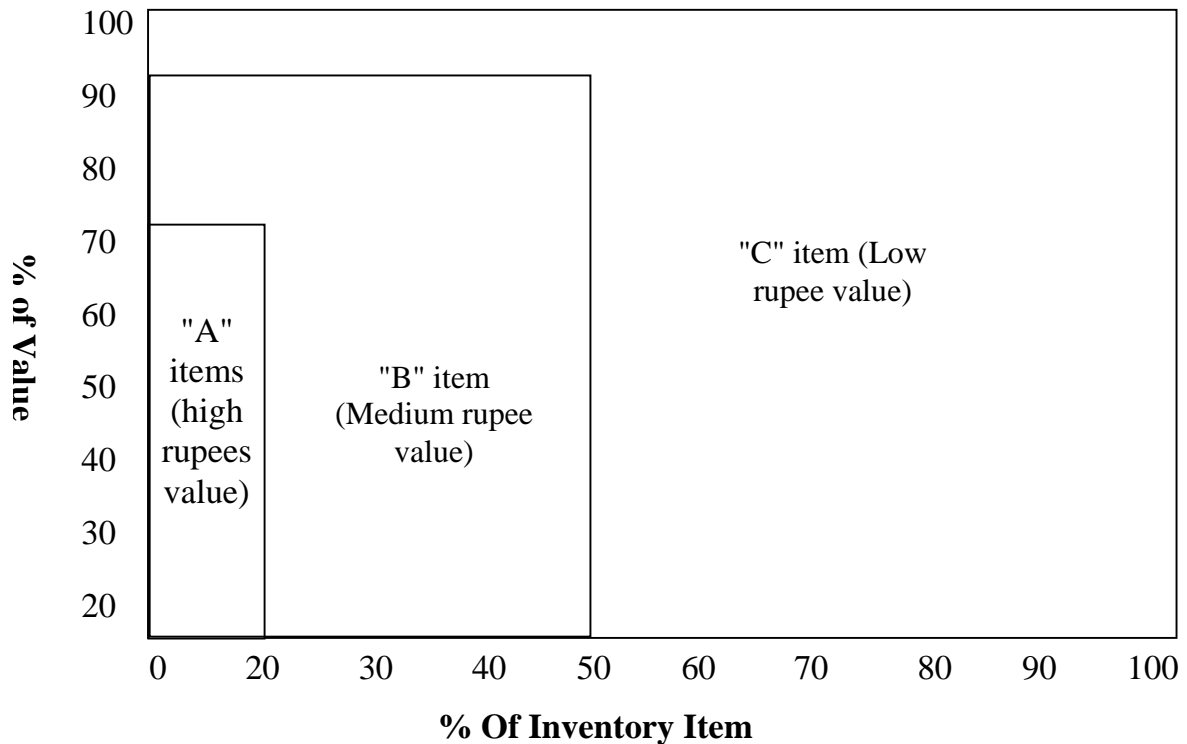
Class	Items		Investment	
	No. of items	Percent of total items	Total cost	Percent of total
A	20,000	20%	2,88,000	72%
B	30,000	30%	76,000	19%
C	50,000	50%	36,000	9%
	1,00,000	100%	4,00,000	100%

The items under Class A are subject to greater continuous control and planning than are the items under other categories. The Class A item account for high annual consumption costs and correspondingly high investment in inventories. Because of high investments in Class A items, there would be frequent ordering and low safety stocks. This also assumes that the cost of placing and following up orders is relatively low in comparison with the cost of carrying excess inventories. A number of things can be done to reduce inventory of 'A' items. For example, A items can generally be ordered for specific runs, the economic order quantity could be applied; local suppliers could be asked to stock supplies so that delivery time can be shortened. On the other hand, where the total annual purchase cost is relatively low as in the case of Class C items, there will be less frequent ordering and higher safety stocks. Items in Class C receive the least amount of control and should be under simple physical controls such as the two-bin system with safety stocks.

A graph can be prepared to show quantity and amount of items in different categories in descending order of value (Fig. 2.6).

Figure 2.6

Classification of Items According to ABC Analysis



Class 'A' items which represents only 20% of amount of quantity for over 72% of the total value in Rupees. The opposite relation holds for category 'C' where 50% of total amount in quantity. Category 'B' occupies the middle place items. A and B jointly represent about 50% of the total units and 91% of the investment. More than half of the total units are item 'C' represent merely 9% of the investment. The highest control should be exercised on item 'A' in order to maximize the profit on its investment. In case of 'C' simple control will be sufficient. High rupees or value is treated most carefully at first time.

An example of the treatment that would be given the three dimensions is,
 Item "A": In item "A", the economic order quantities are carefully calculated for each time. The uses rate and the procurement costs are reviewed continuously with each other. Tight inventory control should be maintained.

Items "B": In item "B", the economic order quantities are developed periodically. Normal inventory control is exercised.

Items "C": In item "C", the specific order quantities are not made. Roughly estimate the inventory or the quantities that will be sufficient for long period are ordered. Inventories are checked physically once in every six months or every year to determine if new order should be placed.

2.8 Inventory Valuation method under Cost Basis

Conceptually, the process of valuing the inventory is simple. One can calculate inventory value by multiplying physical quantity of goods by cost per unit. However, in practice, many organizations purchase different types of raw materials at different price at different time. Price of materials changes time to time.

It is always possible to identify the individual particular purchase group. At that situation, firm faces difficulties in valuing the inventory. For this situation, there are many methods, which are based on historical cost used in determining the value of inventory. Those methods are:

a) Specific Price or Identification Method

Under this method, materials issued for production are priced at their purchase prices. The basic assumption of following this method is that materials in the stores are capable of being identified as belonging to specific lots. Identification can be made by placing some distinguishing mark usually price tag on every lot. When materials are issued, price tags are removed and forwarded to the costing department for ascertaining the materials cost of production.

It is suited to small business enterprises where a small number of items of materials are purchased and stored which can be easily identified. Further, the

production lots with lower or higher acquisitions costs because the method does not prescribe any particular order in which materials are to be issued.

b) First in First out Method (FIFO)

In this method, material is first issued from the earliest consignment on hand and priced at the cost at which that consignment was placed in the store. In other words, materials received first are issued first. This method is most suitable in times of falling prices but in case of rising prices, this method is not suitable because the issue price of materials of production will be low while the cost of replacement of materials will be high.

c) Last in First out Method (LIFO)

As against the First in First out method, the issues under this method are priced in the reverse order of purchase that is the price of the latest available consignment is taken. This method is sometimes known as the Replacement cost method because materials are issued at the current cost to jobs or works orders except when purchases were made long ago. This method is suitable in times of rising prices because material will be issued from the latest consignment at a price, which is closely related to the current price levels. Valuing material issues at the price of the latest available consignment will help the management in fixing the competitive selling price of the products.

d) Average Cost Method

The principle on which the average cost method based in that all of the materials in store are mixed up. Therefore, an issue cannot be made from any particular lot of purchases. Hence, it is appropriate if the materials are issued at the average cost to materials in store. Average may be of two types:s

- Simple Arithmetic Average
- Weighted arithmetic Average

e) Based Stock Method

Each concern always maintains a minimum quantity of materials in stock. This minimum quantity is known as safety or base stock and it should be used only when an emergency arises. The base stock is created out of the first lot of the material purchased and, therefore, it is always valued at the cost price of the first lot and is carried forward as a fixed asset. The objective will be achieved only when the LIFO method is used together with the Base Stock Method.

f) Highest in First out Method (HIFO)

This method is based on the assumption that the closing stock of materials should always remain at the minimum value. So, the issues are priced at the highest value of the available consignments in the store. The method is not popular as it always undervalues the stock, which amounts to creation a secret reserve. The method is mainly used in case of cost plus contracts or monopoly, as it is helpful in increasing the price of the contract of products.

2.8.1 Importance of Inventory Valuation

In this age we should value its assets including inventory to show true and fact view of financial positions of organization. Inventory is valued in proper manner. If inventory is measure undervaluation profit will be reduce and if inventory is overvalued the profit will be increased. It will affect on capital because shareholders will receive the dividend accordingly. Similarly, over-or-under valuation of inventory also affect for the next period because closing stock of the current period will become opening stock of the next period.

The following are some of the important reasons for giving too much emphasis on inventory valuation.

- 1) Sufficient inventory for production and sale process: Inventory represents a major current assets investment. Adequate inventory is essential for production and sale of an enterprise as insufficient inventory hampers production and fails to generate sufficient sales. Inventory is not purchase

as investment or to realize a gain from possession but rather to sell and realize a gain from resale. The fact of realizing profit from resale of inventory makes it compulsory for a concern to follow a proper determination of inventory valuation.

- J) Proper determination of profit: The proper determination of profit depends upon the proper Valuation. If the ending inventory is valued at a lower figure, profit is understated and if it is overvalued, profit is overstated. This shows that proper method of valuation of inventory should be followed.
- J) True financial position: Overvaluation of inventory amounts to window dressing, which in turn gives wrong idea about the liquid position of the company. The proper valuation of inventory, which constitutes a significant portion of current assets, is essential so that short-term creditors may not be misled about the liquid position of the company. Balance sheet can exhibit a true fair view of the financial position of a company if there is a proper valuation of inventory, which constitutes a major portion of current assets.

2.9 Inventory Control

As the term inventory control has two functions, which are quite different but related to each other only in that they both required the maintenance of adequate record of inventories as well as receipt and issues. These functions are accounting control and operating control.

1. Accounting control of inventories is concerned with the safeguarding of the following: Taking property in the form of raw materials, work-in-progress and semi-finished as well as finished products, and the proper recording of receipt and consumption of materials as well as flow of the goods through the plant in to finished stock and eventually to customers.
2. Operating control of inventories is concerned with maintaining inventories at the optimum level keeping in view the operational requirements and financial resources of the business.

Every organization holds inventory at necessary level. Under and over stocking of an inventory is evil for business. Therefore, inventory control may be defined as the planning, ordering and scheduling of materials used in the manufacturing process. It is possible to exercise control over the three types of inventories recognized by accountant i.e. raw materials, work-in-progress and finished goods.

2.9.1 Benefits of Inventory Control

The Primary purpose of holding inventories is to meet the demand from indenters or users. The simplest way of satisfying user is to hold large amount of stocks. However, holding large stocks means high inventory carrying charges (such as storage and deterioration expenses) and possible losses caused by price declines. Similarly, shortages in inventories interrupt production, making machines and employee idle and causing sales loss. Hence, there is need of for inventory control or that is sometimes termed as 'inventory planning'.

It would be appropriate to mention that effective inventory control/planning system secures various benefits to the concerned business unit. Some of the important benefits of inventory control system are as follows:

-) It enables the material to be procured in economic quantities i.e. it obtains economics through a reduction in needless variety of items carried in stock.
-) It acts as a cushion against an unpredictably high rate of usage.
-) It eliminates delays in production caused by the non-availability of required materials.
-) It works as a check on the over accumulation of inventories and thereby results in minimum investment consistent with production requirements.
-) It reduces inventory losses caused by inadequate inspection of incoming materials and losses due to obsolescence, deterioration, waste and theft while in storage.

-) It ensures proper execution of policies covering procurement and use of materials. It also facilitates timely adjustment with changing conditions in the market.

It also serves, through 'balance of store' records, as a reliable basis for production planning and preparation of financial reports.

2.10 Inventory System

An organization keeps different types of items in inventory to meet its needs. In order to know the concept of inventory and its application in our real practice, it will be better to be clear about the inventory system concepts.

The concept inventory system can be broadly viewed as follows.

a) Multi-Stage Inventory

When parts are stocked at more than one point of the sequential production process, there are multi-stage inventories, these parts must eventually come together into finished goods.

b) Multi-Echelon Inventory

Multi-echelon inventories are inventories of products at the various levels, or echelons, in the distribution system. In other words, it deals with the management of inventories at different points, such as factory, warehouse, retailer and customer, of distribution system.

2.10.1 Inventory Control Procedure

There are various inventory management systems. They are used to follow according to adequate need of control over each inventory item and ensuring accuracy of stock on hand. The following are some controlling systems.

1. Fixed Order- Sizes System

Fixed order sizes system is a fixed quantity of good is ordered whenever inventory decrease below to predetermined level. The time between ordered

various with the demand rates but the size of the order remains constant. In practice, fixed- order-size systems are generally called perpetual inventory system.

2. Two-Bin System

The two bin system an application of the fixed order size approach is one of the oldest inventory system, where all materials or given type is the second is put into use and replacement order for a fixed amount is dispatched immediately.

Interval system, periodic reviews of inventories are made at which time they are restored to some predetermined optimum level, no running records of daily inventory activities are kept.

The status of the inventory is known only at the time of the review, which may take place weekly monthly, quarterly or yearly that are commonly called periodic inventory system (Star and Devid, 1977).

3. Cardex File System:

A cardex file system is a manually operated inventory system, in which inventory card represents each stock item with transaction kept on the cardex. When transaction sales the entry, with corresponding date is recorded. When physical inventories are taken cards are adjusted to show current inventory levels.

4. Management Accounting and Production Information Control System (IBM's MAPICS)

It is an IBM's computerized common data base system and manufacturing for implementation of planning. Key models to control are product data management, production costing and control applications.

Inventory management application reduces times, increase overall plant capacity, and reduces investment stock and space improves customer service and provides inventory data and reports.

2.11 Comparison of the Periodic and Perpetual Inventory System

Both systems are designed to control inventory to face the uncertainties. Whether one of other is employee in particular stocked the type of controls needed and nature of the source of supply.

The "fixed-size" system is well suited for managing inventories of two value items. Since it permits lower control. Items of this sort are usually bought in large quantities relatives to their use and can be readily obtained from the suppliers at any time. They can be controlled by a simple two-bin-system process without a large investment in record keeping. Perpetual inventories also lend the sales the stocking of high-cost items that can be purchased at any time. These items are controlled by continuous posting to inventory records. In this way the status of the high costly item can closely watch. This is costly lower inventory records made feasible by computers.

The "fixed-order-interval" system lends to inventories that consist of large number of products because the clerical cost of periodic evaluation is substantially below that required for perpetual recording. This system is also well suited for items whose availability may be limited because of the suppliers demand for periodic orders so that they can plan their production runs economically.

In order to use the "Fixed-order-interval" system however highly safety-stock must be maintained (Star & David, 1977).

2.12 Probabilistic Inventory Models (Condition of Uncertainty)

The deterministic models assumed that demand was constant and known. In the majority of cases, demand varies. Safety stock must therefore be maintained to provide some level of protection against stock out. This degree of protection is usually based on two criteria. That is, set safety stock:

- i. At the point which provides some level of customer service or
- ii. At the point which minimizes the cost of shortage and the cost of carrying added inventory. In this model, we assume that the demand over a period of time is normally distributed with a mean and a standard deviation. Again remember that his approach only considers the probability of running out of stock, nor how many units we are short (Chase, Aquilano and Jacobs, 1999).

a. Fixed Order Quantity Model (Under Uncertainty)

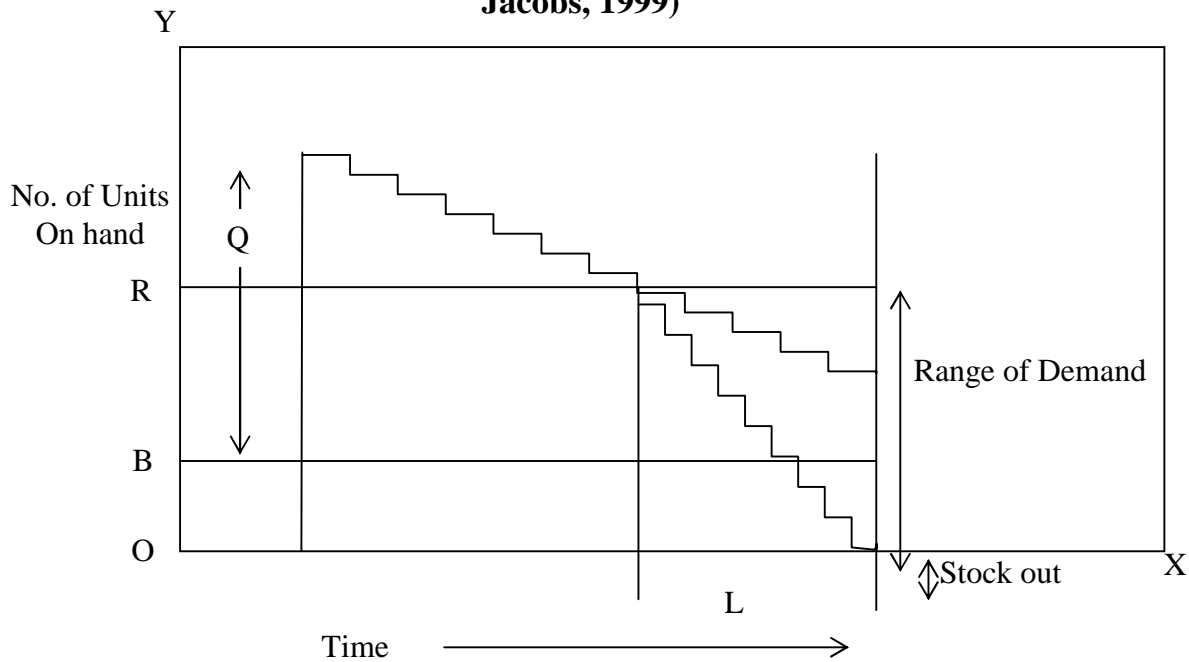
The danger of stock out in this model occurs only during the lead-time, that is, between the times an order is place and the time it is received. An order is placed when the inventory level drops to the re-order point R, during the lead-time (L); a range of demand is possible. This range is determined either from an analysis of past demand data or from as estimate. (Everet & Ronald, 2000)

The amount of safety stock depends upon the service level desired. The quantity to be ordered (Q) is calculated in the usual way considering the demand, shortage cost, ordering cost, holding cost and so forth. A fixed-order quantity model can be used to computer Q such as the simple optimum quantity model (Q opt.). The reorder point is then set to cover the expected demand during the lead-time plus a safety stock. Determined by the desired stock level. Thus, the key difference between a fixed order quantity model, where demand is known and one where demand is uncertain is in computing the reorder point. The order quantity is the same in both cases. The uncertainty elements are taken in to account in the safety stock. The reorder point is:

$$R = \bar{D}L + Z\sigma_L$$

Figure 2.7

Graphic Approach of Fixed Order Quantity Model (Chase, Aquilano and Jacobs, 1999)



Where,

R = Re-order point in units

\bar{D} = Average daily demand

L = Lead-time in days

Z = Number of standard deviation for a specified service level

σ_L = S.D. usage during lead-time.

b. Fixed Period Model under Uncertainty

The fixed period model under uncertainty differs from the model under certainty through the provision of a safety stock. In many cases, the demand and lead-time may vary.

In this fixed period model, if the frequency for inventory review can be set at any time period, the problem is to determine T (the optimum time between inventory reviews) and M (a replenishment level used to determine order

quantity). Lower case quantity is used to indicate that order size changes from period to period if T is already established.

$$Qty = M - I$$

$$M = B + \bar{d}(T - L)$$

Where,

Qty = Quantity to be ordered

M = Replenishment level in units

I = Number of units of inventory on hand

B = Safety stock in units

\bar{d} = Average daily demand

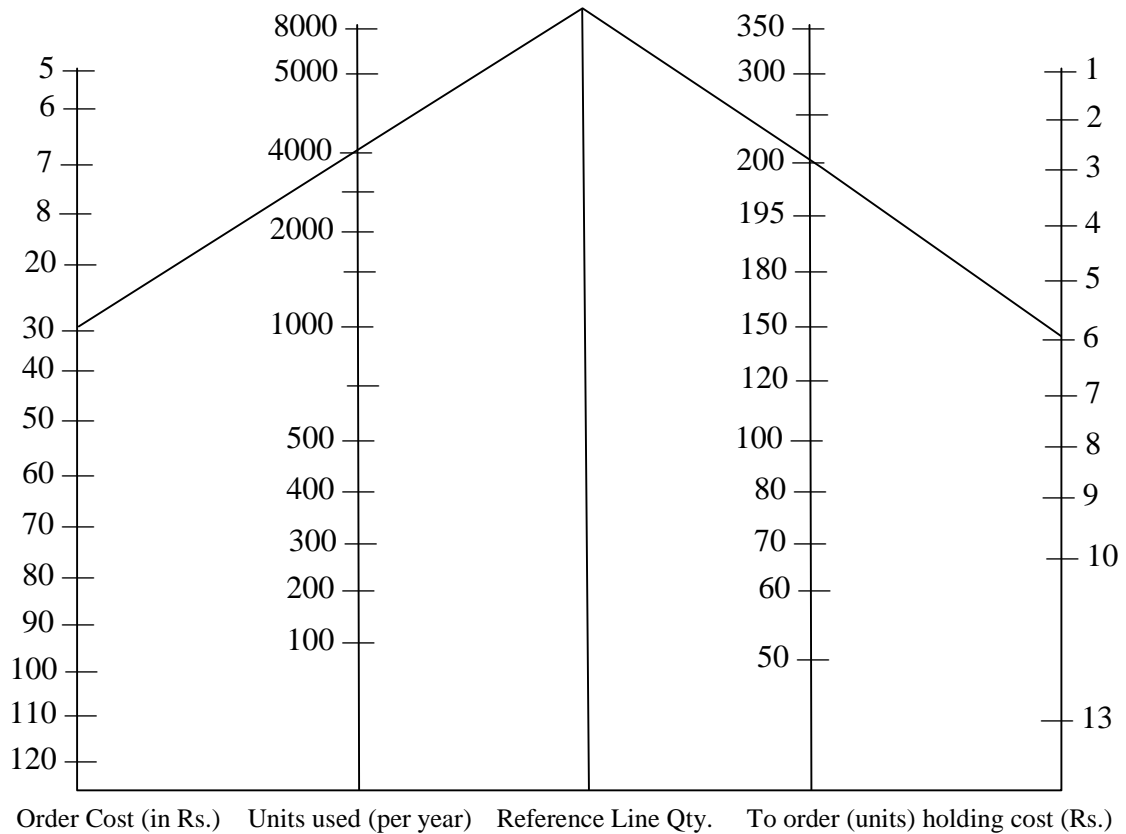
T = Review period

L = Average lead-time (Chase, Aquilano and Jacobs, 1999).

Use of Nomograph for Inventory Management

Another common labour saving method that widely uses to facilitate application of the basic inventory model is nomograph. Many kinds of nomographs are currently in use.

Figure 2.8
Nomograph of Selected Economic Order Quantity
(Starr and Miller, 1977)



When this chart is used to calculate economic order quantity a line must be drawn connecting to order cost with the quantity used per year. Then this line is continued until it crosses the reference line. From this point another line is drawn to the cost of holding an item in the far right column. When this line crosses the "Quantity to order" column gives us our answer if the ordering cost is 30. If 4000 units were used per year and the cost of holding one unit for a year were Rs.6, line would be drawn on a nomograph as shown in above figure. The economic order quantity in this case could thus be about 200 units.

Although, it is somewhat more difficult to use this type of nomograph than to use order tables, it is simpler and quicker than calculating each order quantity separately. Furthermore, one nomograph can be used for calculation at varying demand rates, ordering cost and holding (carrying) cost.

2.13 Inventory Reports

Inventory reports main objectives are management for exercising effective inventory control and appropriate decisions. Inventory reports serve as means of communication usually in the written form of facts relating to inventory which from all level of management brought attention who can use them to take suitable action for the purpose of inventory control.

Purpose of inventory report is to achieve the result of inventory control. It is difficult to give the design of inventory reports, which will be inventory reports suitable for all organizations. Design inventory reports should be according to the individual requirements of the organization.

General inventory reports prepared are given the table: Frequency	Style of Reports	Sent to	Contents	Purpose of Report
Weekly	Material usage and waste report	Works manager	Actual quantity of material used against standard quantity specified	Controlling use of materials and elimination of excessive wastage, scrap, spoilage defectives
Monthly	Material price variance report	Purchase manager	Comparison of actual prices of materials with standard prices of materials for quantities purchased	Watching efficiency of the purchase department and trend of price movements
Monthly	Purchasing report	Purchase committee	Comparison of actual purchase consumption and stock figures	Determining the result of the policies decide upon
Special	Inventory report	Top management	A study of slow moving stock, dominant stocks and absolute stock	Controlling investment in materials
Special	Physical verification	Storekeeper	Discrepancy between physical and book balance	Controlling storage of materials
Special	Materials shortage report	Top management	Cost of idleness due to stoppage of production for want of material	Avoiding stoppage of production due to shortage of materials

Source: *Bulletin of RDL 1992*

2.14 Review of Related Studies

There are many researchers for the study of inventory management in Nepalese perspective. In the sector of public & private enterprises some researcher study on the manufacturing public enterprises and some researcher study on the trading enterprises. This previous studies cannot be ignored because they provided the foundation to the present study, so that the continuity of research is ensured by linking the present study with the previous research studies.

Review of literature is the available literature in owns field of study. The literature study provides the researcher with the knowledge of the status of their field of research. The library is rich storage for all kinds of published materials including thesis, dissertations, business reports and government publications. The purpose of literature review is to find out what research has been conducted in owns chosen field of study and what remains to be done. It provides the foundation for developed for testing. The literature survey also minimizes the risk of pursuing the dead ends of research.

In this study, attempts have been made towards the review of literature regarding inventory management. Review of dissertation, Articles and Magazines are done for study of inventory management and control.

2.14.1 Review of Dissertations

Their findings and recommendations are presented as follows:

Liladhar Dhital (1995), entitled “Inventory Management: A Case Study of Nepal Food Corporation”. Findings in his study and given recommendation are as below:

Liladhar Dhital has conducted the research work on the topic of inventory management (A case study of Nepal Food Corporation). The main objectives focused by him were to analyze the various related variable, like purchase,

sales demand and food quota of Nepal Food Corporation and to find out their trends. The nature of data used was both primary as well as secondary. The primary data were collected through interview with personal observation, the secondary data were collected from the unpublished and published materials such as journals, articles and books concerned with respective corporation.

Dhital has pointed out some conclusion based on major findings:

Under food grains purchasing the domestic purchase is more fluctuated one greater than import. Primary market purchase is made the paddy, maize, wheat, pulse but rice is purchased only in open market. The relationship between edible cereal production and requirement is negative etc.

Narayan Bahadur Karki (1999), has studies on the “Inventory management and control of Sajha Swasthya Sewa” for his degree thesis some major points started by Karki are reviewed below.

-) The main objectives of the study are to analyze the present system of inventory management in Sajha Swasthya Sewa. This study is based upon quality as well as price aspect.
-) To access the types of inventory maintained in Sajha Swasthya Sewa.
-) To examine the techniques being employed to manage the inventory in Sajha Swasthya Sewa.
-) To suggest proper inventory model to Sajha Swasthya Sewa based on the analysis.

From the analysis and interpretation of available data the following Mr. Karki has made conclusions as the major findings is derived;

-) The purchase quantities made by the organization differ from year to year are not in economic order quantity.
-) In Shaja Swasthya Sewa the economic order quantity model is not applied and the organization has maintained the safety stock, which is highly fluctuated and estimated roughly.

-) The organization has not categorized its inventory for the purpose of control and paid equal attention for the inventory held in the store.
-) The annual target made by the organization differs from year to year and highly fluctuated.

On the basis of analysis and the conclusion, the following **recommendation** have to improve the state of affair of existing inventory management system of Sajha Swasthya Sewa has been forwarded,

The organization should define its goals and objectives clearly with regard to its inputs and outputs separately.

-) The organization should follow the quantitative models because with the application of economic order quantity formula and economic lot size formula or selling/distribution the total relevant costs for both can be minimized.
-) Sajha Swasthya Sewa is not adopting the ABC analysis, so the organization should categorize its inventory.
-) Ledger card can also be used to manage inventory in a simple way.
-) The frequently changing the board member including chairman and General Manager has been found as disturbance for the effective management.

Indra Shrestha (2000), has made a study as inventory management of manufacturing industries in Nepal (with special reference to quick foods.)

His major findings and recommendations are as below

Findings:

-) The selling price of noodles (Thai Foods) was constant for the fiscal year 2051/056 but cost price of Noodles was increasing from year to year with different rate. There is no correlation between selling and cost

price because if cost price increases the selling price should also increase.

-) The selling price and cost price of cheese ball was increasing from year to year. There is highest degree of correlation between cost price and selling price. The company has not classified its inventory for the purpose of control and equal attention for the entire inventory hold in the store but they are using bin card for inventory.
-) When and how much to order is estimated haphazardly by Thai foods and quick Foods P. Limited different from year to year and are not in economic order quantity.
-) This purchase made by company is increasing from previous year to this year. It shows good production of company
-) The company has maintained safety stock but company is not using re-order level for when to re-order.
-) Raw material turnover ratio of some inventories is increasing year to year and some are fluctuating year to year but this ratio was satisfactory.

Recommendations:

From this study following suggestions have been suggested.

-) Record keeping system should be scientific. It means the company should define its goals clearly with regards to its input and output separately i.e. the quantities, time period should be specified. So factory can locate the post records. It is also helpful for researchers.
-) Some raw materials were imported from Japan, New Zealand, Singapore, India, Korea and China. This should be discouraged and alternative should be searched within the nation as possible.
-) In case of Thai foods the cost of price of Noodles for the five fiscal year 2051/052 to 2055/056 is increasing but selling price is constant i.e. some price for five fiscal year. If cost price increases then selling price should also proportionally increase for good profitability.

-) Thai foods and quick Foods P. Ltd was not conducted the ABC analysis. The company should follow scientific tools and techniques i.e. economic order quantity and economic lot size formula which help to reduce the relevant total cost for manufacturing the product. The output obtained from quantitative analyzes results the lowest cost and consumer can use with low cost than company can increase their selling.

Krishna Naraya Shrestha (2000), has made a study that is concerned that in what extent the company is applying the inventory management techniques to minimize the cost of inventory, which directly affect the price of Drugs.

His major findings and recommendation are as below:

Findings:

-) Required raw material for the production of different types of Drugs are imported by the company from India, China and other third world countries on global tender agreement.
-) The company has purchased some material from other than listed supplier and producers of the company.
-) The company has purchased some material at higher price although there is the possibility of purchasing at lower price.
-) The company has purchased more raw material than requirement.
-) The valued of closing inventory of raw material is in increasing from year to year.
-) The company has not determined the re-order level, maximum stock level and minimum stock level
-) The company has not following scientific inventory management technique i.e. economic order quantity model for purchasing different types of raw materials.
-) The company has prepared purchase budget of raw material but it is highly differ from the actual purchase

-) The investment of inventory stock of RDL is large and the value of inventory stocks is increasing from year to year.
-) The company has not applied ABC analysis technique to control the various types of inventory in the store.
-) The company's purchase position of different types of material is highly differing from year to year.

Recommendation

-) Purchase plan should be prepared of different types of raw material with the proper cooperation among the planning, purchasing storing and production, marketing and sales department to avoid the excessive investment on inventory.
-) The popular scientific inventory management techniques should apply by the company for purchasing varieties types of raw material so as to maintain optimum level of inventory and to minimize the total inventory cost i.e. carrying and holding cost.
-) The selective inventory model should apply by the company for control the inventories in the store. ABC analysis divides the inventory into three groups i.e. ABC according to their usage values helps to apply proper degree of control for different group of inventory minimize the investment on inventory and minimize the cost of storage.
-) Minimum, maximum and recording level for each type of material should be fixed by the company to avoid the over stocking of different types of material.
-) The recruitment and selection procedures of efficient personnel handling the inventory should be unbiased on the basis, which the corporation will be able to acquire the efficient and skilled technician, and require giving regular training about on inventory management.
-) For the timely procurement and supply of inventory items, reliable supplier should be selected and RDL should impose appropriate actions to them if they follow against the term and condition.

The frequent change in top-level management creates the unstable environment in the company, which leads the company backwards so the post of general manager should be professionalized.

Kashi Joshi (2001), studied on topic of inventory management of Herbs Processing and Production Company Ltd. He found the following problems the area of inventory management in HPPCL like.

-) What types of inventory problems do they face?
-) Do they have any plan for inventory?
-) What are the bases of such plan?
-) Are there any plans and policies to increase profit reduce expenditure through improving size of inventory in future, if yes what, if no. Why?

He set some objectives, which are given below:

-) Identify present position of inventory in HPPCL.
-) What types of problems faced by HPPCL in the management cost and profit that should be identified.
-) Provide the appropriate recommendation and suggestion improvement of inventory management in HPPCL on the basis of above study and findings.

He concluded after study, if the company wanted to be success, it was necessary to apply the theoretical and practical methods in collection, production, distribution management, marketing, proper remuneration and rewards and punishment etc. The company had given extra facilities and inspiration to the farmer to produce the raw materials to reduce the loss of inventory expenses. Transportation high change and loss of company would reduce if the company were able to fulfill desired raced materials from private resources.

Bindo Raj Thapa (2005), entitled “Inventory Management System of Royal Drugs Limited”. Mainly this study focused on the problems of inventory management and control system of Royal Drugs Limited objectives are as follows:

-) To identify the present position of inventory of Royal Drugs Limited.
-) To analyze the inventory management of Royal Drugs Limited.
-) To provide suggestion based on the analysis.

Major Findings are as follows:

-) Com. has not conducted any ABC analysis at the period of this research.
-) When and how much to order is estimated haphazardly by the Royal Drugs Limited. In other wards, purchase quantity made by Royal Drugs Limited differs from year to year and are not in EOQ.
-) The Royal Drugs Limited has established a separate unit for management of inventory although the separate unit is unable to management the inventory.
-) The company has been able to produce goods quality medicine because of its quantity control.
-) Company's production is not regularly and decreasing order.
-) Annual purchase made by company differs from year to year and highly fluctuated.

Recommendations:

-) The drugs company should not define its goals and objective clearly with regards to minimized inventory costs. Company has store only with storekeeper and store officer. There is need of separate management department.
-) Company should not use any kind of scientific tools and techniques so that there cost is maximized. Scientific inventory management. Techniques are EOQ; reorder level, safety stock and lead-time. It should

not be identified properly and lack of safety stock. Its bad impact from one month before company's production break for few days.

-) Company has not categorized its raw materials inventory in A, B, & C group at present. Its result company is bearing the maximum loss. Company categorized A, B & C till 2050 and that time company's financial condition was considerable.
-) In a simple way bin card should be used to manage inventory. This card includes the name of items, quantity and unit price, quantity issued and balance of stock.
-) Material purchase system using EOQ method is best for company to make production target oriented.

Ram Bahadur Rawal Kshetry (2006), entitled “Inventory Management: (A case study of Agriculture Inputs Corporation with special reference to chemical fertilizer in Katmandu Valley”

-) The procurement procedure followed by the corporation are i) estimation of requirements ii) inviting tender iii) evaluation of bids iv) placing the order v) dispatch orders to clearing and forwarding agency.
-) Except global tender are procure the fertilizer through negotiation, through assistance from donor countries and agencies, through agreement of government.
-) There are 196 institutional and Pvt. dealers to chamalie the fertilizer to the farmers in Katmandu valley but they don't get adequate fertilizers, as they need to distribute.
-) The education level of farmer in Katmandu valley is poor for right mix of fertilizers to be used in farm. They are following urea only. Which lead the problem of inventory management.
-) In Aic targeted supply of fertilizers and actual supply various largely every year. So, it the case with Katmandu valley also? The most important aspect of inventory management is to match the regular supply, demand and purchase of inventory components. If supply

targeted supply don't match each other then there would be either under stock position or over stock position.

-) There is rate problem due to dependence on foreign country, in accessible memorable roads for hilly regions of Nepal have created inventory management problem. However, there is no such problem in Katmandu valley
-) For the efficient management, the Aic has not taken any measure regarding the improvement of its inventory management practices. Aic don't take any action on supplier who delays supply of ordered fertilizers.
-) In the conclusion, Aic is applying scientific techniques of inventory management, which is the most crucial point in Aic. Despite it there are several internal and external causes not to be used scientific techniques but Aic is neglecting the inventory management almost completely. This is the matter of misfortune to the corporation, to farmers, as well as to the nation as a whole.

Suggestions:

-) Aic should make an effort to match the targeted demand and actual supply to overcome to overstocking position or under stocking position or out of stocking position of inventory.
-) For the timely procurement and supply of the inventory items Aic should not depend on the other sources except through global tender because this source is more reliable, economic considering of season to be required of chemical fertilizers, lead-time, transportation, time process to be taken by tender, tender should be called.
-) According to provides valuable information to the decision makers this can serve the controlling function and important function of management if records and classified properly, costing of different factors related to inventory of Aic requires sound classification and definitions of activities.

-) They should attempt to use the scientific models like economic order quantity (EOQ), ABC analysis, reorder point etc. So that inventory problems whether it is the over stock, under stock, out of stock will be solves. As a result Aic can delivery the regular supply of chemical fertilizer to farmer at the right time.

Jharana Thapa (2007), had also studied about the inventory management of Bottlers Nepal Limited. On her study the following major finding and recommendation are as follows.

Findings:

-) In year 2058/059 and 2059/060, net profit margin is the highest and has been declining since then. The decline is because of instable economy condition.
-) Higher the GPM the better operating position of the firm less profit margin indicates the income and efficiency of the firm is poor. There are ups and downs in company's GPM.
-) The sales of cold drinks have been increasing every year except in year 2061/2062.
-) There is negative correlation between sales and inventory of BNL.
-) The inventory management of BNL is not good. There is high investment in stock and the period that the stock converts in to sales is also high.
-) There is a positive correlation between working capital and closing stock of the company. There is positive correlation between working capital and stock this means when stock increase the working capital also increase.
-) The proportion of inventory in total current assets trend shows a fluctuation over the period but the level has unexpectedly decreased in the year 2060/061 and probably it is due to the political situation in the company. In the later year the company has managed almost fifty

percent inventory in the total current assets. It also indicates that the company has less receivable.

-) The level of inventory in the total assets is also not constant. In the later year of the study the percentage of inventory in the total assets is decreasing. The decreasing level of inventory is due to the unstable political situation in the country and frequent strikes.
-) Level and inventory management policy of the company affect the profitability. High level of inventory increase the cost of carrying the inventory and the profitability. Therefore there should be a inverse relationship between the two components. The analysis shows the same situation and the correlation is a negative one 0.33.

Recommendations

The inventory management is crucial part of management. The inventory management of BNL is not only necessary but also compulsion for the better performance of the enterprises. If BNL indicates step to the appropriate management of inventory, certainly it will cope its set objectives successfully. This study is just a small part to fulfill the partial requirements of master's degree. From above analysis of data and studies some findings are extracted. Concerning thus findings it may be appropriate to make some suggestions and recommendations. Although these suggestions may not enough as well as could very easily giving negative reflection they certainly suggest the areas that can be improved and require attention to bring some improvement in inventory management cold drinks.

-) The net profit margin of the company is decreasing. So the company should reconsider its different management policies including inventory management.
-) Company's sales are decreasing every year except 2061/062 and there is a negative relationship between sales and inventory. But these components should have a negative relationship. The relationship here is

negative. The production may be increasing but inventory could be decreasing. So, company should change its sales policy.

-) The percentage of the inventory in total current assets is also inconsistent. In the later year of the study the percentage of inventory in the total assets is decreasing. Therefore, there should be a inverse relationship between the two components. The analysis shows the same situation and the correlation is a negative one 0.33.

Prakash K.C. (2008), entitled “A comparative study on Inventory Management: (A case study of Dabur Nepal Pvt. Ltd and Unilever Nepal Ltd.)”. He had also studied about the inventory management Dabur Nepal Pvt. Ltd and Unilever Nepal Ltd. His study the following major findings and recommendations are as follows.

Findings

The inventory management of DNL and UNL and its impact on profitability has been analyzed by using various financial and statistical tools. The major findings are as follows while analysis the data: -

Analysis of its effect on the present position of inventory management:

1. Both organizations purchase the raw materials through locally, India and third countries.
2. Both organizations are not following economic order quantity and re-order level model in purchasing decision.
3. The procurement of materials in UNL shows fluctuating trend first two year it is increasing trend and then after decreasing trend. And the procurement of raw materials in DNL also shows fluctuating trend.
4. The consumption of raw materials in terms of monetary value is fluctuating trend in DNL first three year it is decreasing trend and in the year 2062/063 it is increasing trend than the base year. In the case of UNL, the

consumption of raw materials in terms of monetary value also in fluctuating trend.

5. The total production and sales of the products produced by DNL is in fluctuating trend from year to year. In other hand, the total production and sales of the products produced by UNL is also fluctuating trend from year to year. In the case of UNL the sales is increasing trend in the first two-year then it is in decreasing trend.
6. The trend of demand and supply are in fluctuating trend in DNL and UNL. The supply of raw materials is not matching with the demand of raw materials in DNL trend. The demand is decreasing trend in first three year and finally it is increasing trend. The supply is decreasing trend in first two year and it is increasing trend there after. In case of UNL the demand is in fluctuating trend and the supply also fluctuating.
7. The investment in inventory stock of both organizations is in large amount. The value of inventory stock in every year is in increasing trend in UNL. The value of inventory stock in first it is decreasing trend and then after it is in increasing trend. In case of DNL it is fluctuating trend.
8. Both organization DNL and UNL give more emphasis on inventory items in terms of their investment and value.
9. Both organization do not apply's just – in – time (JIT) purchase concept.

Efficiency on Inventory Management of DNL and UNL (Turnover Ratio)

As we know that higher inventory turnover ratio is better than lower ratio. Higher turnover ratio indicates that firm has good inventory management system and it is able to earn profit saving quickly over a period of time. Both organizations' efficiency in inventory is poor. Both organizations are not able to change its inventory into cash through sales. So, they have to give more attention in inventory management. However, UNL has the satisfactory inventory turnover ratio than DNL.

DNL and UNL hold average inventory of 93.4 and 71.2 days in regards of mean respectively. UNL has fewer inventories holding days than DNL. So comparatively, UNL has good inventory management system than DNL. However, DNL's inventory holding days are more uniform than UNL because it has less C.V. than DNL.

Raw materials turnover ratios of both organizations are not in satisfactory level. Comparatively, UNL has satisfactory ratio than DNL.

Other Ratio Analysis

Inventory to current assets ratio of DNL is in satisfactory situation in 2060/061-f/y. likewise, UNL has satisfactory situation on inventory to current assets ratio in 2058/059 comparatively than other year. However, on average, DNL has satisfactory situation about inventory to current assets ratio in regards of mean.

According to Weston & Brigham, inventory to total assets are concentrated in the 16% to 30% are optimum ratio. So, we can say that UNL is kept good ratio of inventory to total assets. Likewise, DNL has also the satisfactory ratio in regards of inventory to total assets except in fiscal year 2061/062 and 2062/063. Comparatively, we come to know that UNL has the satisfactory ratio than DNL.

Inventory to net working capital ratio in terms of value of both organization are not satisfactory. Comparatively, UNL has satisfactory ratio than DNL.

Inventory to profit of UNL has satisfactory ratios than DNL. As we know that low ratio means company is not able to generate a unit of profit in regards of materials consumed. However, UNL generates more profit in regards of material consumed than DNL though the study period.

Recommendation

The study focus on the good inventory management system to the better performance of the organization on the basis of the study, following suggestion are recommended for consideration for both organization, which are given below.

-) There is a lack of proper planning of purchase raw materials in UNL because the procurement of raw materials in UNL shows fluctuating trend. On the other hand, the procurement of raw materials in DNL also shows fluctuating trend. This is not favorable condition for both organizations.
-) However, if possible maximum stock level and reorder level as well as economic lot size should be fixed by both organizations. This helps the management to strike balance between liquidity and profitability in the organization.
-) The total production and sales of the products produced by UNL is in fluctuating trend from year to year. It shows that the organization has not been able to expand its market. So the organization must do promotional activities to expand its market through the qualitative products on the other hand. DNL also has the fluctuating trend in production so DNL also not able to expand its market.
-) Both organizations do not have effective and efficient inventory management systems for controlling inventory. Due to this the huge money to be blocked in the inventory. How much money should be the organization invested in the inventory? What is the optimum EOQ and what is R_e – order level is some questions relating with inventory management in which both organization pay more attention for the better performance.
-) The investment in inventory stock of both organizations is in large amount. Obviously, it increases more holding cost. So both organization use modern tools and techniques to keep sound inventory management system.

-) Both organizations' efficiency in inventory is poor. During the 5 years study period, inventory turnover ratio is very poor. It shows that both organizations have more finished goods for sale. Due to more inventories are kept in the stock, unnecessary investment tied up on it. Both organizations are not able to change its inventory into receivable/cash through sales so; DNL and UNL have to given more attention in regards of inventory turnover.
-) As we know that in manufacturing public enterprises in Nepal inventories to current assets ratio should about 45% UNL has satisfactory situation on inventory to current assets ratio in 2058/059 and DNL has satisfactory situation on inventory to current assets ratio so, it is recommended that the company should pay attention in the management of current assets.
-) Both organizations have not exercised how much working capital should keep in form of closing stock of finished goods. We have earlier discussed that 85% of working capital, in the form of closing stock of finished goods is considered as an ideal ratio. But during the study period, we do not find such optimum ratio. So it is suggested that it should be better to improve the relationship of closing stock of finished goods and working capital.
-) At last, it is recommended to both organization to enhance the materials control mechanic because studies by expert in this field have bought out it, if an organization, can affect 5% saving in materials cost, it would be as increasing the production or sales by about 36%. So, both organizations take initiative steps in the element of cost of materials management that reduce cost of production and effect on selling price per unit.

2.14.2 Review of Article and Institutions Report

Some articles are revised with related to inventory management and control these are under

Dr. G.R. Agrawal has made study relating to the Nepalese public enterprises stated that inventory management is the weakest aspect of management in Nepal. The tools and techniques for controlling inventory has not been applied in Nepalese enterprises for controlling their physical as well as financial dimensions (Agrawal, 1980)

Rao and N.V.S. Jagmohan Rao also observed that for the efficient management of inventory. There are the needs of tackling the human element in the third world country like Nepal. They have suggested to orienting the attitude of the staffs towards material cost because lack of knowledge and carelessness which were the responsible of this management of the inventory (Rao, K. 1981).

A study relating to Nepal Transport Corporation concerning with aspects has been made by CEDA. One of the major finding was that thought inventory management of this factory is rather simple but due to the mismanagement of stocking of the spare parts that hampered the smooth operation of the enterprise (CEDA, 1973).

Another significance study relating to agriculture tools factory has been conducted by CEDA was that the ratio of inventory to sales give more frustrate picture as the sales could not go with inventory or vice versa (CEDA, 1974)

A comprehensive study of Bansbari leather and shoe factory conducted by Corporation Coordination Council in which it was found that inventory planning is out of scope of concerning this factory. Because of this, some of that the materials are not available some are not procured in time resulting in the bottlenecks in the smooth flow of production function. (CCC, 2033)

Industrial Service Center has conducted a study regarding the performance of Biratnagar Jute mills Ltd. Some of the major finding of this study was that store keeping and control stock level of various item are not fixed up, goods received not normally entered with goods received notes along with quality

verification. Bin cards are not mentioned and stock ledgers are not kept up to date (I.S.C, 2036).

Bajracharya, Puskar made the study about the inventory management of GPS came to conclusion that the procedure of recording stock out cost and back order cost of the corporation was very poor no techniques of inventory management is possible to apply to calculate one of the major decision when to buy. If no concrete steps are taken with regard to recording and maintaining to proper data, future researcher would not able to predict the reorder point properly. Thus, the real situation of the operation of the corporation regarding its inventory managing system could not be found (Bajracharya, 1983).

Center for Economic Development and Administration Center has conducted as study on management problem in public sector manufacture enterprise in Nepal. One of the important findings was the inventory management. Suffer from the lack of planning, high carrying cost, poor recording and stores management and virtual absence of controlling system. (CEDA, 1974).

Referring the above given facts and figures, it is implied that most of the Nepalese manufacturing concerns are not that much serious regarding the inventory and material management. That is why the company has been success to achieve their targets.

Most of the researchers in Nepal, in the field of inventory management are focusing on only scientific technique for the inventory management. Researcher recommend only EOQ technique to reduce total cost. In context of Nepal political instability, strike and various abnormal cases arrives time to time so all of the PEs must consider this factor too and hold inventory. In my view not only scientific technique are applicable in Nepal but also consider about the abnormal cases and manage the inventory properly for regular production and regular supply to customer.

CHAPTER - III

RESEARCH METHODOLOGY

Research is a careful search or inquiry in to subject matter, which is an attempt to discover or to find out proposed information or relationship that would be useful for further application. Therefore, research is that systematic and in-depth study of any particular topic or subject matter or area of investigation, which increase knowledge or improve scientific knowledge.

Research methodology is a way to systematically solve the research problem. It refers to the various steps that are generally adopted by a researcher in studying his problem along with the logic behind them. In other words, research methodology describes the method and process to be followed during the research work.

Thus basic objectives of the study are to analyze the present position of the inventory management, present procurement procedure of raw materials and finished goods of Herbs Production and Processing Company Limited and National Trading Limited. This chapter deals with following topic:

-) Research Design
-) Population and Sample Size
-) Nature and Scope of data
-) Data gathering procedure
-) Data analysis tools

3.1 Research Design

Research design is the plan structure and the strategy for the investigation of the facts in order to arrive at conclusion. The research design of this study is descriptive as well as analytical. According to Claire Selltiz, “A research design is the arrangement of conditions for collection and analysis of data in a

manner that aims to combine relevance to the research purpose with economy in procedure.” As same as according to C.R. Kothari “Research design is a conceptual structure within which the research would be conducted. The preparation of such a design facilitates research to be as efficient as possible yielding maximal information.”

The study is primarily based on secondary data. However, primary data can also be used. Primary data are taken from the personal observations and discussions with officers and non-officers of the companies.

3.2 Population and Sample Size

Including both manufacturing and non-manufacturing public enterprises, 43 Public companies are operating in Nepal. All are studied in case of population method, which are not possible so that sample method is used here. In order to select the corporation was prepared of the 30 non- manufacturing and 13 manufacturing companies (security Board, Nepal). Among 13 manufacturing companies, “Herbs Production and Processing Company Limited” is selected randomly from theses manufacturing companies and National Trading Ltd. is selected randomly from trading companies for the study of inventory management and control of these companies.

3.3 Nature and Source of Data

Both primary and secondary data have been used in this study. Primary data are collected through the personnel observation and informal discussion with the staffs of the Herbs Production and Processing Company and National Trading Ltd. where as the secondary data are collected from the following sources.

- a. Reports and financial statement of the factory.
- b. Published and unpublished official records
- c. Articles
- d. Previous Studies

3.4 Data Gathering Procedure

In order to collect the required data from the official records of both "National Trading Limited and Herbs Production and Processing Company Limited" the researcher has visited there personally. Similarly, personal observation, informal discussion, interview with the officials, collect the data from journals, magazines published, financial statement and annual reports has been carried out to collect data at first hand. Regarding the primary sources, personnel observations and personal discussion methods are used.

3.5 Data Analytical Tools

The collected facts and figures are used to study about the inventory management of the National Trading Limited and Herbs Production and Processing Company Limited. Various tools and techniques have been used to analyze the effectiveness of the inventory management and control wherever necessary. The tools applied in this study are as follows:

(A) Financial Tools

There are various types of financial tools that are applied in order to evaluate and examine inventory management in the research process are given below.

- (i) EOQ Model
- (ii) ROL and Safety stock
- (iii) ABC analysis

(B) Ratio Analysis.

- Inventory Turnover Ratio

(C) Mean, Standard Deviation and Correlation

CHAPTER - IV

DATA PRESENTATION AND ANALYSIS

The basis objective of this study is to analyze to examine the technique being employed to manage the inventory by HPPCL and NTL. To fulfill the said objectives, collected information is analyzed in this section. On the basis of the analysis and diagnosis of the collected data to provide the suggestions and recommendation to HPPCL and NTL. Data are collected from the personal observation and company records to show the existing system of inventory management and control.

4.1 inventory Policy Adopted by NTL and HPPCL

While determining inventory policies every organization consider cost of holding inventory adequacy of capital to finance inventory, protection against price increase, risk involved in inventory. Under the suitability of its nature inventory policy are as follows.

a. Stable Inventory Policy

An equal ending inventory is kept every time so, the planned production fluctuates with the size of planned sales units.

b. Fluctuating Inventory Policy

An equal production is maintained throughout the year, so the size of inventory fluctuates with the size of planned sales units.

c. Inventory- Production Coordination Policy

Production and ending inventory units are adjusted as per the change in sales unit.

d. Just – in – Time Inventory Policy

Production is made when the output is demand, so inventory is not kept except a very small quantity for sample display.

The basic raw materials required for producing goods in HPPCL are herbs, which are collected from the Himalayan Region. HPPCL purchased directly or taken from the cultivated area. There are no specific methods for the collection of different kinds of raw material. Same as, NTL is a non-manufacturing company it imports finished goods like machine, parts, manufacturing goods from international market as well as purchase from national market on the basis of customer demand. Both companies should not have adopted only one specific policy. They adopted of their need and nature of product.

4.2 Analysis of Raw materials and the Tradings Good of the Companies

Herbs Production and Processing Company Limited

1. Wintergreen Oil

A) Optimum Order Level (By Formula Method):

Based on the company's records, the following data are available,

Annual demand	= 1545 kg
Total amount tied up	= Rs.1545×1050
	= Rs.16, 22,250
Order size	= 1545 kg

Ordering Charges:

Transportation charges	= Rs.6550
Bank charges & commission	= Rs.8500
Fax charges	= Rs.2410
Total Ordering cost	= Rs.17, 460

Carrying Charges:

Insurance charges	= Rs.21, 500
-------------------	--------------

Administration	= Rs.4, 360
Obsolescence charges	= Rs.5, 150
Handling charges	= Rs.8, 730
Total carrying Cost	= Rs.39, 740
Carrying cost per unit	= Rs. $\frac{36740}{1545}$
	= Rs.25.72
Annual Demand (A)	= 1545kg
Ordering Charges (O)	= Rs.17, 460
Carrying Cost per Unit (C)	= Rs.25.72

(I) by fitting the above mentioned data into Economic Order Quantity Formula, we get:

$$Q = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2 \times 1545 \times 17460}{25.72}} = \sqrt{\frac{53951400}{25.72}} = \sqrt{2097643.86}$$

$$= 1448.32 \quad = 1448\text{kg}$$

It means that if the company seeks to minimize the total cost by compromising the carrying cost and ordering cost, the economic order quantity should be 1448kg of Wintergreen oil. Now we are able to calculate the number of order for Wintergreen oil per year by using the formula:

$$\frac{A}{\text{EOQ}} \text{ i.e. } \frac{1545}{1448} \text{ which comes } 1.07 \text{ i.e. one order in a year.}$$

(B) Optimum Order of Inventory (Tabulation Method)

Table 4.1

Economic Order Quantity of Wintergreen Oil

No. Of order	Order Size	Average Inventory	Carrying Cost (Rs.)	Ordering Cost (Rs.)	Total Cost
1	2	$\frac{2}{2}=1$	$3 \times C=4$	$1 \times O=5$	$4+5=9$
1	1545.00	772.50	19868.70	17460	37328.70
2	772.50	386.25	9934.35	34920	44854.35
3	515.00	257.50	6622.90	52380	59002.90

4	386.25	193.12	4967.04	69840	74807.04
5	309.00	154.50	3973.74	87300	91273.74

Where, Average Inventory = $\frac{\text{Ordertime}}{2}$

Carrying Cost = Average Inventory × Carrying cost per unit

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

Total Cost = Carrying Cost + Ordering Cost

From above calculation, it is clear that by the use of tabulation method, the lowest minimum cost of Wintergreen oil is Rs.37328.70, which lies in the order size of 1545kg. The carrying cost and the ordering cost are Rs.19868.70 and Rs.17460 respectively.

The number of orders to be placed in a year once varies significantly with the existing number of order per year is 3. The existing number of order shows that the lower carrying cost with higher order cost. From the tabulation method, it depicts that the existing order size shows higher total cost Rs.59002.90. If the company orders 1545kg in a year with a single order cost will be reduced by Rs. (59002.9-37328.7) Rs.21674.2. Any number above one order per year will increase the total cost.

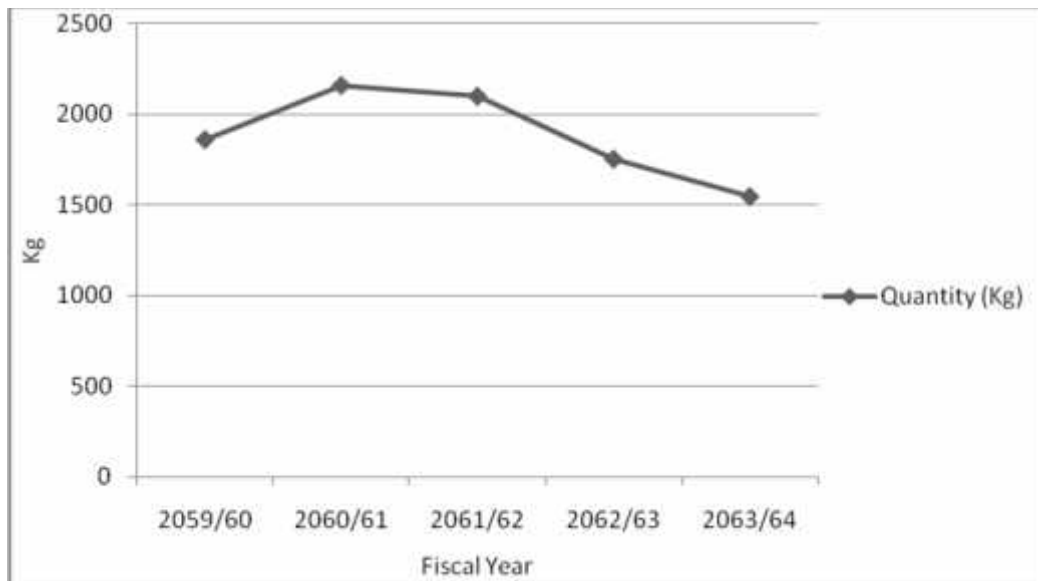
Table 4.2

Annual Demand of Wintergreen Oil

Fiscal Year (B.S.)	Quantity (kg)
2059/60	1860
2060/61	2160
2061/62	2100
2062/63	1752
2063/64	1545

Source: Herbs Production and Processing Company Ltd.

Figure 4.1
Annual Demand of Wintergreen Oil



From the table and figure, it is clear that the company has no fixed rule applied. The purchase made by the company is haphazard. It does not follow according to the EOQ model. The annual demand is increased and decreased by great quantity but it goes upon decreasing trend.

2. Xanthoxylum Oil

(A) Optimum Order Level (By Formula Method):

Based on the company's records, the following data are available,

Annual demand	= 300 kg
Total amount tied up	= 300 × Rs.4225
	= Rs.12, 67,500
Order size	= 300 kg

Ordering Charges:

Transportation charges	= Rs.880
Bank charges & commission	= Rs.1600
Fax charges	= Rs.150

$$\text{Total Ordering cost} = \text{Rs.2, 630}$$

Carrying Charges:

Insurance charges	= Rs.4, 500
Administration	= Rs.340
Obsolescence charges	= Rs.300
Handling charges	= Rs.600
Total carrying Cost	= Rs.5, 740
Carrying cost per unit	= Rs. $\frac{5740}{300}$
	= Rs.19.13
Annual Demand (A)	= 300kg
Ordering Charges (O)	= Rs.2630
Carrying Cost per Unit (C)	= Rs.19.13

(i) By fitting the above-mentioned data into Economic Order Quantity Formula, we get:

$$\begin{aligned} \text{EOQ} &= \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2 \times 300 \times 2630}{19.13}} = \sqrt{\frac{1578000}{19.13}} = \sqrt{82488.24} = 287.21 \\ &= 287\text{kg} \end{aligned}$$

Above calculation shows that if the company seeks to minimize the total cost, the optimal order should be 287kg. The number of order size for the Xanthoxylum can be calculated by using following formula:

$$\text{Number of order} = \frac{A}{\text{EOQ}} = \frac{300}{287} = 1.05$$

Therefore the number of order for the Xanthoxylum is 1.

(B) Optimum Order of Inventory (Tabulation Method)

By the tabulation method, the economic order quantity for Xanthoxylum can be calculated as follows:

Table 4.3
Economic Order Quantity of Xanthoxylum

No. of order	Order size	Average Inventory	Carrying Cost (Rs.)	Ordering Cost (Rs.)	Total Cost
1	2	$\frac{2}{2}=1$	$1 \times C=4$	$1 \times O=5$	$4+5=9$
1	300	150	2869.5	2630	5499.5
2	150	75	1434.75	5260	6694.75
3	100	50	956.5	7890	8846.5
4	75	37.5	717.37	10520	11237.37
5	60	30	573.9	13150	13723.9

Source: Herbs Production and Processing Company Ltd.

Where, Average Inventory = $\frac{\text{Ordertime}}{2}$

Carrying cost = Average Inventory \times Carrying cost per unit

Ordering cost = No. Of order \times Ordering cost per order

Total cost = Carrying Cost + Ordering Cost

The EOQ in case of Xanthoxylum comes to 300kg per order which gives the number of order per year is one. The number of order per year 1 is again justified by the use of tabulation method. This is the best possible number of order, where the total of carrying cost and ordering cost is minimum.

In this case, the carrying cost is Rs.2869.5 and ordering cost is Rs.2630 respectively gives the total cost Rs.5499.5. If the company order two times in a year, the cost will be increased by Rs.(6694.75-5499.5)= 1195.25. So, company should order the Xanthoxylum once a year to minimize its cost.

(C) The Annual Demand made by the Company for the Xanthoxylum is given below:

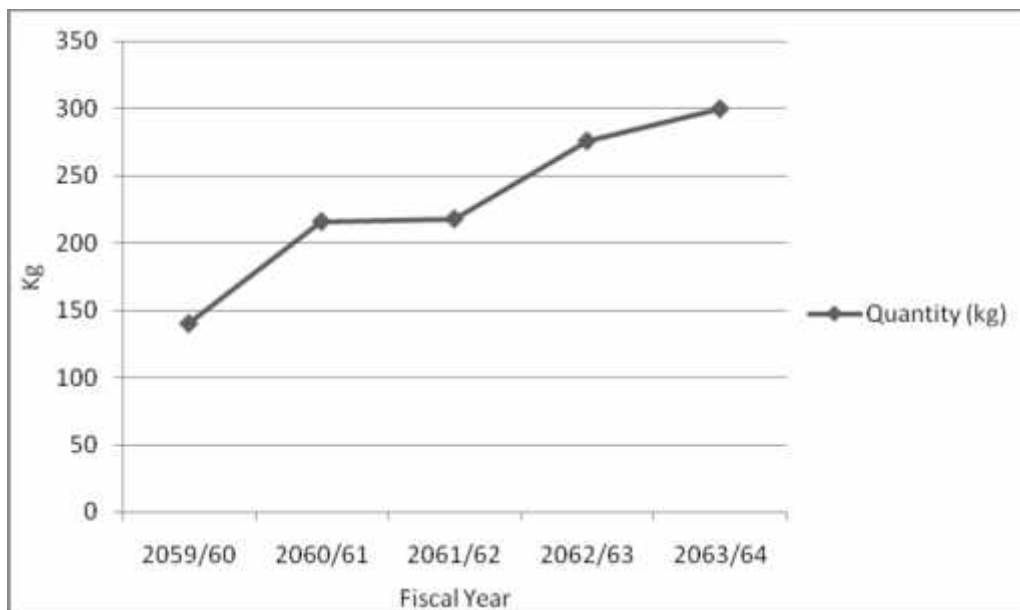
Table 4.4
Annual Demand for the Xanthoxylum

Fiscal Year (B.S.)	Quantity (kg)
2059/60	140
2060/61	216
2061/62	218
2062/63	276
2063/64	300

Source: Herbs Production and Processing Company Ltd.

Annual demand of Xanthoxylum can be presented in figure as follows:

Figure 4.2
Annual Demand of Xanthoxylum



From the table and figure, it is clear that the company has no fixed rule applied. The purchase made by the company is haphazardly. It does not follow according to the EOQ model. The annual demand is increased and

decreased by great quantity. Annual purchasing of company is in increasing trend.

3. Eucalyptus

(A) Optimum Order Level (By Formula Method):

Based on the company's records, the following data are available,

Annual Demand	= 4,379 kg
Total Amount tied up	= 4379 × Rs.800
	= Rs.35, 03,200
Order Size	= 4,379 kg

Ordering Charges:

Transportation Charges	= Rs.8, 800
Bank Charges & Commission	= Rs.10, 500
Fax Charges	= Rs.2, 300
Total Ordering Cost	= Rs.21, 600

Carrying Charges:

Insurance Charges	= Rs.28, 500
Administration	= Rs.4, 950
Obsolescence Charges	= Rs.8, 100
Handling Charges	= Rs.11, 910
Total Carrying Cost	= Rs.53, 460
Carrying Cost Per Unit	= Rs. $\frac{53460}{4379}$
	= Rs.12.21
Annual Demand (A)	= 4379kg
Ordering Charges (O)	= Rs.21,600
Carrying Cost per Unit (C)	= Rs.12.21

(i)By fitting the above mentioned data into Economic Order Quantity Formula, we get:

$$Q = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2 \times 4379 \times 21600}{12.21}} = \sqrt{\frac{189172800}{12.21}} = \sqrt{15493267.81}$$

$$= 3936.14 = 3936\text{kg}$$

It means that if the company seeks to minimize the total cost by compromising the carrying cost and ordering cost, the economic order quantity should be 3936kg of Eucalyptus. Now we are able to calculate the

number of order for Eucalyptus per year by using the formula: $\frac{A}{\text{EOQ}}$ i.e.

$\frac{4379}{3936}$ which comes 1.11 i.e. one order in a year.

(B) Optimum Order of Inventory (Tabulation Method)

Table 4.5

Economic Order Quantity of Eucalyptus

No. Of order	Order Size	Average Inventory	Carrying Cost (Rs.)	Ordering Cost (Rs.)	Total Cost
1	2	$\frac{2}{2}=1$	$1 \times C=4$	$1 \times O=5$	$4+5=9$
1	4379	2189.5	26733.79	21600	48333.79
2	2189.5	1094.75	13366.90	43200	56566.90
3	1459.75	729.87	8911.71	64800	73711.71
4	1094.75	547.37	6683.39	86400	93083.39
5	875.8	437.9	5346.76	108000	113346.76

Source: Herbs Production and Processing Company Ltd.

Where, Average Inventory = $\frac{\text{Ordertime}}{2}$

Carrying cost = Average Inventory \times Carrying cost per unit

Ordering cost = No. Of order \times Ordering cost per order

Total cost = Carrying Cost + Ordering Cost

From above calculation, it is clear that by the use of tabulation method, the lowest minimum cost of Eucalyptus is Rs.48333.79, which lies in the order

size of 4379kg. The carrying cost and the ordering cost are Rs.26733.79 and Rs.21600 respectively.

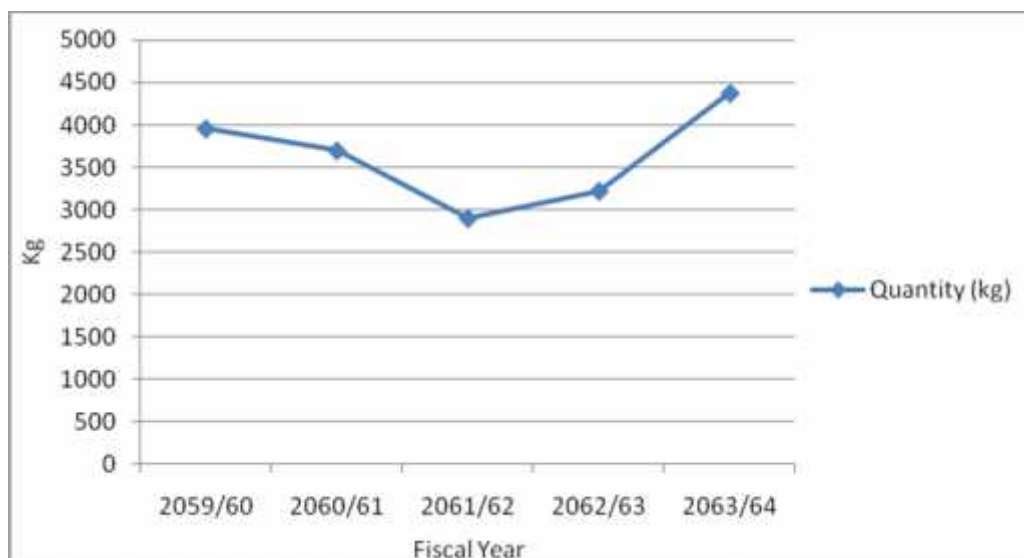
The number of orders to be placed in a year once varies significantly with the existing number of order per year is 3. The existing number of order shows that the lower carrying cost with higher order cost. From the tabulation method, it depicts that the existing order size shows higher total cost Rs.73711.71. If the company orders 4379kg in a year with a single order cost will be reduced by $\text{Rs.}73711.71 - 48333.79 = \text{Rs.}25377.92$. Any number above one order per year will increase the total cost.

Table 4.6
Annual Demand of Eucalyptus

Fiscal Year (B.S.)	Quantity (kg)
2059/60	3959
2060/61	3700
2061/62	2905
2062/63	3224
2063/64	4379

Source: Herbs Production and Processing Company Ltd.

Figure 4.3
Annual Demand of Eucalyptus



From the table and figure, it is clear that the company has no fixed rule applied. The purchase made by the company is haphazardly. It does not follow according to the EOQ model. The annual demand is increased and decreased by great quantity.

4. Cinnamon Leaf Oil

(A) Optimum Order Level (By Formula Method):

Based on the company's records, the following data are available,

Annual demand	= 184 kg
Total amount tied up	= $184 \times \text{Rs.}5000$
	= Rs.9, 20,000
Order size	= 184 kg

Ordering Charges:

Transportation charges	= Rs.400
Bank charges & commission	= Rs.310
Fax charges	= Rs.150
Total Ordering cost	= Rs.860

Carrying Charges:

Insurance Charges	= Rs.800
Administration	= Rs.360
Obsolescence Charges	= Rs.700
Handling Charges	= Rs.200
Total Carrying Cost	= Rs.2060
Carrying Cost Per Unit	= Rs. $\frac{2060}{184}$
	= Rs.11.2
Annual Demand (A)	= 184kg
Ordering Charges (O)	= Rs.860
Carrying Cost per Unit (C)	= Rs.11.2

- (i) By fitting the above mentioned data into Economic Order Quantity Formula, we get:

$$Q = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2 \times 184 \times 860}{11.2}} = \sqrt{\frac{316480}{11.2}} = \sqrt{28257.14} = 168.09 = 168\text{kg}$$

It means that if the company seeks to minimize the total cost by compromising the carrying cost and ordering cost, the economic order quantity should be 168kg of Cinnamon leaf oil. Now we are able to calculate the number of order for Cinnamon leaf oil per year by using the formula: $\frac{A}{\text{EOQ}}$ i.e. $\frac{184}{168}$ which comes 1.09 i.e. one order in a year. We can prove this result by tabulation method, which is given below;

(B) Optimum Order of Inventory (Tabulation Method)

Table 4.7

Economic Order Quantity of Cinnamon leaf oil

No. of order 1	Order size 2	Average Inventory 2]2=3	Carrying Cost (Rs.) 3×C=4	Ordering Cost (Rs.) 1×0=5	Total Cost 4+5=6
1	184	92	1030.4	860	1890.40
2	92	46	515.2	1720	2235.20
3	61.3	30.65	343.47	2580	2923.47
4	46	23	257.6	3440	3697.60
5	36.8	18.4	206.08	4300	4506.08

Source: Herbs Production and Processing Company Ltd.

The EOQ in case of cinnamon leaf oil is 184 kg per order, which gives the number of order per year, is 1. From the tabulation method, the number of order is also one where the total ordering and carrying cost are low.

In this case, the carrying cost and ordering cost are Rs.1030.4 and Rs.860 respectively, which gives the total cost Rs.1890.40. This is the lowest

possible cost. So, the company should order once in a year to reduce the total cost.

(C) Annual demand made by the company for the cinnamon leaf oil is given below:

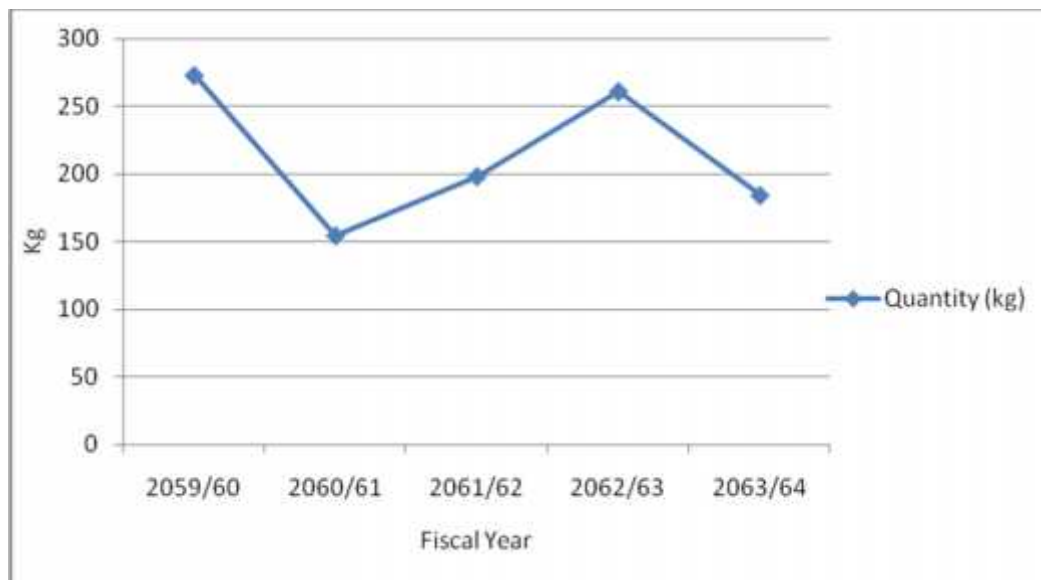
Table 4.8
Annual Demand of Cinnamon Leaf Oil

Fiscal Year (B.S.)	Quantity (kg)
2059/60	273
2060/61	154
2061/62	198
2062/63	261
2063/64	184

Source: Herbs Production and Processing Company Ltd.

Annual demand of Cinnamon can be presented in figure as follows:

Figure 4.4
Annual Demand of Cinnamon Leaf Oil



From the table and figure, it is clear that the company has no fixed rule applied. The purchase made by the company is haphazardly. It does not follow according to the EOQ model. The annual demand is increased and decreased by great quantity.

B. National Trading Limited

5. Various Liquor

(A) Optimum Order Level (By Formula Method):

Based on the company's records, the following data are available,

Annual demand	= 14000 units
Total amount tied up	= Rs.11.65 crore
Order size	= 1 times

Ordering Charges:

Transportation charges	= Rs.4000
Bank charges & commission	= Rs.2500
Fax charges	= Rs.500
Total Ordering cost	= Rs.7000

Carrying Charges:

Insurance charges	= Rs.3000
Administration	= Rs.2000
Other charges	= Rs.2500
	Rs.34500
Carrying cost per unit	= Rs. $\frac{34500}{14000}$
	= Rs.2.46
Annual Demand (A)	= Rs.14000
Ordering Charges (O)	= Rs.7000
Carrying Cost per Unit (C)	= Rs.2.46

(i) By fitting the above-mentioned data into Economic Order Quantity

Formula, we get:

$$Q = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{\Lambda | \text{KNII} | \text{PIII}}{\Lambda \text{NO}}} = 8926.07 \text{ units}$$

Above calculation shows that if the company seeks to minimize the total cost, the optimal order should be 8926 unit. The number of order size for the various liquor can be calculated by using formula.

$$\text{No. Of order} = \frac{A}{\text{EOQ}} = \frac{14000}{8926} = 1.57$$

Therefore, the number of order for various liquor is 2 times

B. Optimum order of Inventory (Tabulation Method)

By the tabulation method, the economic order quantity for various liquor can be calculated by:

Table 4.9

Economic Order Quantity of Various Liquor

No. of order	Order size	Average Inventory	Carrying Cost (Rs.)	Ordering Cost (Rs.)	Total Cost
1	2	$2 \div 2 = 3$	$3 \times C = 4$	$1 \times O = 5$	$4 + 5 = 6$
1	14000	7000	17220	7000	24220
2	7000	3500	8610	14000	22610
3	466.7	2333	5739	21000	26739
4	3500	1750	4305	28000	32305
5	2800	1400	3444	35000	38444

Source: National Trading Limited

The EOQ in case of various liquor comes to 8926 unit per order which gives the number of order per year is two. The number of order per year is again justified by the use of tabulation method. This is the best possible number of order, where the total of carrying and ordering cost is lowest.

In this case, the carrying and ordering cost of Rs.8610 and Rs.14000 respectively gives the total cost Rs.22610. If the company orders except two times in a year, the cost will increase. So, company should order the various liquor twice a year to minimize its cost.

C. The trends of Annual Demand Made by the Company for the Various Liquor are given below:

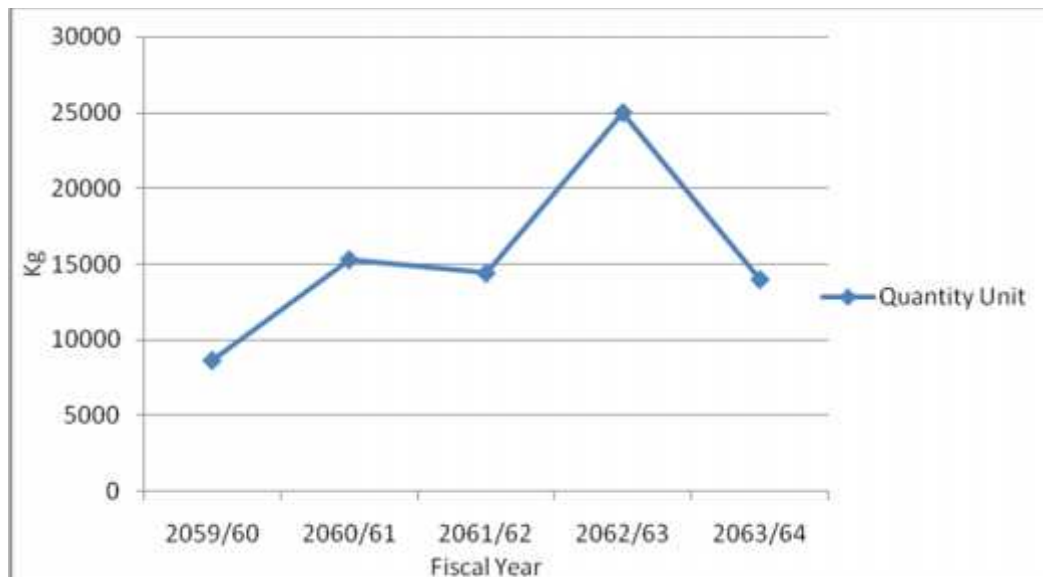
Table 4.10
Annual Demand of Various Liquor

Fiscal Year (B.S.)	Quantity Unit
2059/60	8665
2060/61	15300
2061/62	14412
2062/63	25000
2063/64	14000

Source: National Trading Limited

Annual demand of various liquor can be shown as follows:

Figure 4.5
Annual Demand of Various Liquor



From the table and figure, the annual demand made by the company is on the basis of roughly estimate. The unsystematic purchase plan is increasing

the total cost. The demand of various liquor for different year is different. The purchase plan should be systematic to minimize the total cost.

6. Water Pump

(A) Optimum Order Level (By Formula Method):

Based on the company's records, the following data are available,

Annual demand	= 135 units
Order size	= 2 times

Ordering Charges:

Transportation Charges	= Rs.600
Bank Charges & Commission	= Rs.100
Fax Charges	= Rs.75
Total Ordering Cost	= Rs.775

Carrying Cost:

Insurance Charges	= Rs.1200
Holding Charges	= Rs.500
	Rs.1700
Carrying cost per unit	= Rs. $\frac{1700}{135}$
	= Rs.12.59
Annual Demand (A)	= 135 unit
Ordering Charges (O)	= Rs.775
Carrying Cost per Unit (C)	= Rs.12.59

- (i) By fitting the above mentioned data into Economic Order Quantity Formula, we get:

$$Q = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{\Lambda | \text{KME} | \text{ITE}}{\text{K} \Lambda \Xi \Sigma}} = 128.9 = 129 \text{ units}$$

It means that if the company seeks to minimize the total cost by compromising the carrying cost and ordering cost, the economic order quantity should be 129 unit of water pump. How we are able to calculate

the number of order for water pump power year by using the formula: $\frac{A}{Q}$ i.e.

$\frac{135}{129}$ which comes 1.04 i.e. one order in a year.

B. Optimum order of Inventory (Tabulation Method)

By the tabulation method. The economic order quantity for water pump can be calculated as follows:

Table 4.11
Economic Order Quantity of Water Pump

No. of order 1	Order size 2	Average Inventory $\frac{2}{2}=1$	Carrying Cost (Rs.) $3 \times C=4$	Ordering Cost (Rs.) $1 \times O=5$	Total Cost $4+5=6$
1	135	67.5	849.8	775	1624.8
2	67.5	33.75	425	1550	1975.00
3	45	22.5	283	2325	2608.00
4	33.75	16.875	212	3100	3312.00
5	27	13.5	170	3875	4045.00

Source: National Trading Limited

Where,

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

$$\text{Carrying cost} = \text{average inventory} \times \text{carrying cost per unit}$$

$$\text{Ordering cost} = \text{No. of order} \times \text{ordering cost per order}$$

$$\text{Total cost} = \text{carrying cost} + \text{ordering cost}$$

From the above calculation, it is clear that by the use of tabulation method, the lowest minimum cost of water pump once is Rs.1624.8 which is the total of ordering cost Rs.775 and carrying cost Rs.849.8. The number of order is 1 times.

The company should order water pump once in a year to minimize the total cost. If it orders twice a year the total cost will increase. From table, we can

conclude that when company order twice a year then the cost is increased by Rs.350.20. Therefore no. Of order increase the total cost will also be increases.

C. The company's Annual Demand of the Water Pump is given below:

Table 4.12

Annual Demand for Water Pump

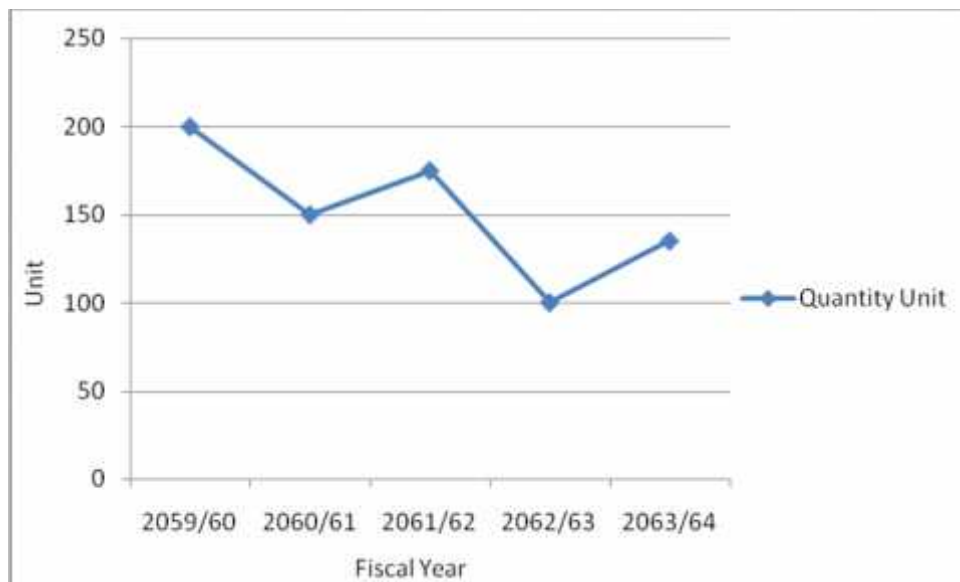
Fiscal Year (B.S.)	Quantity Unit
2059/60	200
2060/61	150
2061/62	175
2062/63	100
2063/64	135

Source: National Trading Limited

Annual demand of various liquor can be shown as follows:

Figure 4.6

Annual Demand of Water Pump



From the table and figure, it is clear that the company has no. any fixed rule of purchase of inventory. It is made on the basis of roughly estimate. So,

the company should formulate plans and policy about when and how much to buy the inventory.

7. Sugar

(A) Optimum Order Level (By Formula Method):

Based on the company's records, the following data are available,

Annual demand	= 100 ton
Total amount tie up	= Rs.23, 00,000
Order size	= 1 times

Ordering Charges:

Transportation Charges	= Rs.12000
Bank Charges & Commission	= Rs.1500
Fax and Phone Charges	= Rs.500
Total Ordering Cost	= Rs.14000

Carrying Cost:

Insurance Charges	= Rs.15000
Administration	= Rs.4000
Other	=Rs.9000
Total Carrying Cost	= Rs.28000
Carrying Cost Per Unit	= Rs. $\frac{28000}{100}$
	= Rs.280 per ton
Annual Demand (A)	= 100 ton
Ordering Charges (O)	= Rs.14000
Carrying Cost per Unit (C)	= Rs.280/T

- (i) By fitting the above mentioned data into Economic Order Quantity Formula, we get:

$$Q = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{\Lambda |KI| |KNII}{\Lambda PI}} = 100$$

Above calculation shows that if the company seeks to minimize the total cost, the optimal order should be 100 ton. The number of order size for the sugar can be calculated by using formula.

$$\text{No. of order} = \frac{A}{\text{EOQ}} = \frac{100}{100} = 1$$

B. Optimum Order of Inventory (Tabulation Method)

By the tabulation method. The economic order quantity for Sugar can be calculated as follows:

Table 4.13
Economic Order Quantity of Sugar

No. of order 1	Order size 2	Average Inventory 2]2=3	Carrying Cost (Rs.) 3×C=4	Ordering Cost (Rs.) 1×0=5	Total Cost 4+5=6
1	100	50	14000	14000	28000
2	50	25	7000	28000	35000
3	33.33	16.67	4667	42000	46667
4	25	12.5	3500	56000	59500
5	20	10	2800	70000	72800

Source: National Trading Limited

Where,

$$\text{Average Inventory} = \frac{\text{order size}}{2}$$

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

$$\text{Ordering Cost} = \text{No. of Order} \times \text{Ordering Cost Per Order}$$

$$\text{Total Cost} = \text{Carrying Cost} + \text{Ordering Cost}$$

From the above calculation, it is clear that by the use of tabulation method, the lowest minimum cost of Sugar is Rs.28000 which is the total of ordering cost Rs.14000 and carrying cost Rs.14000. The number of order is 1 times. This is the best possible number of order, where the total of carrying and ordering cost is lowest.

If the company orders two times in a year, the cost will increase. So company should order the Sugar ones a year to minimize its cost.

C. The Company's Annual Demand of the Sugar is given below:

Table 4.14

Annual Demand for Sugar

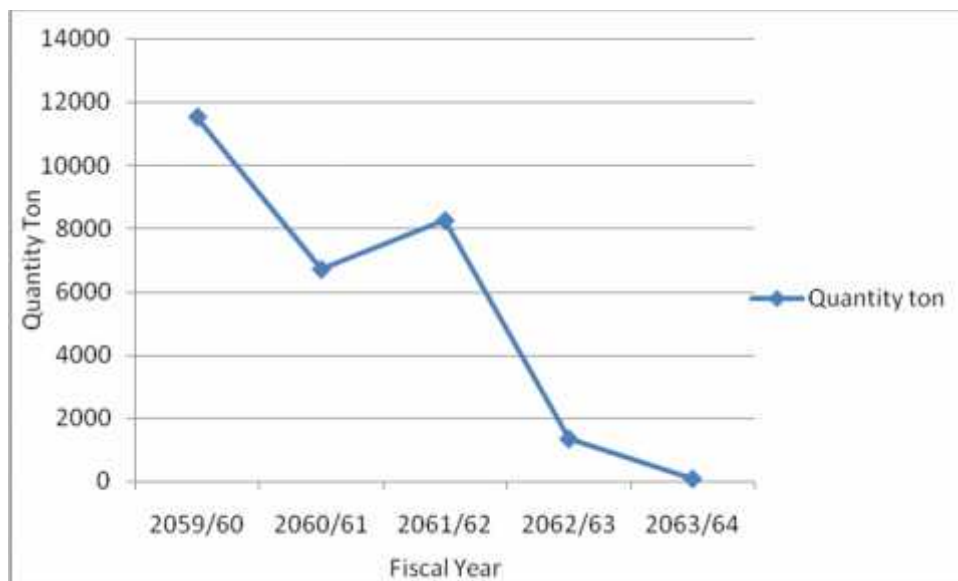
Fiscal Year (B.S.)	Quantity ton
2059/60	11530
2060/61	6720
2061/62	8260
2062/63	1360
2063/64	100

Source: National Trading Limited

The graphic representation of annual demand of Sugar can be shown as follows:

Figure 4.7

Annual Demand of Sugar



From the table and figure, it is clear that the company has no. Any fixed rule of purchase of inventory. It is made on the basis of roughly estimate. So, the company should formulate plans and policy about when and how much to buy the inventory.

4.3 Reorder Point and Safety Stock

Here, the researcher will try to analyze the reorder period of raw material and trading goods on the basis of lead-time safety-stock and daily usage rate kept by the company.

1. Wintergreen Oil

In case of wintergreen oil, the average daily consumption for the production of perfumery oil is 5kg per day. The company used to procure 386kg in four equal orders in a year. The quantity 386kg at the rate of 5kg is consumed in 77 days. This quantity is insufficient to produce smoothly for whole year. The required quantity has been fulfilled by the company from previous stock and next order. The normal lead-time for the procuring this oil is 30 days. The safety stock maintained by the company is differing from year to year although daily consumption rate has not been very fluctuating.

Table 4.15

Safety Stock and Daily Usage Rate of Wintergreen Oil

Fiscal year (B.S.)	Safety Stock (kg.)	Daily Usage Rate (kg)
2059/60	625	6
2060/61	710	7
2061/62	537	7
2062/63	630	6
2063/64	525	5

Source: Herbs Production and Processing Company Limited

This is the system used by the company to procure wintergreen oil at present. By the use of EOQ formula, researcher has computed the quantity of wintergreen oil to be procure in a year is 1448kg with the number of order per year is 1. The lead-time for the procurement of wintergreen oil is 30 days and practiced used by company for the safety stock level is equal to 5 days consumption. If we consider this safety stock, the order should be placed by keeping margin 35 days i.e. 175kg. If means that when the stock falls to 175kg in the stock, another order for 1545kg has to be placed.

2. Xanthoxylum

In case of Xanthoxylum, the company is applying a system of ordering 300kg of Xanthoxylum oil on equal four orders in a year. The quantity of 300kg is consumed in 295 days at the rate of 2.5kg per day. The quantity of 300kg is not sufficient for the whole year remaining demand for this Xanthoxylum were fulfilled from the stock. Normally, lead-time for procuring Xanthoxylum is 15 days. It requires the minimum safety stock of materials 40kg at minimum required materials used in minimum level was 45kg per day at the end of every year. The reorder point differs from year to year but daily usage rate is nearly to constant which are given below:

Table 4.16
Safety Stock and Daily Usage Rate of Xanthoxylum

Fiscal year (B.S.)	Safety stock (kg.)	Daily usage rate (kg)
2059/60	90	2.4
2060/61	87	2.5
2061/62	65	2.3
2062/63	73	1.9
2063/64	96	2.5

Source: Herbs Production and Processing Company Limited

This is the system used by the company to procure Xanthoxylum at present. By the use of EOQ formula, we have computed the quantity of Xanthoxylum to be procured in a year is 287kg with the number of order per year is 1 time. The lead-time for the procurement of Xanthoxylum is 15 days and the practice used by the company for the safety stock is equal to 4 days consumption. If we consider this safety stock keeping the margin of lead-time plus safety stock i.e. 19 days i.e. 47.5kg. It means that when inventory in hands falls to 47.5kg in the stock, another order for 300kg should be placed.

3. Eucalyptus

The average daily consumption of Eucalyptus for the production of medicine is 14kg per day. As the practice of the company is to produce 4379kg in a year. This quantity of 4379kg was consumed in 255 days at the rate of 17kg per day. This quantity was sufficient for the production for whole year. This quantity has been fulfilled by the company in order to produce materials. The normal lead-time for the procuring Eucalyptus is 35 days. Ordering period and safety stock maintained by company differ from year to year although the daily consumption rate has not been very fluctuating. The safety stock for the procuring material, it should be taken 10 days.

Table 4.17

Safety Stock and Daily Usage Rate of Eucalyptus

Fiscal year (B.S.)	Safety stock (kg.)	Daily usage rate (kg)
2059/60	880	17
2060/61	910	16
2061/62	820	14
2062/63	925	15
2063/64	885	17

Source: Herbs Production and Processing Company Limited

This is the system used by the company to procure Eucalyptus at present. By the use of EOQ formula, we have computed the quantity of Eucalyptus to be procured in a year is 3936kg with the number of order per year is 1 times. The lead-time for the procurement of Eucalyptus is 35 days and the practiced used by the company for the safety stock is equal to 10 days consumption. If we consider this safety stock keeping the margin of lead-time plus safety stock i.e. 45 days i.e. 765kg in the stock. It means that when inventory in hands falls to 765kg, another order 4379kg should be placed.

4. Cinnamon Leaf Oil

In case of cinnamon leaf oil, the ordering system used by company to procure 184kg twice a year. The quantity of cinnamon leaf oil requires 1.30kg in a day. That is the amount of cinnamon leaf oil 184kg procured in an order will be consumed by the company in 142 days at the daily average rate of 1.30kg. The remaining quantity has been fulfilled by the company from the next order and previous stock. Normally, the lead-time for procuring cinnamon leaf oil is 10 days. It requires the minimum safety stock for the cinnamon leaf oil is $(10 \times 1.30) = 13\text{kg}$ plus minimum balance for 4 days is 5.2kg i.e. 18.2kg at the end of year. But the safety stock maintained by the company is differing from year to year.

Table 4.18

Safety Stock and Daily Usage Rate of Cinnamon Leaf Oil

Fiscal year (B.S.)	Safety stock (kg.)	Daily usage rate (kg)
2059/60	70	2.1
2060/61	65	1.5
2061/62	87	1.2
2062/63	55	1.7
2063/64	77	1.3

Source: Herbs Production and Processing Company Limited

This is the system used by the company to procure Cinnamon leaf oil at present. By the use of EOQ formula, we have computed the quantity of Cinnamon leaf oil to be procured in a year is 168kg with the number of order per year is 1 times. The lead-time for the procurement of Cinnamon leaf oil is 10 days and the practiced used by the company for the safety stock is equal to 4 days consumption. If we consider this safety stock keeping the margin of lead-time plus safety stock i.e. 14 days and 184kg should be place an order. It means that when inventory in hands falls to 18.2kg another order should be placed.

5. Various Liquor

The system for buying various liquor for the sales used by the National Trading Limited orders 14000 units in a single order. If we compute the amount of liquor for the sales average daily sales rate is 45 units. The 14000 unit's liquor is not sufficient for the whole year. Remaining quantity will be fulfilled from the stock.

By the use of economic order quantity formula we have computed the quantity of liquor to be purchase in a single order is 8926 units the number of order per year of 2 times. The lead-time for the procurement of liquor is 2 months. When the balance in stock remains for the 60 days (2700 units) another order has to be placed to procure liquor. But the trends of stocking of liquor are made by the company differently which are given below:

Table 4.19

Safety Stock and Daily Usage (Sales) Rate of Various Liquor

Fiscal Year (B.S.)	Safety stock quantity (units)	Daily usages/sales units
2059/60	3060	50
2060/61	2885	48
2061/62	5100	85
2062/63	2760	46
2063/64	2700	45

Source: National Trading Limited

The normal lead-time is 2 months for the liquor and the normal usage rate is 45 units per day based on 300 days in a year. It shows that when the inventory fails to (60×45) 2700 units another order has to be placed. In other words the second order should be placed after $\frac{300}{1.57} = 191$ days of the first order.

The time can be calculated by the following formula.

$$T \times \sqrt{\frac{\Delta O}{AC}} \times \text{No. of working days} \times \sqrt{\frac{\Delta | \Pi \Pi \Pi}{KN \Pi \Pi | \Delta NO}} \quad | \text{MI} = 191.27 = 191 \text{ days}$$

6. Water Pump

In case of water pump, the ordering system used by National Trading Limited is to procure 135 units twice a year. The quantity of water pumps sales one (1) unit in a day. That is the amount of water pump 135 units procures in the year sales by the company 135 days of the daily average sales rate of one unit. The remaining quantity has been fulfilled by the company from the next order and previous stock. Normally the lead-time for procuring water pump is 15 days. It requires the minimum safety stock for the water pump (15 × 1) 15 units plus minimum balance for 10 days 10 units i.e. 25 units at the end of every year. But the safety stock maintained by the company is differing from year to year.

Table 4.20

Safety Stock and Daily Usage (Sales) Rate of Water Pump

Fiscal Year (B.S.)	Safety stock quantity (units)	Daily usages/sales units
2059/60	8	1
2060/61	10	2
2061/62	15	2
2062/63	15	1
2063/64	25	1

Source: National Trading Limited

This is the existing system used by the company to procure water pump at present.

By the use of the economic order quantity formula, we have computed the quantity of water pump is to be procured in a year is 129 units with a number of orders per year. The lead-time for the procurement of water

pump is 15 days and the practices used by the company for the minimum safety stock is equal to the 10 days consumption. If we consider this when the stock of in hand falls 25 units, a new order should be placed of water pump.

7. Sugar

In case of Sugar, The ordering system used by the National Trading Limited is to procure 100 ton. The average daily sale of Sugar is 0.3 ton based on the 300 days in a year. The quantity of 100 ton is not sufficient for the whole year. Remaining demand for this has fulfilled from the stock. Normally, the lead-time for procuring Sugar is 2 days. It requires the minimum safety stock for the sugar 0.6 ton at the end of year the reorder point also differ from year to year, the average daily sales rate is not constant which are given below:

Table 4.21

Safety Stock and Daily Usage (Sales) Rate of Sugar

Fiscal Year (B.S.)	Safety stock quantity (ton)	Daily usages/sales (ton)
2059/60	100	35
2060/61	70	22
2061/62	85	27
2062/63	15	5
2063/64	2	0.3

Source: National Trading Limited

This is the system used by the company to procure sugar at present. The economic order quantity of sugar is 100 ton with number of order size 1 of a year. The normal lead-time for sugar is 2 days and the minimum safety stock kept by the company is 4 days sales. They we have to place orders when the quantity of sugar falls 1.8 ton. This number 1.8 tons will be the reorder point for the company for placing orders for sugar.

The system of procuring by company one time in a year is suitable for the company.

4.4 Turnover Ratio Analysis

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

As we know that ITR is better than low ratio. High turnover ratio indicats that a firm has good inventory management system and it is able to earn profit selling quickly over period of time, like wise, low turnover ratio indicats that a firm has poor inventory management system and firm has more stock of finished goods for sales due to this, inventory turnover cost in term of interest, opportunity, rent, depreciation, insurance, taxes and so on.

Therefore, the company has to keep optimum level of inventory. Inventory turnover ratio can be calculated by using this formula.

$$\text{Inventory Turnover Ratio} = \frac{\text{Cost of Goods Sold}}{\text{Average Inventory}}$$

$$\text{Cost of Goods Sold} = \text{Opening Stock} + \text{Purchase} - \text{Closing Stock}$$

$$\text{Average Inventory} = \frac{\text{Opening Stock} + \text{Closing Stock}}{2}$$

Table 4.22
Inventory Turnover Ratio in Terms of Value
National Trading Limited

Year	Cost of goods sold	Average inventory	Ratio
2059/060	406586997	259277397	1.56
2060/061	956583133	416192332	2.29
2061/062	392329798	367485867	1.06
2062/063	336482952	396679492	0.84
2063/064	702247961	362314035	1.93

Source : Unpublished Official Record

Table 4.23
Inventory Turnover Ratio in Terms of Value
Herbs Production and Processing Company Limited

Year	Cost of good sold	Average inventory	Ratio
2059/060	18825598	34401691	0.54
2060/061	13371712	29588351	0.45
2061/062	9263007	33573039	0.27
2062/063	14025403	39688657	0.35
2063/064	13536890	42406858	0.31

Source: Unpublished Office Record

From above the tabulation we have to know that inventory ratio of both organization is low it means more investment has been made on inventories which results unnecessary investment tied-up on it and will increase the idle cost of capital. It directly effect on the profitability of the firm.

At last we can say that both organization efficiency in inventory is poor. Booth organization is not able to change its inventory into cash through sales so they have to give more attention in inventory management.

4.5 Relationship between Inventory and Profits

Level and inventory management policy of the company affects the profitability. High level of inventory increase the cost of carrying the inventory and the profitability. Therefore there should be a inverse relationship between the two components.

Table 4.24**Relationship between Inventory and Profit**

Rs in lakhs

NTL			HPPCL		
Years	Inventory	Profits	Years	Inventory	Profits
2059/060	4780	48	2059/060	304	(32)
2060/061	3544	(828)	2060/061	288	20
2061/062	3806	(559)	2061/062	383	(5)
2062/063	4128	(531)	2062/063	411	(31)
2063/064	3118	(389)	2063/064	438	15
Mean	3875	(228)	Mean	365	(7)
S.D.	560	484	S.D.	59	21
Correlation -0.64			Correlation -0.25		

Source: Unpublished Record of HPPCL and NTL

From above calculation, correlation between the inventory and net profit Of NTL and HPPCL is -0.64 and -0.25 respectively. There is average negative correlation between inventory and net profit of both company. There is negative relationship between inventory and profit i.e. increase in inventory result decrease in profit and decrease in inventory result increase in net profit.

4.6 Classification of Raw Materials and Trading goods Under ABC Inventory System

According to the concept of ABC analysis, the item of goods with regarding to three purchase department of National Trading Limited are divided ABC on the basis of their usage value and volume as shown in table below.

Table 4.25

Classifications of Inventory of National Trading Limited

Division	Goods Items
A	Rice milling, Machine, Food Processing, Power Teller (Tractor), Bicycles, Water Pumps, Noodles making, Tools, Workshop machine spare parts.
B	Various Liquor (Vodka, xxx Rum, Back piper, Virgine, Jose, Red Level)
C	Kashmere Yarn, Blanket, DAP Fertilizer, Sugar, Electric fan, sport goods, cieft items, T.V. Rice Cocker Parphinwax, Volume Cleaner Jasmine tea;

Source: National Trading Ltd. Teku.

Table 4.26

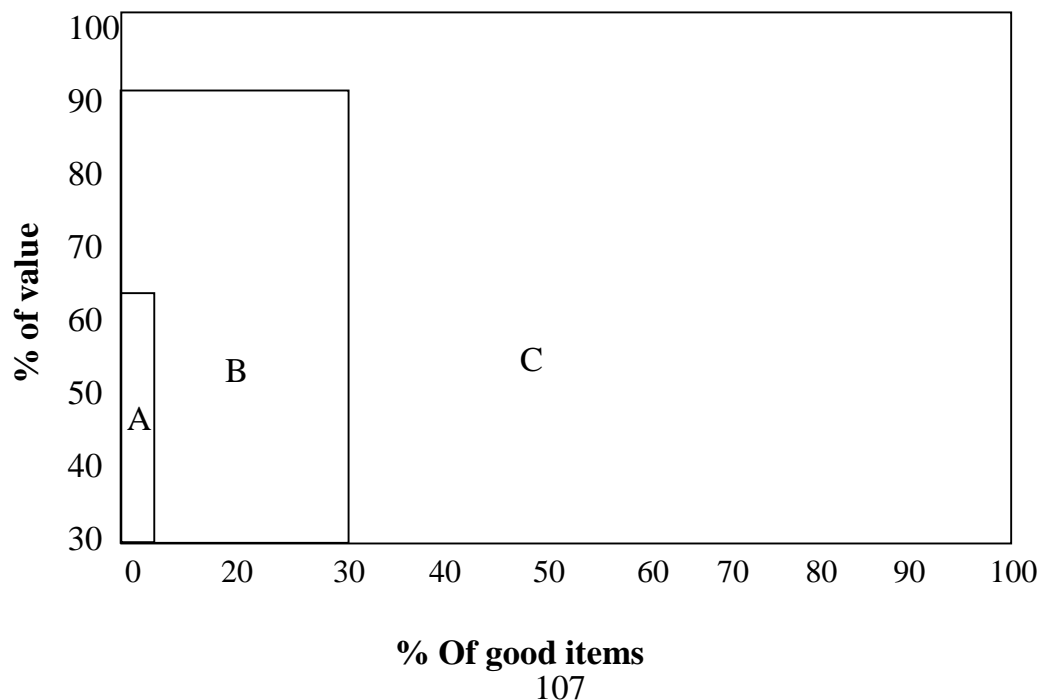
ABC Classification

Category	Items (Units)	% of items	Value (Rs.)	% of value
A	505	2%	157800000	64%
B	8465	28%	67900000	27%
C	20990	70%	21555000	9%
Total	29960	100%	247255000	100%

Source: National Trading Ltd. Teku.

Figure 4.8

ABC Analysis



The table and graphic presentation indicate that "item A" form a minimum proportion 2% units of all items, but represents the highest volume 64 of total cost on the other hand "item B" consists 28% of total volume but only 27% of total value. Similarly, "item C" consists maximum 70 of the volume but least 9% of total value. This division of goods items reflects the concept of inventory control according to their volume and cost but the companies spend the same effect on all item. Since it is clear that a strict control should be exercised on "item A" in order to minimize inventory control cost and less control "item B & C" respectively. On its investment item "A" should be traced first and most carefully, in case of "item C" simple control will be sufficient.

Similarly, for the production of different kinds of products, twenty-six kinds of raw materials are used. According to the concept of ABC analysis, these items of raw materials regarding the purchase of these materials by HPPCL are categorized as follows.

Table 4.27
Classifications of the Inventories of HPPCL

Division of items	Inventory items
A	Jatamasi oil, Junifer berry oil, Anthapogan oil, Cammomile oil, Xenthoxylem oil, Cinamomum oil, Texus Resin, Juniper Beri oil etc.
B	Lemongrass, Sugantha koki oil, Tagetes oil, Wintergreen oil, Palmarosa oil, Calamus oil, Shilajeet etc.
C	Citronella oil, Turpentine, oil, Mentha oil, Curuma Zedoaria oil, Rosin, Eucalyptus oil, Kashur oil, Matricaria flower etc.

Source: HPPCL, Koteshwor

The division of inventory reflects the concept of inventory control according their cost. It is clear that a strict control should be exercised on item "A" whose value is maximum. In case of 'Item C' simple control will be sufficient.

4.7 Major Findings

Every study has certain findings, so that, the following findings are extracted from this study about the inventory management and control of Herbs Production and Processing Company Limited and National Trading Limited.

1. Purchase of inventory and goods haphazardly by the national trading and HPPCL. In other words, the purchase quantity made by the company differ from year to and are not in economic order quantity.
2. HPPCL and National Trading Limited also have established a separate unit for management of inventory although the separate unit is unable to manage the inventory effectively.
3. In the National Trading Limited the EOQ model is not applied and the company has maintained the safety stock which is highly fluctuated and estimated roughly and HPPCL has also same condition.
4. Both company have not categorized its inventory for the purpose of control and paid equal attention for the entire inventory held in the store.
5. In the both company the annual demand and purchase made by company differ from year to year and highly fluctuated.
6. Cost related with ordering and holding inventory is not recorded separate in both companies which are recorded as a whole.
7. The raw materials used by HPPCL is not classified according to ABC.

8. Purchase of raw material in HPPCL is on the agreement and local tender basis some materials are imported and some are taken from the market with huge amount at a time.
9. Both companies should not have adopted only one specific inventory policy.

CHAPTER - V

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

There are different types of enterprises either public or private operating in the country. Among them some are running with profit and some are running in loss. So that the success of an enterprises depends upon the strength of management along with efficiency in managing the various functional aspects and modeling them to achieve the company's objectives. Management is basically concerned with getting the jobs done effectively and efficiently.

In present context, public enterprises provide the goods and services which are provided by private enterprises are more effective. Public enterprises face two types of challenges, the first one is to meet public responsibility of providing goods and services cheaply and the second one is to utilize the scarce resources more effectively. In this context, the study is concerned to appraise HPPCL and National Trading Limited examine that in what extent the company is applying inventory management and control system so as to minimize the cost, that ultimately affect the price of manufacturing goods and trading goods. Most of the manufacturing and trading company invests a huge amount of money in inventories. The expenses involve for carrying on functional associated with inventories such as purchasing, handling storage and record keeping is large. Thus in recent year, the subject inventory management has engaged the attention of management and extensive literature has evolved which encompass statistical tools like economic order quantity for how much to purchase together with the re-order point.

There are certain problems of the study. Therefore, the basis problem of this study is to examine the inventory management system practiced by the company. The order size, carrying cost, ordering cost, safety stock are determined unscientifically by the company and is not given proper attention to the lead-time and all these functions lead to increase the total cost of the company.

Herbs Production and Processing Company Limited and National Trading Limited invest a huge amount of capital in the form of inventory. The main objectives of this study is to find out what technique have been used by the Herbs Production and Processing Company Limited and National Trading Limited to manage the inventory and provide suggestions to use the scientific technique to help in the reduction of cost and getting profit. For this purpose, the researcher interviewed with officials and observes the inventory system personally and data were collected from various sources. Quantitative tools were applied in this study to analyze the collected data.

All the collected data and facts are analyzed on the basis of inventory management theory and with the help of ABC analysis, EOQ model, and Re-order label as well as safety stock. For making certain type of inventory management decision, many mathematical tools and techniques have been available for controlling the inventory but these companies have not applied any sort of techniques for managing their inventories.

5.2 Conclusion

On the basis of analysis of data and information collected from HPPCL and NTL separately the following conclusion have been drawn.

To meet the consumer demand production on time efficiently and effectively, the study focus the need for a good inventory system to

maintain a suitable level of inventory and also control the cost for the HPPCL and National Trading Limited.

The values maintaining proper stock of inputs as well as discussed previously are necessary to know the answer about when and how much to buy. The models examples and formula as discussed previously are necessary for every manufacturing and non-manufacturing enterprise to reduce unnecessary cost incurred on ordering and carrying the inventory.

Though, these models, example and formula etc. For managing inventory are available they could not be used fully for finding out the necessary operation of the company because of the lack of adequate data. No techniques for inventory management are possible to apply to calculate one of the major decisions when to buy because of the lack of planning and unsystematic methods of recording cost. If no concrete step is taken with regards to recording and maintaining of proper data on stock out cost, carrying cost, ordering cost, price of raw material etc. Separately, future researcher would not be able to predict the re-order period and how much to maintain the safety stock properly. Thus, in the real situation of the operation of the company regarding its inventory managing system could not be found. From study and analysis of data, inventory management and control system is same.

5.3 Recommendations

On the basis of the study, the following suggestions may be recommended for consideration:

1. The both company should define its goals and objectives clearly with regards to its inputs and outputs separately i.e. the quantities, time period should be specified.
2. The most applicable model of ABC classification is another tool that can be applied for managing inventory smoothly. The classification of ABC analysis helps to know which items in inventory have higher

usage value and which have not and accordingly a precise control over the items in inventory can be applied HPPCL and NTL are not adopting the ABC analysis.

3. The company should follow scientific tools and technique i.e. economic order quantity and economic lot size formula which help to reduce the relevant total cost for manufacturing product. The output obtained from quantitative analyzed results the lowest cost and consumer can use with low cost than company can increase their selling.
4. Expert technicians are needed for the production of qualitative products and effective sales plan. So the process of selection and recruitment techniques should be unbiased.
5. To manage inventory, ledger cards can also be used by both companies. In this card the name of items, item numbers, unit price, usage rate, suppliers name, the percentage of carrying cost and the ordering cost, data of order and its receipts with date, quantity used and issues of raw materials are maintained.
6. Job evaluation should be launched in certain time interval so that the hard-working employees can be rewarded and the task avoiding once can be taken into action of both companies.
7. In case of HPPCL, the encouragement should be done to the farmers to cultivate herbs plants.
8. Record keeping system should be scientific and computerized. So that the corporation can locate the past records which are helpful for the researcher as well as concern parties of this company.
9. The vision of the top level management should be clear for solving the problems appeared in course of inventory management system.
10. The frequently changing of the general manager has also affected the management. It should create unstable environment. Therefore, the post of the manger should be professionalized and it should be far from political interfering.

APPENDIX - I**Inventory Purchased by Herbs Production and Processing Company Limited****(Fiscal Year: 2063/64 B.S.)**

S.N.	Names of Inventories	Quantity (kg)	Rs.
1	Jatamasi oil	-	-
2	Junifer berry oil	-	-
3	Anthapogan oil	-	-
4	Xanthoxylum	300	1267500
5	Lemon grass	3180	2257800
6	Sugantgha Koki oil	157	200803
7	Mentha leaves dry	48	2448
8	Wintergreen oil	1545	1622250
9	Palmarosa oil	1150	741750
10	Eucalyptus oil	4379	3503200
11	Citronela oil	2143	9429820
12	Turpentine oil	18000ltr	34476
13	Matricaria flower dry	213	29192
14	Mentha oil	8162	5795020
15	Artemesia oil	-	-
16	Anthopogan oil	274	183183
17	Cammamile oil	-	-
18	Rosin	42351	1397583
19	Cinnamon leaf oil	184	920000
20	Shilajeet	606	2551260

APPENDIX - II

Annual Purchase, Closing Stock and Consumption of Raw Materials of HPPCL

S.N.	Names of Inventories	59/60	60/61	61/62	62/63	63/64
1	Wintergreen oil					
	Annual purchase	1860	2160	2100	1752	1545
	Closing stock	1300	1780	1399	1357	893
	Annual consumption	550	376	692	385	646
2	Cinnamon leaf oil					
	Annual purchase	273	154	198	261	184
	Closing stock	154	33	55	78	20
	Annual consumption	119	121	143	182	164
3	Eucalyptus					
	Annual purchase	3959	3700	2905	3224	4379
	Closing stock	2224	1767	775	635	1947
	Annual consumption	1730	1929	2120	2585	2425
4	Xanthoxylum					
	Annual purchase	140	216	218	276	300
	Closing stock	28	178	116	151	179
	Annual consumption	112	37	101	123	119

APPENDIX - III**Goods Purchase by National Trading**

S.N.	Name of Goods	Qty.	Rs.
1.	Various Liquor	14000	116500000
2.	Rice milling Machine	50	85000000
3.	Food Processing	300	67500000
4.	Power teller (Tractors)	-	-
5.	Bicycles	150	300000
6.	Water pumps	135	5400000
7.	Noodles Making	-	-
8.	Kashereyarn	2500	1000000
9.	Kerosene Hitter	-	-
10.	Jasmine Tea	360	60500
11.	Blanket	120	5500000
12.	Electric Fan	-	-
13.	Sports goods	5000	-
14.	Rice Cocker	-	-
15.	Vacuums Clearner	50	350000
16.	Sugar	100000	2300000
17.	Electric Kittle	-	-
18.	Washing machine	-	-
19.	Gieft items	250	-
20.	Paraphin wax	-	-
21.	T.V.	30	300000
22.	Tools	-	-
23.	Printing Machine	-	-
24.	Workshop Machine	-	-
25.	Spare parts	610	9750000

APPENDIX - IV

Calculation of Trend Values

Calculation of trend values of purchase of raw material of HPPCL

1. Wintergreen oil (2059/60 - 2063/64)

F/Y (t)	Purchase (y)	X = t - 2061/062	X ²	Xy	Trend value
2059/60	1860	-2	4	-3720	2091
2060/61	2160	-1	1	-2160	1987.2
2061/62	2100	0	0	0	1883.4
2062/63	1752	1	1	1752	1779.6
2063/64	1545	2	4	3090	1675.8
N = 5	∑y = 9417	∑x = 0	∑x ² = 10	∑xy = -1038	

Working note:

Here, the equation of straight line is $y = a + bx$

Where,

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

$$= \frac{9417}{5}$$

$$= 1883.4$$

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

$$= \frac{-1038}{10}$$

$$= -103.8$$

Substituting these values in equation of straight line i.e.

$$Y = a + bx$$

$$= 1883.4 - 103.8x$$

Trend values of purchase for next five year (2064/65 to 2068/69)

F/Y (t)	x = t - 2061/062	Trend value
2064/65	3	1572
2065/66	4	1468.2
2066/67	5	1364.4
2067/68	6	1260.6
2068/69	7	1156.8

2. Cinnamon Leaf Oil

F/Y (t)	Purchase (y)	X = t - 2061/62	X ²	Xy	Trend value
2059/60	273	-2	4	-546	228.2
2060/61	154	-1	1	-154	221.1
2061/62	198	0	0	0	214
2062/63	261	1	1	261	206.9
2063/64	184	2	4	368	199.8
N = 5	$\phi y = 1070$	$\phi x = 0$	$\phi x^2 = 10$	$\phi xy = -71$	

Working note:

Here, the equation of straight line is $y = a + bx$

Where,

$$a = \frac{\sum y}{n} = \frac{1070}{5} = 214$$

$$b = \frac{\sum xy}{\sum x^2} = \frac{-71}{10} = -7.1$$

Substituting these values in equation of straight line i.e.

$$y = a + bx$$

$$= 214 - 7.1x$$

Trend values of purchase for next five year (2064/65 to 2068/69)

F/Y (t)	X = t - 2061/62	Trend value
2064/65	3	192.7
2065/66	4	185.6
2066/67	5	178.5
2067/68	6	171.4
2068/69	7	164.3

3. Eucalyptus

F/Y (t)	Purchase (y)	X = t - 2061/62	X ²	Xy	Trend value
2059/60	3959	-2	4	-7918	3560.6
2060/61	3700	-1	1	-3700	3597
2061/62	2905	0	0	0	3633.4
2062/63	3224	1	1	3224	3669.8
2063/64	4379	2	4	8758	3706.2
N = 5	$\phi y = 18167$	$\phi x = 0$	$\phi x^2 = 10$	$\phi xy = 364$	

Working note:

Here, the equation of straight line is $y = a + bx$

Where,

$$a = \frac{\sum y}{n} \qquad b = \frac{\sum xy}{\sum x^2}$$

$$= \frac{3633.4}{5} \qquad = \frac{181.67}{10}$$

$$= 726.68 \qquad = 18.167$$

Substituting these values in equation of straight line i.e.

$$y = a + bx$$

$$= 3633.4 + 36.4x$$

Trend values of purchase for next five year (2064/65 to 2068/69)

F/Y (t)	X = t - 2061/62	Trend value
2064/65	3	3742.6
2065/66	4	3779
2066/67	5	3815.4
2067/68	6	3851.8
2068/69	7	3888.2

4. Xanthoxylum

F/Y (t)	Purchase (y)	X = t - 2061/62	X ²	Xy	Trend value
2059/60	140	-2	4	-280	154
2060/61	216	-1	1	-216	192
2061/62	218	0	0	0	230
2062/63	276	1	1	276	268
2063/64	300	2	4	600	306
N = 5	$\sum y = 1150$	$\sum x = 0$	$\sum x^2 = 10$	$\sum xy = 380$	

Working note:

Here, the equation of straight line is $y = a + bx$

Where,

$$a = \frac{\sum y}{n} \qquad b = \frac{\sum xy}{\sum x^2}$$

$$= \frac{230}{5} \qquad = \frac{38}{10}$$

$$= 46 \qquad = 3.8$$

Substituting these values equation of straight line i.e.

$$y = a + bx$$
$$= 230 + 38x$$

Trend values of purchase for next five year (2064/65 to 2068/69)

F/Y (t)	X = t - 2060/061	Trend value
2064/65	3	344
2065/66	4	382
2066/67	5	420
2067/68	6	458
2068/69	7	496

APPENDIX - V

Calculation of trend values of purchase of National Trading Limited

1. Various liquor (2059/60 - 2063/64)

F/Y (t)	Purchase (y)	X = t-2061/62	X ²	Xy	Trend value
2059/60	8665	-2	4	-17330	11401.4
2060/61	15300	-1	1	-15300	13438.4
2061/62	14412	0	0	0	15475.4
2062/63	25000	1	1	25000	17512.4
2063/64	14000	2	4	28000	19549.4
N = 5	$\phi y = 77377$	$\phi x = 0$	$\phi x^2 = 10$	$\phi xy = 20370$	

Working note:

Here, the equation of straight line is $y = a + bx$

Where,

$$a = \frac{\sum y}{n} = \frac{77377}{5} = 15475.4$$

$$b = \frac{\sum xy}{\sum x^2} = \frac{20370}{10} = 2037$$

Substituting these values in equation of straight line i.e.

$$y = a + bx$$

$$= 15475.4 + 2037(x)$$

Trend values of purchase for next five year (2064/65 to 2068/69)

F/Y (t)	x = t - 2061/62	Trend value
2064/65	3	21586.4
2065/66	4	23623.4
2066/67	5	25660.4
2067/68	6	27697.4
2068/69	7	29734.4

2. Sugar

F/Y (t)	Purchase (y)	X = t-2061/62	X ²	Xy	Trend value
2059/60	11530	-2	4	-23060	11238
2060/61	6720	-1	1	-6720	8416
2061/62	8260	0	0	0	5594
2062/63	1360	1	1	1360	2772
2063/64	100	2	4	200	-50
N = 5	$\phi y = 27970$	$\phi x = 0$	$\phi x^2 = 10$	$\phi xy = -28220$	

Working note:

Here, the equation of straight line is $y = a + bx$

Where,

$$a = \frac{\sum y}{n} \qquad b = \frac{\sum xy}{\sum x^2}$$

$$= \frac{11111}{5} \qquad = \frac{21111}{10}$$

$$= 2222.2 \qquad = 2111.1$$

Substituting these values in equation of straight line i.e.

$$y = a + bx$$

$$= 5594 + (-2822) x$$

Trend values of purchase for next five year (2064/65 to 2068/069)

F/Y (t)	$x = t - 2061/062$	Trend value
2064/65	3	-2872
2065/066	4	-5694
2066/067	5	-8516
2067/068	6	-11338
2068/069	7	-14160

3. Water Pump

F/Y (t)	Purchase (y)	$X = t - 2061/062$	X^2	xy	Trend value
2059/060	200	-2	4	-400	188
2060/061	150	-1	1	-150	170
2061/062	175	0	0	0	152
2062/063	100	1	1	100	134
2063/064	135	2	4	270	116
$N = 5$	$\sum y = 760$	$\sum x = 0$	$\sum x^2 = 10$	$\sum xy = -180$	

Working note:

Here, the equation of straight line is $y = a + bx$

Where,

$$a = \frac{\sum y}{n} \qquad b = \frac{\sum xy}{\sum x^2}$$

$$= \frac{152}{5} \qquad = \frac{18}{10}$$

$$= 30.4 \qquad = 1.8$$

Substituting these values in equation of straight line i.e.

$$y = a + bx$$

$$= 152 - 18(x)$$

Trend values of purchase for next five year (2064/065 to 2068/069)

F/Y (t)	x = t - 2061/062	Trend value
2064/065	3	98
2065/066	4	80
2066/067	5	62
2067/068	6	44
2068/069	7	26

Appendix VI
QUESTIONNAIRE

Supplementary Questionnaire

A. Herbs Production and Processing Company Limited

Name of the Respondent:

Position:

Department:

1. What types of products produced by your company?
a) Machine b) Medicine c) clothes d) Others
2. Please list out the inventory of raw materials of your company?
a) b)
c) d)
3. Where do raw materials purchase?
a) Local market b) Domestic market c) Foreign market
4. What was the safety stock of the company of different raw material from F/Y 2059/60 to 2063/064?
5. Do you have any techniques of inventory control in your company?
a) Yes b) No c) Others
6. If yes, which type of technique were used?
a) b)
c) d)
- 7) What is the process of purchasing inventories?
a) Quotation b) tender
c) Contract d) others
8. How much lead-time is taken for raw material purchase?
a) 5 days b) 10 days c) 15 days d) others
9. Which inventory policy is adopted by your company?
a) EOQ b) ABC analysis c) Bin cards d) Others
10. How much raw material was consumed by the company from F/Y 2059/060 to 2063/064?

B. National Trading Limited

Name of the Respondent:

Position:

Department:

1. What type of goods purchased by your company?
a) b)
c) d)
2. Please list out the inventory of goods of your company?
a) b)
c) d)
3. Where do good purchase from?
a) Local market b) National Market
c) Foreign market d) All of them
4. How many annual demand of goods from F/Y 2059/060 to 2063/064?
.....
5. Do you have any techniques of inventory control in your company?
a) Yes b) No c) Others
6. If yes, which type of technique were used?
a) b)
c) d)
- 7) What is the process of purchasing inventories ?
a) Quotation b) tender
c) Contract d) others
8. How much lead-time is taken goods purchase?
a) 5 days b) 10 days c) 15 days d) others
9. Which inventory policy is adopted by your company?
a) EOQ b) ABC analysis c) Bin cards d) Others
10. What was the inventor of the company each year from F/Y 2059/060 to 2063/064?
.....

BIBLIOGRAPHY

Books

- Adam, Everette E. & Ronald, Ebert J. (1993). *Production and Operation Management*. New Delhi: Prentice Hall of India Pvt. Ltd.
- Chase, B. Richard and Aquivio, Nicholas J. (1973). *Production and Operation Management*. Georgetown Ontario: Irwin-Dowsay Ltd.
- Chaudhary, Dr. S.R. Roy (1999). *Accounting Theory and Management Accounting*. New Delhi: S. Chand & Sons Company.
- Dangol, Ranta Man (2059). *Accounting for Financial Analysis and Planning*. Katmandu: Taleju Prakashan.
- Goal, B.S. (1992). *Production and Operation Management*. India: Pragati Prakashan.
- Goyal, M.M. & B.S. (1992). *Production Management*. India: Pragati Prakashan.
- Goyal, M.M. and S.N. (1993). *Principals of Management Accounting*. Agra: Shahity Bhawan.
- Hampton, J.H. (1990). *Financial Decision Making Practice*. New Delhi: Prentice Hall of India Pvt. Ltd.
- Horngreen, Charles T. (2002). *Introduction to Financial Accounting*. Singapore: Pearson Education Inc.
- Jain, S.P. and Narang, K.L. (1994). *Advanced Accountancy*. New Delhi: Kalyani Publisher.
- James, C. Van Horne (1979). *Financial Management and Policy*. New Delhi: Prentice Hall of India Pvt. Ltd.
- Jawahar Lal (1996). *Cost Accounting*. (2nd Edition). New Delhi: Tata McGraw-Hill Publishing Co. Ltd.
- Killeen, Lousis M. (1969). *Techniques of Inventory Management*. USA: American Management Association.
- Larson, K.D. (1997). *Financial Accounting Principles*. New Delhi: Tata McGraw Hill Publishing Co.

- Magee, F. John (1985). *Production Planning and Inventory Control*. Tokyo: McGraw Hill.
- Pandey, I.M. (1993). *Financial Management*. New Delhi: Vikash Publishing House Pvt. Ltd.
- Ross, H. Jonson and Pool, R. Winn (1979). *Quantitative Methods for Management*. New York: American Association.
- Sahajanha, S.K. and Datta, Subir (1997). *Theory and Practice of Cost Accounting*. New Delhi: S. Chand & Company.
- Sharma, R.K. and Gupta, Shashi K. (1995). *Management Accounting Principles and Practice*. India: Kalyani Publishers.
- Shrestha, Manhar Kumar (2037). *Financial Management: Theory and Practice*. Katmandu: CDM, T.U.
- Star, Martin K. and Devid, W. Miller (1977). *Inventory Control: Theory and Practices*. New Delhi: Prentice Hall of India, Pvt. Ltd.
- Western, J. Fred and Eugene F. Bringham (1981). *Managerial Finance*. Tokyo: The Dryden Press.

Reports and Newspapers

- Agrawal, G.R. (1980). *Management in Nepal*. Katmandu: CEDA, T.U.
- Bajracharya, Puskar (1983). *Management Problems In Manufacturing in Nepal*. Katmandu: CEDA, T.U.
- CCC (2033). *Study Report of Bansbari Lather and Shoes Factory*. Government of Nepal.
- I.S.C. (2036). *Performance Report on Biratnagar Jute Mill Ltd*. Government of Nepal.
- National Trading Limited (1986). *National Trading Limited: An Introductory Profile*. Teku: National Trading Limited.

Dissertations

- Bajracharya, Samarna (2003). *A Study on Financial Position of National Trading Limited*. An Unpublished Master Degree Dissertation, Faculty of Management, T.U.

- Baral, Puspa Raj (1996). *Inventory Management: A Case Study of Gandaki Noodles Pvt. Ltd.* An Unpublished Master Degree Dissertation, Faculty of Management, T.U.
- Bhandari, Gopi (1993). Profit Planning in Nepal. *Case Study of Royal Drug Limited.* An Unpublished Master Degree Dissertation, Faculty of Management, T.U.
- K.C., Parkash (2008). *A Comparative Study on Inventory Management: A Case Study of Dabur Nepal Pvt. Ltd. and Unilever Nepal Ltd.* An Unpublished Master Degree Dissertation, Faculty of Management, T.U.
- Pandey, Laxmi (2000). *Inventory Management: A Case Study of Gorkhapatra Corporation.* An Unpublished Master Degree Dissertation, Faculty of Management, T.U.
- Pant, Dinesh Kumar (1999). *Impact of Inventory Over the Profit: A Case Study of Gorkhapatra Corporation.* Dissertation, Faculty of Management, T.U
- Panta, D.K. (1999). *Inventory Over the Profit: A Case Study of Gorkhapatra Corporation.* An Unpublished Master Degree Dissertation, Faculty of Management, T.U.
- Rawal, Ram Bahadur Chhetri (1999). *Inventory Management: A Case Study of Agriculture Input Corporation with Special Reference to Chemical Fertilizer in Katmandu Valley.* An Unpublished Master Degree Dissertation, Faculty of Management, T.U.
- Sharma, A.K. (1996). *Inventory Management: A Case Study of Royal Drugs Limited.* An Unpublished Master Degree Dissertation, Faculty of Management, T.U.
- Shrestha, Indra (2000). *Inventory Management of Manufacturing Industries in Nepal with Reference to Quick Foods.* An Unpublished Master Degree Dissertation, Faculty of Management, T.U.

Shrestha, K.N. (2000). *Inventory Management: A Case Study of Royal Drugs Limited*. An Unpublished Master Degree Dissertation, Faculty of Management, T.U.

Thapa, Jharana (2007). *Inventory Management of Bottlers Nepal Ltd*. An Unpublished Master Degree Dissertation, Faculty of Management, T.U.