Chapter I

INTRODUCTION

1.1 Background of the Study

In this age of globalization, tremendous industries are established with a motive of earning profit in both sectors i.e. private and government. They produce both tangible and intangible products. The industries which produce products such as beer, soft drinks, soap, sweet, noodles, etc. are called manufacturing industries and the industries that produce services such as hotel, consultancy, parlor, etc are call service industries. For both types of industries, inventory management plays a vital role to achieve their goal of profit maximization through the efficient management of both input and output as well.

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

Now, Nepal has adopted the policy of economic liberalization and privatization and also got the membership of World Trade Organization (WTO) through the globalization. For strengthening the economy of any country both private and public sector should play vital role. Now government is adopting foreign direct investment policy to encourage foreign investors. These policies create positive impact to the private manufacturing companies for industrial development. Due to the poor performance in term of capacity utilization, productivity, efficiency, and profitability of Nepalese public sector manufacturing company needs to

take competitive strategy, innovation, research, and development. To be alive in competitive environment of globalization today, industries can sustain their existence and growth only through a continuous process of research and development on goods and service

1.2 Introduction of inventory management.

Inventory is one of the most important assets to most of the organization. Larger percentage of total capital is invested in inventory. Inventory is vital element of the firms in the efforts to achieve desired sales level. Inventory can be defined as a stock of any kind of items reserved in a store for a certain period. It constitutes the most significant portion of current assets. Inventories are stocks of finished product of a company or components that make up the product.

The various forms in which inventories exist in a manufacturing company are raw materials, work in progress, and finished goods. Raw materials are those basic inputs that are converted into finished product through the manufacturing process. Raw materials inventories are those units which have been purchased and stored for future production. They represent product that need more work before they become finished product for sale. Finished goods inventories are those completely manufactured products, which are ready for sale. Stock of raw materials and work in progress facilitate production while stock of finished gods is required for smooth marketing operation. Thus, inventories serve as a link between the production and consumption of goods.

Inventory management involves planning of the optimum level of inventory 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 are interrelated and cannot be looked in isolation. (Agrawal, 2000; p. 238)

1.3 Introduction of J. K. Soap & Chemicals Industries Pvt. Ltd.

J. K. Soap & Chemicals Industries Pvt. Ltd. is a manufacturing company which was established on 24th Falgun 2054 under the Company Act 2049. It started its production from the factory which was situated in Mangalapur, Rupandehi with initially authorized capital of Rs. 35,34,90,800 and issued and paid up capital of Rs. 4,38,00,000. The main shareholders of this company are Ashok Kumar Kasaudhan and Satish Kasaudhan. The main objective for establishment of this company is to provide best quality product at a reasonable price all-round of the country. This company is producing different varieties of soaps. Basically it has classified its production into three types. They are laundry soap, detergent soap, and bathing soap. Rupa 72%, Kiran, Gagan, Rupa washing powder and other bathing soaps are the main product of the company. These products are marketed in the country, Nepal.

For the production of different types of soaps, different types of raw materials are used like palm acid oil, palm fatty acid oil, soap stone powder, salt, caustic soda, and soap color. All these raw materials are imported from neighboring as well as other third countries like India, Malaysia, China, and Australia. In the initial years of establishment, it had sold Rs. 8020233 value of soaps which increased to Rs. 155876967.63 value of soaps in fiscal year 2067/68.

For distributing the soaps all-round places of Nepal and increasing products sales, various dealers are available at different places like Pokhara, Narayanghaat, Kathmandu, Baglung, Surkhet, Nepalgunj, Biratnagar, Birgunj, and Siraha. The company had given prime importance to its quality product for which it had established well equipped laboratory to assess the quality of raw materials as well as finished products.

1.4 Statement of the Problem

Inventory is an essential element to the organization for generating profit. Generally inventory management covers from procurement of inventory to its distribution. So, how much to purchase? When to purchase? By which supplier should we purchase? How to purchase? We have to consider all these questions seriously. After procurement of inventories we must consider how they are well stored or maintain quality.

Inventory management has a significant role in manufacturing organization as well as service organization. In general, every business firm should keep the stock so that they can get them whenever they require. But both excessive and inadequate inventories are not desirable. The main aim of the inventory management is to maintain optimum level of inventory. The optimum level of inventory lies between two danger points of excessive and inadequate inventories. Excessive inventories indicate overinvestment which creates the problem of unnecessary tie up of the firms fund; excessive costs, the risk of liquidity and so on although it saves the cost on trade discount. Similarly inadequate inventories are also dangerous. Inadequate raw materials and work in progress interrupts frequent production and insufficient finished goods do not meet the demand of customers regularly which is permanent to the firm because customers shift immediately to competitor's goods. Therefore, both have negative effect in profitability of the organization.

For the success of the unit inventory management takes important role because the cost of inventory directly affect the profitability of industry, but in Nepal least attention has been given to this important segment.

The research questions about the problem of the study are given below:

1. What kind of inventory management system is being followed by J. K. Soaps & Chemicals Industries Pvt. Ltd.?
2. What should be the optimum level of inventory to reduce inventory management cost?
3. What kinds of problems are faced by J. K. Soaps & Chemical Industries Pvt. Ltd. while conducting inventory management system?
4. What would be the impact of inventory management on the profitability of the company?

1.5 Objectives of the Study

The main aim of the study is to identify the underlying constraints in existing inventory management and control system and their impact on the profitability of J.K. Soaps & Chemicals Industries Pvt. Ltd. the major objectives of the study are given below.

1. To examine the existing inventory management system followed by J.K. Soaps & Chemicals Industries Pvt. Ltd.
2. To analyze the techniques used by the company to determine level of inventory.
3. To identify the optimum level of inventory to reduce inventory management cost.
4. To identify the inventories and their consequences on profitability of J.K. Soaps & Chemicals Industries Pvt. Ltd.

1.6. Significance of the Study

Inventory management is one of the most important functions in an organization. No any organization can achieve its goal without effective inventory management. Only effective inventory management can help organization to increase the profit. A little bit change in cost of inventory can bring a great change in the firm's profitability.

Inventory management is an important concern for all types of the business. Every business organization however big or small has to maintain some inventory. Inventory helps the company quickly responding to the customer demands which is an important element of competitive strategy. Inventories of finished off correct items to meet the market at the different point of the time within a reasonable, response time play an important role in a company's ability to compete in the market. Inventories of raw materials or partially processed goods can help a company complete the production cycle in a much shorter time. Therefore, it is said that inventory for any organization is necessary evil.

It is not hidden from anyone that most of Nepalese organization are suffering from poor inventory management. It is rare case that a business can operate in the absence of inventories. In practice, it is usually found necessary to maintain inventories of raw materials; semi finished goods and finished goods. It has already been started that inventory, plant capacity and labor can be regarded as interchangeable within limits. Generally this study is based on inventory management in J.K. Soaps & Chemicals Industries Pvt. Ltd. the conclusion coming from this study will be useful to J.K. Soaps & Chemicals Industries Pvt. Ltd. as well as other print media. Other researchers will get benefit from this study.

1.7 Limitation of the Study

Each research study has its own limitation. The study will have following limitations:

1. The study is concentrated on only the area of inventory management of J.K. Soaps & Chemicals Industries Pvt. Ltd.
2. Since this is the case study, the conclusion derived from the study is not applicable in all types of organizations.
3. This study covers only a period of 5 years (2063/64 to 2067/68).
4. The study is based on data provided from organization and other available resources. Hence this study is based on secondary data as well as primary data.
5. It is not a comparative study of similar nature undertaking.

1.8 Organization of the Study

This study is divided into five different chapters which are given below:

a. Introduction

The first chapter consists of the introduction of the study, statement of the problem, objectives of the study, significance of the study, methodology used, limitation of the study, and scheme of the study.

b. Review of Literature

The second chapter can be divided into two parts. The first part is concerned with review of the concepts, theory of inventory management and framework from various books, journal and articles. The second part reviews previous related studies on inventory management.

c. Research Methodology

This chapter deals with research design, population and sample, nature and sources of data, data gathering procedure and tools and technologies used for gathering data.

d. Presentation and Analysis of Data

This chapter consists of presentation and analysis of data used in the study. This is the main body of the study which is presentation in the tabular and other form. Major findings are drawn after analysis and presentation of the data.

e. Summary, Conclusion and recommendation

This chapter consists of summary, conclusion, and recommendation of the study.

Besides these, bibliography and appendixes will be attached at the end of the study.

Chapter II

REVIEW OF LITERATURE

2. Review of Literature

This chapter deals with review of literature regarding inventory management. Only limited number of studies has been conducted in the field of inventory management, but still the inventory management of J.K. Soaps & Chemicals Industries Pvt. Ltd. has been studied. Therefore, the researcher is not able to find any literatures relating to this study. This chapter is mainly concerned with the conceptual framework and review of literatures.

2.1 Conceptual Review

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

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

2.1.1 Inventory Management

The term inventory refers to assets, which will be sold in future in the normal course of business operations. The assets that the firm stores as inventory in anticipation of need are raw materials, work in progress (semi finished goods) and finished products.

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

a) Raw materials

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

b) Work-in-progress

A manufacturing company must maintain a certain amount of inventory during the production, the inventory is known as work-in-progress. Work-in-progress is materials they have been partly fabricated, but are not yet completed. Work-in-progress inventory is strongly

influenced by the length of the production period, which is the time between placing the raw materials in production and obtaining the finished product. Decreasing the production period can increase inventory turnover. One means to accomplishing this is a new technique such as just-in-time inventory management. Another means is to buy items rather than make them.

c) Finished products

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

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

Any sort of item that a firm kept in meeting the future requirement of production and sale is called inventory. The basic reason for holding inventory is to keep up the production activities unhampered. It is neither physically possible nor economically justifiable to wait for the stocks to arrive at the time when they are actually required. Therefore, keeping of inventory is must for the efficient working of business unit (Jain and Narang: 194; pg. 109)

Therefore, inventory management is mainly concerned with minimizing investment on inventory on one hand and minimizing cost of inventory management on other hand. Both physical as well as financial dimension of inventory should be managed effectively. The main duty of top level management is formulating plan and polices that will be helpful to main optimum level of inventory investment for achievement of desired goal.

2.1.2 Objectives of Inventory Management

Main objectives of inventory management are:

a. To maintain large size of inventory for efficient and smooth production and sales.\
b. To maintain a minimum investment in inventories to maximize profitability.
c. Continuous supply of raw materials without obstruction for smooth production operation.
d. Provide enough raw materials to cope with the situation when there is lack of raw materials supply and price change in future.
e. Maintain enough finished goods inventory for effective market operation and customer services.
f. To minimize carrying cost and time.

2.1.3 Needs and Importance of Inventory Management

Inventory management plays a vital role in any organization. Inventory is the most significant part of current assets of huge trading corporation. Inventory consists of major element on the working capital of many business undertaking and accordingly requires substantial investment.

The need to be

i) Investment in inventory minimized.
ii) Desired inventory level can be maintained for something production operation and customer satisfaction increase.
iii) Total inventory cost is minimized.

2.1.4 Procedure of Inventory Management

Mainly inventory management begins with purchasing storekeeping and issuing and pricing.

2.1.4.1 Purchasing

Purchasing to a manufacturing company is of extreme importance because it has its own bearing on every vital factor concerning to the manufacture i.e. quantity, quality, efficiency, economy, prompt delivery, volume of production, etc. It is the scientific purchasing that can save much money, time, and efforts of the management.

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

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

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

2.1.4.2 a. Objectives of Purchasing

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

a. Procurement of required quality and quantity of materials at the best price not necessarily at the lowest price.
b. Procurement of materials which best suits the product and the purposes for which they are intended.
c. Purchasing for time utility by schedule, sufficiently in advance of the demands of the production department so that the production work shall not suffer due to lack of raw materials.
d. Buying the quality, which is neither too much that involves belonging of the capital nor too little that holds up the regular supply for production.
e. Improvement of the product with reference to quality and distribution by means of selection of adequate materials.
f. Maintaining continue supply to ensure production schedule at a minimum investment.
g. Avoidance of duplication of materials, leading to waster of materials and equipment.
h. Maintenance of company competitive position in the market by having company's quality standards in accordance with the demands of the consumers.
i. Creation of goodwill for the company through dealings with supplies.
j. Developing fullest cooperation and coordination maintaining internal relationship among various departments of the company.

2.1.4.2 b. Purchase procedures

The main steps in purchasing may be listed as follows

i. Purchase requisition
ii. Decision of purchase
iii. Study of market condition and search of supply
iv. Selection of vendors
v. Purchase order
vi. Receiving materials

2.1.4.2 Store Keeping

Materials form a high percentage of the cost of production of product. It is therefore necessary to have a close watch in the proper use of the materials. The best method of maintaining materials properly is store keeping. Store keeping is a service function in a manufacturing concern, which deals with the physical storage of goods under the custodian of well-trained and experienced person termed as storekeeper. Raw materials are usually known as stores and the place where such stores are kept is known as storeroom. Store keeping is that aspect of inventory control, which is concerned with the physical storage of goods. The responsibilities of store keeping management are too receive materials to protect them in storage from the materials in the right quantities at the right time to the right place and provide these services promptly and at leas cost (Maynard, 1992P pg. 90)

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

Objectives of Store Keeping

i) Receiving, handling and issuing goods economically and efficiently.

ii) Using the storage available, space and labor effectively.

iii) Protection of all goods in stores against all losses from fires, theft, and obsolesce.

iv) Minimizing the investment on inventories.

v) Maintaining regular supply of raw materials at all times when properly authorized.

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

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

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

b. Store Ledger: This ledger is kept in the costing department and is identical with the bin card except that receipts issues and balanced are shown along with their money values. This contains an account for every items of stores and makes a record of the receipts, issues and balances, both in quantity and value. Thus, this ledger provides the information for the pricing of materials issued and the money value of any items of each item of stores (Jain and Narang: 1991; pg. 237-239)

2.1.4.3 Issuing and Pricing

Materials should be issued against materials requisition slip. The prices of the issues can be determined on the basis of cost price or market price. The price always changes in accordance with market situation. There are various methods followed by costing department for pricing the materials issued. The pricing can be done with any of the following methods:

1. FIFO
2. LIFO
3. Average cost method
4. Weighted average method
5. Market price method
6. Standard price method

All these methods have their own advantages and disadvantages although they have significant role for efficient inventory management especially its financial dimensions.

2.1.5 Cost Associated with Inventory

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

i) Holding Cost/Carrying Cost/Explicit Cost

Cost incurred for maintaining a given level of inventory is called carrying cost. Carrying cost varies with inventory size. This behavior is contrary to that ordering cost which decline with increase inventory size (Bishwakarma: 1994; pg. 39)

The carrying cost includes the cost incurred in the following activities:

a. Opportunity cost or cost of capital
b. Warehousing cost
c. Handling cost
d. Clerical and staff
e. Insurance and taxes
f. Deterioration, obsolesce, and spoilage.

Carrying cost is the first category of inventory management cost which is generally associated proportionally with the average value of inventory. The total carrying cost is calculated as follows:

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

where,

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

P = Price per unit of inventory

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

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

ii) Ordering Cost

Ordering cost is the entire cost of acquiring raw materials. Ordering cost increases with the number of order. Thus, more frequently is the inventory purchased higher the firm's ordering cost. On the other hand, if the firm maintained large inventory levels there will be few order placed and ordering cost will be relatively small. Thus, ordering cost decreased with increasing size of the inventory. Thus ordering cost decreases with increasing the size of inventory. The ordering cost includes the cost incurred in the following activities:

a. Purchase requisition
b. Purchase order
c. Transportation

It is the second category of inventory maintenance cost. Generally this cost is fixed in nature with some exception. This cost involves both fixed and variable costs assuming the ordering cost (O) if fixed per order, the total ordering cost is calculated simply by multiplying 'O' by the number of times to be ordered per year (Pradhan: pg. 181). Therefore, total ordering cost is calculated as follows:

$$\text{Total ordering cost (TOC)} = (O)(N)$$

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

where,

O = Cost of placing an order

N = Number of times to be ordered per year

R = Annual requirement

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

iii. Safety Stock Cost/Stockout Cost

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

TCC = (C%) (P) (AI)

where,

C% = Percentage of cost of carrying inventory

P = Price per unit of inventory and AI = Average inventory

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

Cost of safety stock (CSS) = (C%) (P) (S)

Now we can calculate the total cost of maintaining inventory (TCMI) by summing up all the cost. We can get TCMI by combining TCC, TOC and CSS (Pradhan: pg. 182)

TCMI = TCC + TOC + CSS or

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

where, TCMI = Total cost of maintaining inventory

TCC = Total carrying cost

TOC = Total ordering cost

CSS = Cost of safety stock

C% = Percent of cost of carrying inventory

P = Price per unit of carrying inventory

AI = Average inventory

N = Number of orders made during the year

S = Safety stock

O = Cost of placing order

2.1.6 Techniques of Inventory Management

In managing inventories the firm's objectives should be in consonance with the wealth maximization principle. To achieve this firm should determine the optimum level of inventory. Efficiently controlled inventories make firm flexible. Inefficient inventory control results in unbalanced inventory and inflexibility. The firm may be sometimes out of stock and sometimes may pile unnecessary stocks such situation increases the level of investment and makes the firm unprofitable.

To manage inventories efficiently answer to the following two questions should be sought:

i. How much should be ordered?
ii. When should be ordered?

The first question, how much to order, relates to the problem of determining Economic Over Quantity (EOQ) and is answered by analyzing cost of maintaining various levels of inventories. The second question when to order arises because of uncertainty with replenishing time and is a problem of determining the reorder level (Pandey: 1989; pg. 395)

2.1.7 Inventory Management System

To manage its inventory effectively a firm should use systems which are as follows:

2.1.7.1 Economic Order Quantity

The question of how much to be ordered can be solved by the EOG technique. It always tries to balance the ordering cost and handling costs., it In other words suggests to the management to order those quantity which would be least expensive.

This inventory control technique is widely used these days in many countries irrespective of developed or developing nature. This model

determines the optimal order quantity of an individual item of inventory given its forecasted wage, ordering cost and carrying cost (Pandey: 1989; pg. 395)

Ordering and Carrying Cost

The optimum inventory size is commonly referred to as economic order quantity. It is that size at which annual total cost of ordering and holding are minimum. We can follow three approaches – the formula approach, trial and error approach and graphic approach to determine the economic order quantity (EOQ). We assume the total annual demand is known with certainty and usage of material is steady. Also ordering cost pre-order and cost per unit are to be constant (Pandey: 1993; pg. 759)

To determine EOQ, different approaches have been illustrated below respectively

I. Formula Approach

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

where,

EOQ = Economic Order Quantity

R = Annual requirement

O = Ordering cost per order

C = Carrying cost per unit

Illustration

Total requirement (R) = 2000 units

Ordering cost (O) = Rs. 80 per order

Carrying cost (C) = Rs. 2 per unit

We have,

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

$$= \sqrt{\frac{2 \times 2000 \times 80}{2}}$$

$$= 400 \text{ units}$$

II. Trial and Error Approach (Table Method)

Under this approach, calculation of total cost (ordering and carrying cost) at different order size, the economic order size is that inventory level which minimizes the total of ordering and carrying cost.

For this, we prepare table and try at different order size and compare inventory cost and select the minimum cost of lot size.

Table 2.1

Trial and Error Method

I	No. of orders $= N$ or $\frac{A}{Q}$	1	2	4	5	8	10
II	Order size = Q						
III	Average Inventory $= \frac{Q}{2}$						
IV	Ordering cost (Rs.) $= \frac{A}{Q} \times O$						
V	Carrying cost (Rs.) $= \frac{Q}{2} \times C$						
VI	Total cost = (IV+V)						

where,

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

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

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

Carrying cost = CCPU × AI

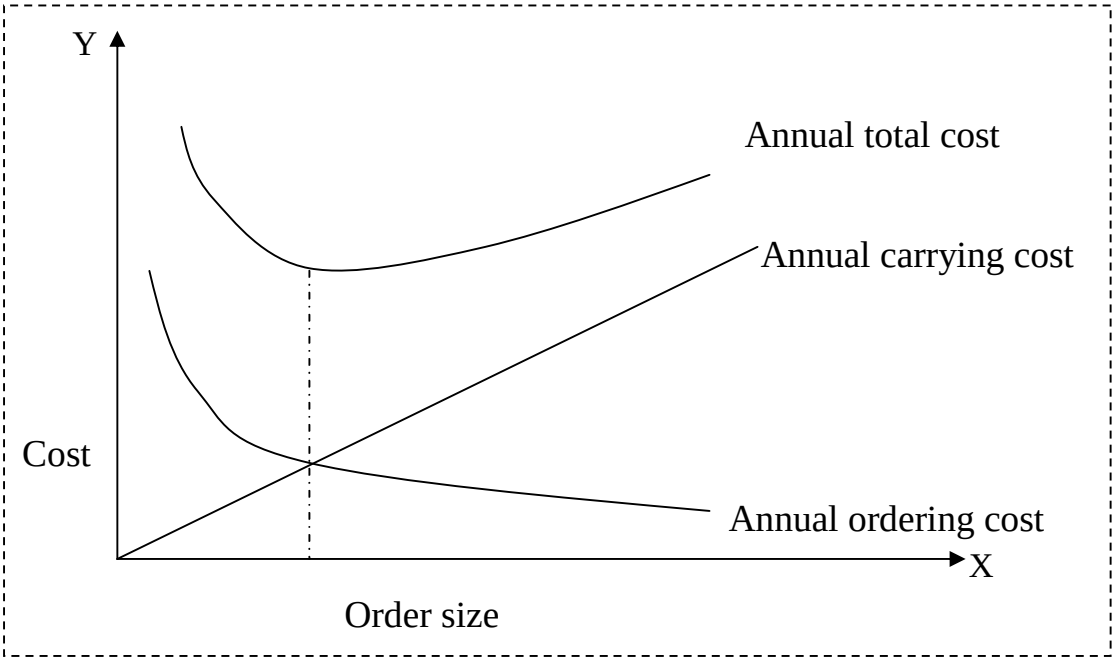
Ordering cost = No. of order × ordering cost per order

Total cost = Ordering cost + carrying cost

III. Graphic Approach

Total ordering cost curve is increased with the number of orders increase but it reduces the carrying cost and vice versa. The point where the total cost curve is minimized represents the EOQ.

Figure 2.1



The above figure clearly shows the general behavior of carrying cost, ordering cost and total cost. The total cost line represents the sum of the ordering cost and carrying cost for each order quantity. The minimum total cost occurs at point Q where total carrying cost equals the total ordering cost. These two costs react in opposite to each other for the changes in order size. As the order size goes on decreasing, the total carrying cost also decreases, but the total ordering costs goes on increasing with this. The opposite occurs when order quantity increases.

2.1.7.2 Important Assumption of Economic Order Quantity Model

Although EOQ is easier technique to solve the problem of how much to purchase at once, but it has some limitations/assumptions which are as follows (Elwoods: 1990; pg. 150)

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

2.1.7.3 Stock Level

The proper amount of safety stock to maintain depends on several things. The greater the uncertainty associated with forecasted demand for inventory the greater the safety stock of the firm will wish to carry, all other things remaining the same. Similarly, the greater the uncertainly of lead time to replenish stock, the greater the risk of running all of stock and the more safety stock the firm will wish to maintain all other things being equal. Another factor influencing the safety stock decision is the cost of running out of inventory. The company being out of raw materials and inventories results delay in production. How much does it cost? When production closes down temporarily? And where fixed costs are high this cost will also be quite high? The cost of running out of finished goods is customer dissatisfaction. It is because of low quality, no regular supply of goods and high price. It not only will lose immediate sale, but also endanger the future sale, if customers take their business elsewhere. Although this opportunity cost is difficult to measure, it must be recognized by management and should incorporate into the safety stock decision. The greater the cost of running out of stock, the greater the safety stock will be wished to maintain, all other things being the same.

The cost of carrying additional inventory is very costly to the firm. If it was not the case a firm could maintain whatever safety stock is required to avoid all possibility of running out of inventory. The greater the cost of carrying inventory the more costly it is to maintain a safety stock, all other things being equal. Determination of the proper amount of safety stock involves balancing the profitability and cost of stock out against the cost of carrying enough safety stock to avoid this possibility. Ultimately the question reduces to the probability of inventory stock out management is willing to tolerate (Vanhorne: 1990; pg.449).

Safety stock can be determined using statistical methods in different situations

1. On the situation when demand .rate varies:

Safety stock = lead time (maximum demand rate – average demand rate)

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

Safety stock = (maximum lead time × maximum demand rate) – (average lead time × average demand rate)

3. On the situation lead time varies demand uniform:

Safety stock: = (maximum lead time – average lead time) × demand rate.

2.1.7.4 ROL (Re-order Level)

Re-order point is the level of inventory at which order should be placed for delivery before depleting the inventory level to the zero so that we can get supply just before being stock out.

"The choice of appropriate point at which an order to replenish the inventory at which re-order should be placed is known as re-order level" (Goel: 1990; pg. 294)

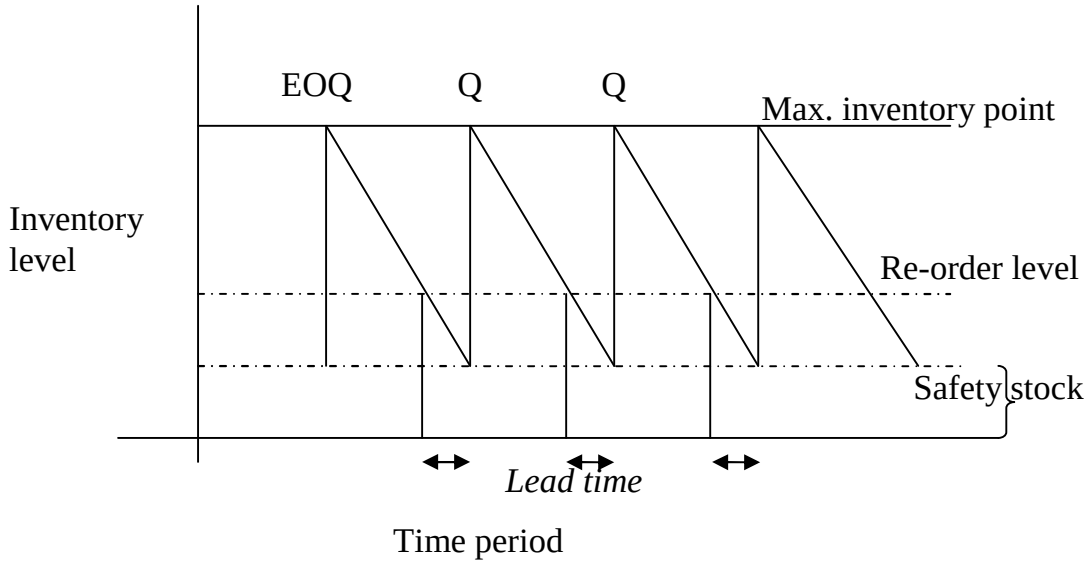
Hence, re-order point is calculated as follows:

ROL = Safety stock + Lead time × Average usage – goods in transit

If lead time is not zero and it known with certainty the re-order level is obtained which is presented with the help of following figure (graph)

Re-order Level with Lead Time

Figure 2.2



- ❖ Safety stock level – This minimum level of inventory may be expressed in terms of several days' production and sales.
- ❖ Lead time – This is length of time placing an order and receiving goods
- ❖ Usage rate – Daily usage at which the items are consumed in production or they are sold to consumer
- ❖ Goods in transit – Goods which have been ordered but not received. If new order must be placed before the previous order received goods in transit will build up.

2.1.7.5 Maximum stock level (Jain and Narang: 1995; pg. 231)

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

Overstocking should be avoided because of the following disadvantages:

a. Overstocking of materials unnecessarily blocks working capital which could be profitable lying un-utilized somewhere else.
b. Overstocking of materials will need more go down space so more rent will have to be paid.
c. There may be loss due to obsolesce on account of overstocking.
d. There are chances of deterioration in quality because large stocks will require more time before they are consumed.
e. There may be fear of depreciation in market values of the overstocking of materials.

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

i. Amount of capital available for maintaining stores
ii. Go-down space available
iii. Rate of consumption of the material during the lead time.
iv. The time lag between indenting and receiving of the materials.
v. Possibility of loss in stores by deterioration and evaporation.
vi. Cost of maintaining stores.

It can be calculated by following formula:

Maximum stock level = re-order level + re-order quantity – (minimum usage × minimum delivery time)

2.1.7.6 Minimum Stock Level (Jain and Narang: 1995; pg. 231)

This presents the minimum quantity of the material which must be maintained in hand all times. The quantity is fixed so that production may not be held up due to shortage of the material.

In fixing this level the following factors are taken into consideration:

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

It can be calculated by the following formula:

Minimum stock level = ROL – (normal consumption × normal re-order period)

2.1.7.7 Danger Stock Level

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

Danger stock level = average consumption × maximum re-order period for emergency purchase

2.1.7.8 Average Stock Level

Average stock level is calculated by following formula:

$$\text{ASL} = \text{Maximum stock level} + \frac{1}{2}\text{of re-order quantity}$$

2.1.7.9 ABC Analysis

Every business firm however big or small has to maintain some inventories. It is not desirable to keep some degree of control on all the items.

According to P.V. Kulkarni “Inventory control is a science based art of ensuring that enough inventory or stock is hold by an organization to met both its internal and external demand commitments.

The firm should pay maximum attention to those items which value is the highest. Thus the firm should be selective in its approach to control investment in various types of inventories. This analytical approach is called ABC analysis. The term ABC is known as always better control. It has shown following classification as being representation in many industries.

Table 2.2

ABC Analysis

Inventory classification	% of items	% of value
A	10-15	70-75
B	15-35	15-35
C	60-80	10-15

This table shows that A items includes low volume and high cost of all items with tightest level of control, but B items consists of moderate volume items and low cost of all items with higher of control of last items consist higher of value items and low total cost with low level of control.

The above graphic presentation indicates that item ‘A’ forms a minimum proportion. 15% of total units of all items but represents the highest value, 70%. On the other hand, item ‘C’ represents 55% of the total units and only 10% of the total value. Item B occupies the middle place.

Items ‘A’ and ‘B’ jointly represent 45% of the total units and 90% of the investment more than half of total units are item ‘C’, representing merely 10% of the investment. Thus, a tightest control should be exercised on item ‘A’ in order to maximize profitability on its investment. In case of item ‘C’ simple controls will be sufficient.

2.2 Inventory Valuation

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

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

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

2.2.1 Specific Identification Method

This method requires that each unit in inventory to be identified with the particular time it be purchased. This is easiest when the items have serial number or are distinguishable by module, color or size because account must be able to identify the particular item in order to find the date of purchase. This is suited to low volume high cost item such as automobile, boat, fur-coat, jewelry, etc. (Jain and Narang: 1995; pg. 262)

2.2.2 First In First Out (FIFO) Method

In this method the earlier lots of materials or goods purchased of goods manufactured are exhausted first and closing stock is out of the latest consignment received or goods manufacturing and is valued at the cost of such goods. In other words, cost of goods sold is calculated keeping in view the earliest lots exhausted on the presumption that units are sold in the order in which they are acquired. Similarly, the ending inventory is valued at the unit cost of most recent acquisitions, which means that the units assumed to be included in the cost of goods sold had been purchased earlier (Shrestha: 1980; pg. 161-164)

2.2.3 Last In Last Out (LILO) Method

As in first out method, latest consignments of materials are exhausted first under this method. Therefore, closing stock is valued at the cost of the earliest lots on the other hand the cost of goods sold is based on the cost of recently purchased goods (Jain and Narang: 1991; pg. 264)

2.2.4 Weighted Average Cost of Capital (WACC)

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

2.2.5 Inflation Price Method

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

2.2.6 Market Price Method

Market price either is the replacement price or the realizable price. The replacement price is used in case of items that are held in stock for use in production while realizable price is used in respect of the items that are kept in stock for sale. This method of valuation of stock is followed when the market value is lower than the cost so that possible losses may be provided for. This method can also be successfully used for the valuation for obsolete items of stock for a long time (Jain and Narang: 1995; pg. 270)

2.3 Just In Time Inventory

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

2.4 Review of Master's Degree Thesis and Previous Researcher

We have emphasized above on the review of text books only so attempt is also made to review the related studies conducted by different agencies, expert, scholars related with inventory management of manufacturing enterprises in Nepal.

Some studies have been made in t subject of inventory management, but few studies are reviewed in this chapter.

1. **Amrit Kumar Sharma Gaire (2000)** has conducted a research work on the topic of "***Inventory Management: A Case Study of Royal Drug Ltd.***" The main objectives of this study are identifying the problems underlying in the inventory management and control system of RDL. Other objectives of his studies are;
   - To assess the types of inventory maintained in RDL.
   - To examine the techniques being employed to mange the inventory in RDL.
   - To suggest proper inventory model to RDL bases on analysis.
   - To find out inventory position of RDL.
2. **Puspa Raj Baral** has also made study regarding "***Inventory Management; A Case Study of Gandaki Noodles Pvt. Ltd***." The main objectives of his study were to highlight the company's policies and objectives, functions and activities regarding inventory management. Finally he came to know that the factory is following neither economic order quantity model in its purchasing decision nor ABC analyze in inventory management. (Baral 1994)
3. **Mr. Surendra Shrestha** regarding ***Inventory Management of Gorkhapatra Corporation*** has conducted a case study. His main objective is to find out the inventory position of the organization

and to provide different suggestion regarding inventory management. He had conducted that Gorkhapatra had not applied any sort of available inventory management techniques to manage the inventory. In Gorkhapatra Corporation, it is difficult but not impossible to apply the inventory management techniques because of lack of certain data. (Shrestha -1998)

4. **Mrs. Radha Kumar Bilika** has studied about the ***Inventory Problems of Hetauda Cement Industry Ltd.*** to find the present inventory position and problems in managing inventory. After these studies, he revealed that there is no proper system for material purchase in t industry and the price and quantity of collected materials are fluctuating from year. The company is not following EOQ model in purchasing decision. The investment in inventory stock of HCIL is in large amount. The value of inventory is increasing from year to year. (Bilika-2003)
5. **Mr. Saroj Rijal** has conducted the research work on the topic of "***Inventory Management: A Case Study of Agriculture Input Corporation.***" His main objectives are to find present inventory position of AIC, to find out inventory management techniques used by AIC and to provide optimum suggestion regarding inventory management of AIC. (Rijal-2005).

Chapter III

RESEARCH METHODOLOGY

3. Research Methodology

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

Research methodology is the way to solve systematically about the research problem. It is the process of aiming at the solution of problem through t planned and systematic dealing with collection, analysis, and interpretation of fact and figures. The major objective of this study is to analyze the inventory management of J.K. Soaps & Chemicals Industries Pvt. Ltd. This study tries to focus on how the ideal inventories of the soaps and major raw materials could be maintained and how the procurement system could be economic and effective.

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

3.1 Research Design

The research design is the plan structure and strategy for investigation of the facts in order to arrive at conclusion. The plan is the overall scheme of program of research. It includes and outlines of what the investigator will do from writing the hypothesis and their operational implications to the financial analysis of data. This research design is planned to obtain the answer of research question through analysis of data. Research is systematic search for knowledge. It applies scientific methods to the study of universe.

The research design of this study will be descriptive as well as analytical. This study is primarily based on secondary data, but whatever necessary the primary data are also collected through interviews with officers and non-officers through personal interview.

3.2 Population and Sample

There are large numbers of manufacturing companies in Nepal, but only one company J.K. Soaps & Chemicals Industries Pvt. Ltd. has been selected for this study purpose. Even though various raw materials are used for producing different types of soaps in this company, but in data analysis only three materials are used for calculating EOQ and ROL.

3.3 Nature and Sources of Data

The sources of data for the study will be primary as well as secondary. Primary data were collected by conducting interview with the officers of company. The secondary data were collected from:

- Studying and analyzing the balance sheet
- Studying and analyzing available unpublished records
- Reports and financial statement of the factory

3.4 Data Gathering Procedure

- Secondary data were directly collected from various sources mentioned above especially from official records of the company as well as published financial statements.
- Primary data were collected with a view to support the information collected from various secondary sources. All the gathered data have been used according to need and requirement of this study.

3.5 Analytical Tools and Presentation Tools

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

3.5.1 Statistical Tools

a. Time Series Analysis

A simple trend of inventory turnover ratio of J.K. Soaps & Chemicals Industries Pvt. Ltd. has been presented which indicates the normal increasing or decreasing trend of ITR.

For forecasting the future requirements of raw materials in the company method of least square has been used. Mathematically, a time series is defined by the functional relationship, y = f(t) where y is the value of the variables under consideration in time 't'. The time 't' may be yearly, monthly, weekly, etc.

$y = a + bx$

Where,

x = fiscal year

y = annual requirement of inventory

a = intercept of value of y when x = o

b = slope of the trend line or the amount of change that comes in requirement for unit change in time.

3.5.2 Financial Tools

a. Economic Order Quantity

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

i. Formula Method
ii. Table Method
iii. Graphic Method

b. Re-order Level

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

c. Cycle Time

It is time span between one order and the second order. It is calculated as follows:

$$\text{Cycle time} = \frac{\text{Days in a year}}{\frac{\text{A}}{\text{EOQ}}}$$

where, A = annual requirement and EOQ = Economic order quantity

d. ABC Analysis

According to this control system, the inventories which have highest value and lower quantity, pay more attention. The firm therefore should classify inventories to identify which items should receive the most effort in controlling. The high value items are classified in ‘A’ and around be under t tight control ‘C’. Item C represent the high quantity, but the low value would be under simple control. Items ‘B’ falls between these two categories and require moderate attention of management.

e. Inventory Turnover Ratio

It tests h efficiency of current assets i.e. inventory to convert it into sales. It is calculated from the following formula:

$$\text{ITR} = \frac{\text{Cost of goods sold}}{\text{Average inventory}}$$

$$\text{Average inventory} = \frac{\text{Closing stock} + \text{Opening stock}}{2}$$

f. Standard Deviation

It is used to analyze the variability of inventory from central point. It is calculated from the following formula:

$$\text{Std. deviation } (\delta\delta = \sqrt{\frac{\Sigma\left(X - \bar{X}\right)^2}{N}}$$

where,

X = Annual sales turnover ratio

N = No. of observation

$\bar{X}$ = Mean of annual turnover ratio

g. Coefficient of variance (c.v.)

It is the best method of meaning the dispersion of the given variables. It is calculated with the help of mean and standard deviation.

$$\text{c.v.} = \frac{¢}{\bar{X}} \times 100\%$$

where,

¢ = Std. of annual ITR

$\bar{X}$ = Mean of annual ITR

Chapter IV

PRESENTATION AND ANALYSIS OF DATA

The basic objective of this study is to analyze the present practice of inventory management system in J.K. Soaps & Chemicals Industries. To achieve the said objective, collected data and information are analyzed in this chapter by applying inventory management tools and techniques.

4.1 Purchasing Procedure Practice in J.K. Soaps & Chemicals Industries

Purchasing is the first important function of inventory management. So it requires different types of raw materials such as palm acid oil, palmy fatty oil, soap stone powder, salt, caustic soda, and soap color for the production of different types of soaps.

J.K. Soaps & Chemicals Industries needs regular supply of different types of raw materials for the continuous production operation. Required raw materials for the factory are purchased by using following purchasing procedures.

4.1.1 Collection of Requisition

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

4.1.2 Decision of Purchase

On the receipt of the purchase requisition, the purchase department decides what and how much to buy?

The level of purchasing raw materials directly affects the investment on inventory and cost associated with inventory which

ultimately affects the profitability rate of the company. So the company should determine appropriate purchase quantity of raw materials to minimize the investment on inventory and cost associated with it. To cope with this situation company may apply the EOQ model to determine the appropriate purchase quantity o materials, but in J.K. Soap & Chemicals Industries EOQ model of inventory management is not in practice.

4.1.3 Selection of Suppliers

Required raw materials for the company are not locally available so the company has to import most of the raw materials from India, China, Malaysia, and Australia. For the selection of suppliers, company should invite bids or tenders from listed suppliers and on studying the terms of supply and the quality, quantity and price of goods supplier should be selected out of bidders or tenderizers. But sometimes company has imported required material directly from a registered supplier without inviting bids or tender by opening L.C.

4.1.4 Purchase Order

After selecting supplier, a purchase order is prepared by the purchase department and sent to the vendor authorizing him to supply a specified quality and quantity of materials at the stipulated terms, time, and place mentioned in it.

4.1.5 Receiving and Inspecting Materials

When materials are arrived they are received and checked by receiving clerk against the order placed by the purchasing department to vendor. After proper checking, materials are delivered into the store departments. On checking if any discrepancy is found as regards to quality and quantity, it is immediately referred to the purchasing

department to adjust the discrepancy, but sometimes the purchasing department has not tried to adjust the discrepancy as regarding to quality and quantity.

4.2 Store Control Device Practice in J.K. Soap & Chemicals Industries

Store keeping function includes the function of keeping the materials in the store and keeping their movements. The cost of materials holding in the store directly affects the total cost associated with holding inventories. To minimize the cost of holding materials in the store all company use different types of controlling devices like bin cards, store ledger and ABC analysis techniques, etc.

4.2.1 Bin Cards

J.K. Soaps & Chemicals Industries is using the bin cards in the form of loose sheets to keep the complete records of the receipt and issues of each item of materials in terms of quantity as well as balance quality. In the loose sheet each item of stores, minimum level, re-order level, re-order quantity are applied. So by seeing the loose sheet, the storekeeper can send the material requisition for the purchase of materials in time. Appendix 1 shows the sample of bin cards used in J.K. Soaps & Chemicals Industries.

4.2.2 Store Ledger

The company is maintaining store ledger to keep the complete record of each item of material purchase, issues and balance in terms of quantity as well as in terms of value. Appendix 2 shows a sample of store ledger used in J.K. Soaps & Chemicals Industries

4.3 Issuing Materials

Materials should be issued against the materials requisition slip. The pricing of the issues can be determined on the basis of cost price or market price. In case of J.K. Soaps & Chemicals Industries inventory of different stock is valued at cost price.

4.4 Annual requirement and annual purchase

The annual requirement and annual purchase of key raw materials of J. K. Soaps & Chemicals Pvt. Ltd. are given below.

4.5 Forecasted and Requirement of Inventory in J.K. Soaps & Chemicals Pvt. Ltd.

1. Annual Requirement and Purchase of Palm Acid Oil (in kg)

Table 4.1

Fiscal Year	Annual Requirement (AR)	Annual Purchase (AP)	Difference (AP-AR)
2063/64	1825000	1939000	114000
2064/65	2164000	2258000	94000
2065/66	1306000	1505000	199000
2066/67	1903000	2052000	149000
2067/68	2620000	2635000	15000

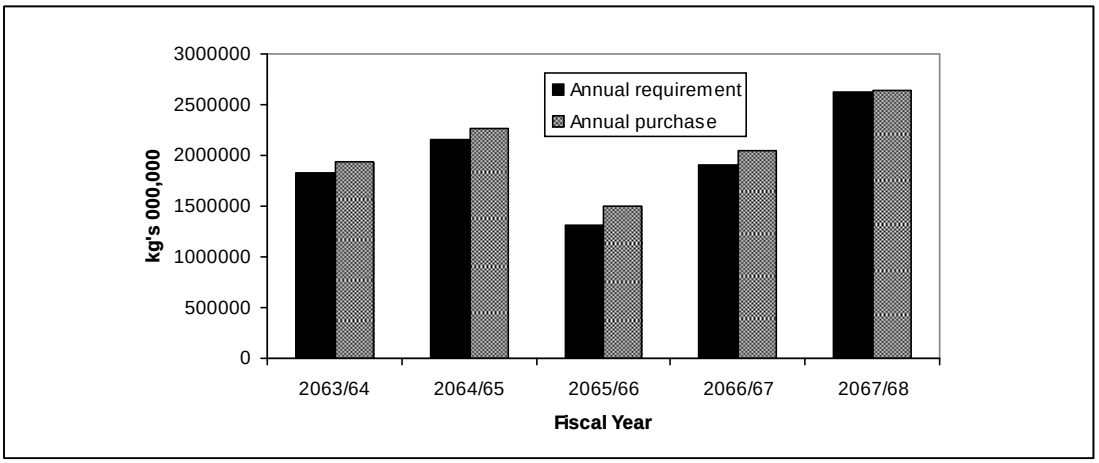
The table shows annual requirement and annual purchase made by the company is increasing or decreasing over the study period. If annual requirement of palm acid oil is compared with actual purchase, it is observed that the actual purchase always exceed the annual requirement of palm acid oil over the study. In F/Y 2063/64 purchase exceeds by 114000 kg, in 2064/65 it was 94000 kg, in 2065/66 it was 199000 kg, and

so on. So we can conclude that there is a need to proper management of inventory of palm acid oil in J.K. Soaps & Chemicals Industries.

From the above table, we can draw a multiple bar diagram which gives the comparative position of inventory requirement and purchase of palm acid oil in the company.

Annual Requirement and Purchase of Palm Acid Oil

Figure 4.1



Above figure gives the clear idea about the stock position of the palm acid oil in J.K. Soaps & Chemicals Industries. This gives the comparative position of annual requirement and purchase of palm acid oil.

2. Annual Requirement and Purchase of soap stone powder

Table 4.2

Fiscal Year	Annual Requirement (AR)	Annual Purchase (AP)	Difference (AP-AR)
2063/64	850000	900000	50000
2064/65	990000	1130000	140000
2065/66	900000	1010000	110000
2066/67	1030000	1050000	20000
2067/68	1120000	1130000	10000

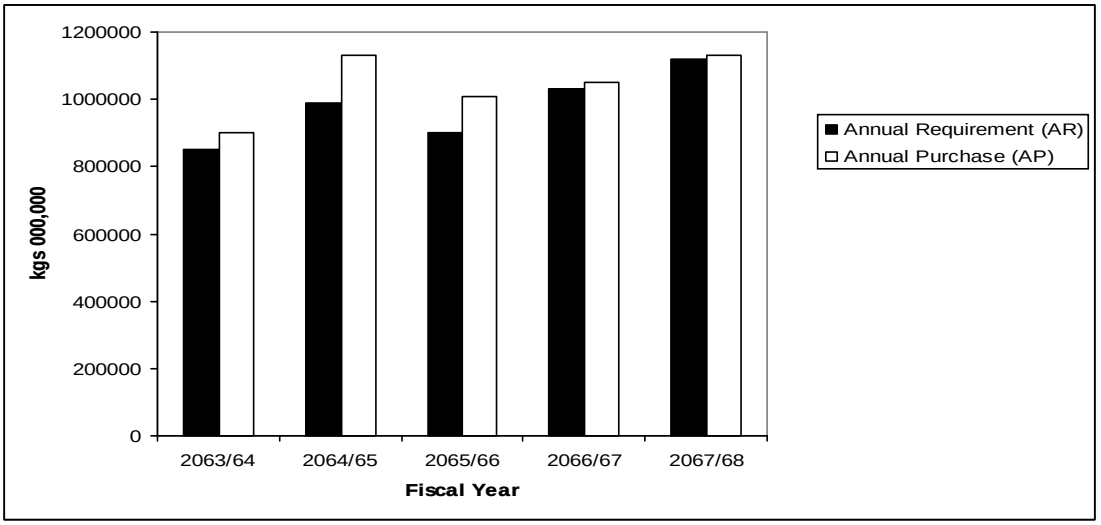
Source: Annual Reports

The table 4.2 shows the difference between annual requirement and purchase in the different fiscal year. The annual purchase of soap stone powder always exceeds from the annual requirement. In F/Y 2063/64 annual purchase of soap stone exceeded annual requirement by 5000 kg. In 2064/65 it was 140000 kg and so on.

Using the above table, we can draw a multiple bar diagram which shows the comparative position of inventory requirement and purchase of soap stone powder in the company.

Annual Requirement and Purchase of Soap Stone Powder

Figure 4.2



The above figure gives the clear idea about the stock position of the soap stone powder where purchase always exceeds in every fiscal year.

3. Annual Requirement and Purchase of Caustic Soda

Table 4.3

Fiscal Year	Annual Requirement (AR)	Annual Purchase (AP)	Difference (AP-AR)
2063/64	537500	600000	62500
2064/65	560000	655000	9500
2065/66	498000	530450	32450
2066/67	560000	600000	40000
2067/68	530000	540000	1000

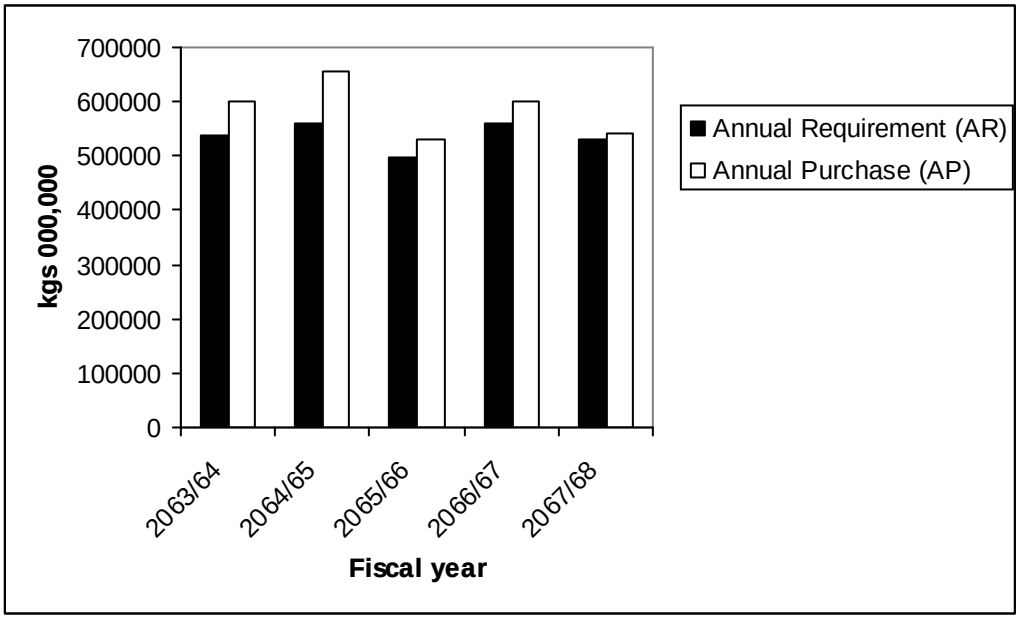
Source: Annual Reports

The above table gives the clear idea about the difference between annual requirement and annual purchase of caustic soda in different fiscal year and whether the stock increasing or decreasing over the study period. In fiscal year 2063/64 annual purchase of caustic soda exceeds annual requirement by 62500 kg , in 2064/65 it was 9500 kg, in 2065/66 it was 32450 kg, in 2066/67 it was 40000 kg and in 2067/68 it was 10000 kg.

It is also clear by the multiple bar diagram which gives the comparative position of inventory annual requirement and purchase of caustic soda in the company.

Annual Requirement and Purchase of Caustic Soda

Figure 4.3



The above figure shows the different stock position in every fiscal year of J.K. Soaps & Chemicals Industries Pvt. Ltd.

4. Annual Requirement and Purchase of Palm Fatty Acid Oil

Table 4.4

Fiscal Year	Annual Requirement (AR)	Annual Purchase (AP)	Difference (AP-AR)
2063/64	183000	197000	14000
2064/65	256000	450000	19400
2065/66	1090000	1199000	109000
2066/67	788000	948900	160900
2067/68	502000	526000	24000

Source: Annual Reports

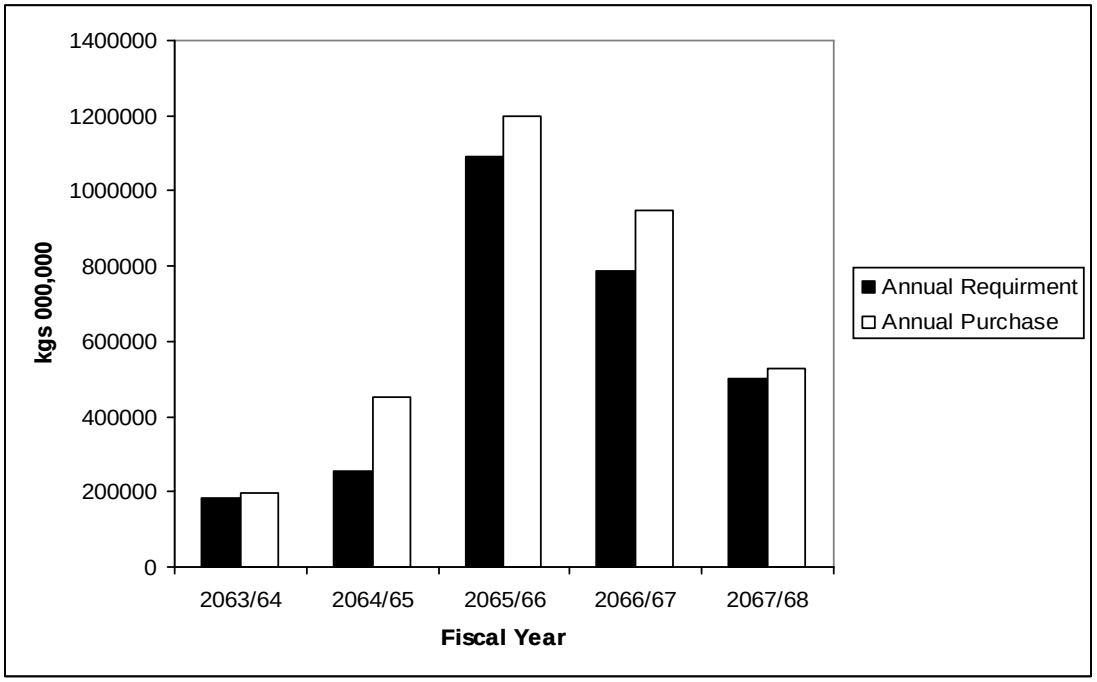
It shows the annual requirement and annual purchase of palm fatty acid oil in different fiscal year. It clears that annual purchase always exceed the annual requirement of palm fatty acid oil over the study. In

fiscal year 2063/64 annual purchase exceed by 14000 kg, in 2064/65 it was 160900 kg, in 2067/68 it was 24000 kg.

From the above table we can draw the bar diagram of palm fatty acid oil in the different fiscal year which shows the comparative position of inventory requirement and annual purchase.

Annual Requirement and Purchase of Palm Fatty Acid Oil

Figure 4.4



The above diagram shows the stock position in fiscal year. It also gives the exceed stock of purchase from requirement of palm fatty acid oil.

5. Annual Requirement and Purchase of Soap Color

Table 4.5

Fiscal Year	Annual Requirement (AR)	Annual Purchase (AP)	Difference (AP-AR)
2063/64	140000	160000	20000
2064/65	170000	180000	10000
2065/66	200000	225000	25000

2066/67	220000	240000	20000
2067/68	250000	272000	22000

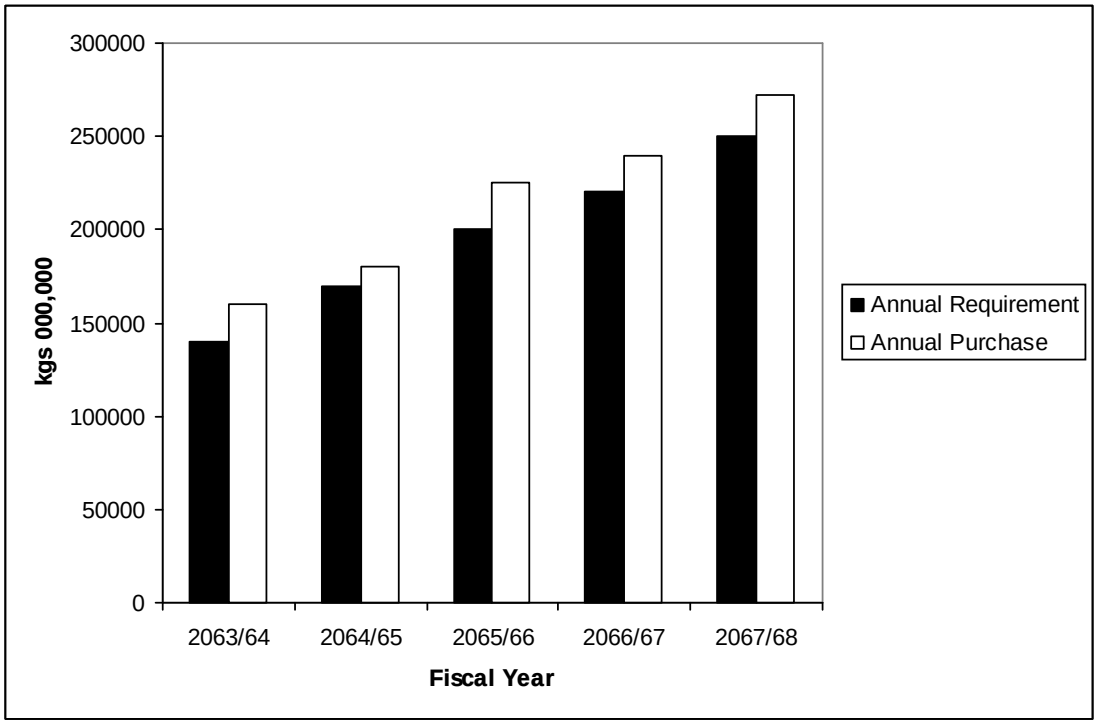
Source: Annual Reports

The above table 4.5 gives the different stock position of annual requirement and purchase determined by the company is increasing or decreasing over the study period. Annual requirement of soap color is less than annual purchase in every fiscal year. In fiscal year 2063/64 annual purchase exceed annual requirement by 20000 kg, in 2064/65 it was 25000 kg, in 2067/68 it was 22000 kg.

It is also clear by the multiple diagram of annual requirement and annual purchase of soap color.

Annual Requirement and Purchase of Soap Color

Figure 4.5



The above figure shows he stock position of annual requirement and annual purchase of soap color annual purchase always exceeds from the annual requirement.

6. Annual Requirement and Purchase of Salt (in kg)

Table 4.6

Fiscal Year	Annual Requirement (AR)	Annual Purchase (AP)	Difference (AP-AR)
2063/64	132000	140000	8000
2064/65	173000	205000	32000
2065/66	225000	240000	15000
2066/67	345000	375000	30000
2067/68	405000	416000	11000

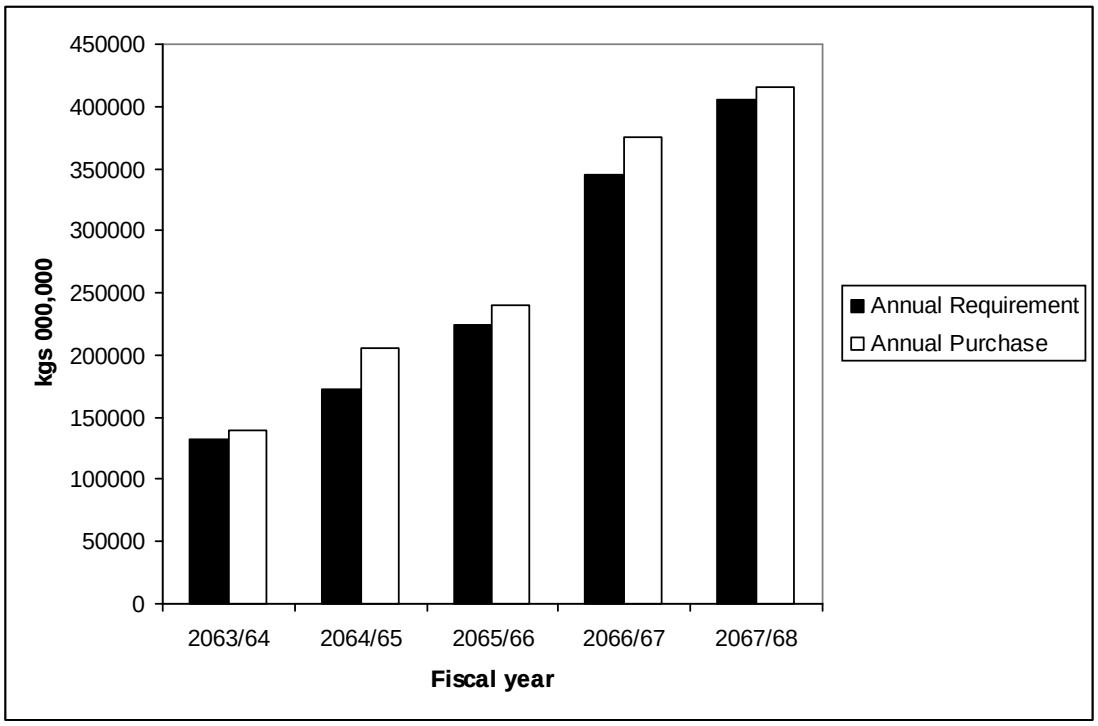
Source: Annual Reports

The table 4.6 shows annual requirement and annual purchase of salt in J.K. Soaps & Chemicals Industries Pvt. Ltd. If annual requirement of salt is compared with actual purchase made by the company shows that annual purchase always exceed the annual requirement. In fiscal year 2063/64 purchase of salt exceed by 8000, in 2064/65 it was 32000 kg, in 2067/68 it was 11000 kg.

Using the above table, we can also draw the multiple bard diagram of different stock position in the company. AR and AP of salt is shown in the following diagram.

Annual Requirement and Purchase of Soap Color

Figure 4.6



The above figure 4.6 shows the clear picture of exceeding annual purchase and annual requirement of salt in J.K. Soaps & Chemicals Industries Pvt. Ltd.

4.7 Forecasted requirement of inventories in J.K. Soaps & Chemicals Industries Pvt. Ltd.

From all the tables above, the annual requirement of inventory items have been forecasted for next five years using least square method of time series. The results are as follows:

It is given that,

$Y = a + bX$

For, palm acid oil

$Y_1 = 1564900 + 132900\,X$

Soapstone powder

$Y_2 = 804000 + 58000\,X$

Palm fatty acid oil

$Y_3 = 212800 + 117000X$

Caustic soda

$Y_4 = 541600 + 1500X$

Salt

$Y_5 = 40600 + 71800X$

Soap color

$Y_6 = 115000 + 27000X$

where, X + independent variable (fiscal years)

$Y_1 ..... Y_6 = \text{dependent variable i.e. annual requirement } of \text{ each inventory item taken as sample}$

By applying these least square equations, the forecasted values for annual requirement for the next five years i.e. 2063/64 to 2067/68 are obtained as below:

Forecasted Inventory Requirement

Table 4.7

S.N.	**Items**	**2063/64**	**2064/65**	**2065/66**	**2066/67**	**2067/68**
1	Palm acid oil	2362300	2495200	2628100	2761000	2893900
2	Soap stone powder	1152000	13210000	1268000	1326000	1324000
3	Palm fatty acid oil	914800	1031800	1148800	1265800	1382800
4	Caustic soda	541600	543100	544600	546100	5476000
5	Salt	471400	543200	615000	686800	758600
6	Soap color	277000	304000	331000	358000	385000

From the above table, the requirements for the palm acid oil for the next five years are 2362300 kg, 2495200 kg, 2628100 kg, 2761000 kg, and 2893900 kg respectively. It gives the increasing trend of annual requirement of palm acid oil in the future. Again for soap stone powder the forecasted requirements are 1152000 kg, 121000 kg, 1268000 kg, 132600 kg, and 1384000 kg respectively. It also gives the increasing trend of requirement of soap stone in the future. Like this annual forecasted quantities for the next five years for other annual requirements and so on.

In the above equation, it is clearly shown that the average change per year of palm acid oil 132900 kg, 58000 kg soap stone, 117000 kg palm fatty acid oil, 1500 kg caustic soda, 71800 kg salt and 27000 kg color. So growth rate of each items are positive, it gives the incising trend requirement in the company.

From the help of these forecasted requirements, company should be aware of over or under pressure of inventory. So it is necessary to realize by company that the requirement of each items were in increasing trend in the past, in the future it might also increase.

4.8 Inventory Management Analysis

Palm Acid Oil

A. Economic Order Quantity

Annual requirement = 1825000

Materials cost =1825000×28 = 51100000

Ordering cost per order

1.	L/C charge	= Rs. 4100
2.	Bank charge	= Rs. 1600
3.	Clerical staff	= Rs. 29000
4.	Transportation cost	= Rs. 105300
	Total	= Rs. 140000

Carrying cost

1. Insurance = Rs. 117000
2. Storage cost = Rs. 391695
3. Spoilage = Rs. 28000
4. Internet on capital = Rs. 150000

Total = Rs. 686695

Carrying cost per kg = $\frac{686695}{1825000} = 0.376$

1. Calculation of EOQ (Formula Method)

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

where,

EOQ = Economic order quantity

R = Annual requirement

O = Ordering cost per order

C = Carrying cost per kg

By fitting above mentioned data in EOQ formula,

$$EOQ = \sqrt{\frac{2 \times 1825000 \times 140000}{0.376}}$$

$$= 1165779.805$$

No. of order = $\frac{1825000}{1165779} = 1.56$

The above calculation shows that the economic order size should be 1165779 kg where the combination of carrying cost and ordering cost are minimum. So if the company wants to minimize the inventory cost the company should place an order of 1165779.8 kg. at a time or place two orders in a year.

2. Calculation of EOQ (Table Method)

Table 4.8

Showing order size, average inventory, ordering cost, carrying cost and total cost

No. of order	1	2	3	4	5
Order size (kg)	1825000	912500	608333	456250	365000
Average inventory	912500	456250	304166	228125	182500
Ordering cost (Rs.)	140000	280000	420000	560000	700000
Carrying cost (Rs.)	343100	171550	114366	85775	68620
Total cost (Rs.)	483100	451550	534366	645775	768620

The above table shows that the carrying cost, ordering cost and total inventory cost of respective order size and number of order. According to table, if the company placed only 1 no. of order in a year for 1825000 kg of palm acid oil, the ordering cost, carrying cost, and total inventory cost will be Rs. 140000, Rs. 343100, and Rs. 483100 respectively. If the company placed 2 no. of order in a year for 1825000 kg of palm acid oil by splitting two equal halves, the order cost, carrying cost and total inventory cost will be Rs. 280000, Rs. 171550, and Rs. 451550 respectively. If the company placed 3 no. of orders in a year for 1825000 kg palm acid oil the ordering cost, carrying cost, and total inventory cost will be Rs. 420000, Rs. 114366.6 and Rs. 534366.6 respectively and so on.

From the above table, the ordering cost (Rs. 280000) and carrying cost (Rs. 171550 at 2 no. of orders are nearly equal and it is the minimum cost of inventory (Rs. 451550). So the economic order quantity is 912500 kg and order to be placed in a year is 2. If the company placed only 1 no. of order in a year for 1825000 kg palm acid oil, total cost will be (Rs.

140000 + Rs. 343100) Rs. 483100 which exceeds by (Rs. 483100-Rs. 451550) Rs. 31550 than 2 no. in a year. If the company placed three numbers 3 no. of orders in a year for 1825000 kg palm acid oil by dividing 3 equal halves, the total cost will be (Rs. 420000 + Rs. 114366) Rs. 534366.6 than 2 no. of order in a year. Likewise if the company placed 4 and 5 nos. of order palm acid oil, the total cost of inventory will be maximized.

B. Re-order Level

Maximum usage rate = 7300 kg/day

Maximum lead time = 42 days

Working days = 250 days/year

Calculation of Re-order level (ROL)

ROL = Maximum usage rate × maximum lead time

= 7300 × 42

= 306600 kg

C. Cycle Time

$$\text{Cycle time} = \frac{\text{Annual working days}}{\text{No. of order}}$$

$$= \frac{250}{2}$$

= 125 days

From the above calculation when the level of inventory reaches to 306600 kg another new order should be placed. By the use of economic order quantity formula we have calculated the EOQ 912500 kg and number of order to be placed 2 times in a year. So the new order for 912500 palm acid oil should be placed after 125 days of the first order when the level of inventory reaches to 306600 kg.

Palm Fatty Acid Oil

A. Economic Order Quantity

Annual requirement = 502000

Materials cost = 502000 × 33 = 16566000

Ordering cost per order

1. L/C charge = Rs. 4000
2. Bank charge = Rs. 1500
3. Clerical charge = Rs. 28000
4. Transportation cost = Rs. 86500

   Total = Rs. 120000

Carrying cost

1. Insurance = Rs. 110000
2. Storage cost = Rs. 350000
3. Spoilage = Rs. 16500
4. Interest on capital = Rs. 90000

   Total = Rs. 566500

Carrying cost per kg $\frac{\text{Rs. } 566500}{\text{Rs. } 502000} 1.128 \text{ per kg}$

1. Calculation of EOQ (Formula Method)

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

where,

EOQ = Economic order quantity

R = Annual requirement

O = Ordering cost per order

C = Carrying cost per kg

By fitting above mentioned data in EOQ formula,

$$\text{EOQ} = \sqrt{\frac{2 \times 502000 \times 120000}{1.128}} = 326815.7$$

a) Calculation of no. of order to be placed in a year

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

$$= \frac{502000}{326815.7} = 1.536 \text{ i.e. } 2 \text{ times}$$

From the above calculation, it shows that the economic order size should be 326815.7 kg where the combination of carrying cost and ordering cost are minimum. So if the company wants to minimize the inventory cost the company should place an order of 326815.7 kg at a time or place 2 orders in a year.

2. Calculation of EOQ (Table Method)

Table 4.9

Showing order size, average inventory, ordering cost, carrying cost and total cost

No. of order	1	2	3	4	5
Order size (kg)	502000	251000	167333	125000	104000
Average inventory	251000	125500	836665	62700	52000
Ordering cost (Rs.)	120000	240000	360000	480000	600000
Carrying cost (Rs.)	385536	192768	128511.7	96384	79872
Total cost (Rs.)	505536	432768	488511.7	576384	679872

From the above table, it shows the carrying cost, ordering cost, and total cost of respective order size and no. or order. According to the table if company placed only 1 no. of order for 502000 kg palm fatty acid oil, the ordering cost, carrying cost and total cost will be Rs. 120000, Rs. 385536 and Rs. 505536 respectively. If the company placed 2 no. of order for palm fatty acid oil the ordering cost, carrying cost and total cost will be Rs. 240000, Rs. 192768, and Rs. 432768 respectively and so on.

From the above table, it is found that the relationship between two different costs is significantly opposite. The ordering cost increases/decreases with the number of order and carrying cost increases/decreases with the order size. When the no. of order increases the ordering cost increases, but the carrying cost decreases and vice-versa. Whenever these two costs reaches nearly equal, the inventory cost will be the lowest and the respective order size will be the economic order quantity.

From the above table 4.8, the carrying cost and ordering cost at 2 no. of order are minimum cost of inventory i.e. Rs. 432768. So the economic order quantity is 251000 kg and no. of order to be placed in a year is 2.

B. Re-order Level

Maximum usage rate = 2008 kg/day

Maximum lead time = 30 days

Working days = 250 days/year

Calculation of Re-order Level (ROL)

ROL = Maximum usage rate × maximum lead time

= 2008 × 30

= 60240 kg

C. Cycle Time

$$\text{Cycle time} = \frac{\text{Annual working days}}{No.\text{ of order}} = \frac{250}{2} = 125 \text{ days}$$

From the above calculation when the level of inventory reaches to 60240 kg another new order should be placed. By the use of EOQ table we have calculated the EOQ 251000 kg and number of order to be placed 2 times in a year. So the new order for 251000 palm acid oil should be placed after 125 days of the first order when the level of inventory reaches to 60240 kg.

Salt

A. Economic Order Quantity

Annual requirement = 405000 kg

Materials cost = 405000 × 23 = Rs. 9315000

Ordering cost per order

1. L/C charge = Rs. 3600
2. Bank charge = Rs. 1400
3. Clerical charge = Rs. 27000
4. Transportation cost = Rs. 83000

Total = Rs. 115000

Carrying cost

1. Insurance = Rs. 98000
2. Interest on capital = Rs. 80000
3. Storage cost = Rs. 223000
4. Spoilage = Rs. 19000

Total = Rs. 420000

$$\text{Carrying cost per kg} = \frac{\text{Rs. } 420000}{\text{Rs. } 40500} = 1.037 \text{ per kg}$$

1. Calculation of EOQ (Formula Method)

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

$$EOQ = \sqrt{\frac{2 \times 405000 \times 115000}{1.037}}$$

= 299710.56 kg

The above calculation shows that EOQ should be 299710 kg where the carrying and ordering costs' combination are minimum and also total inventory cost is minimum. So the company should place an order 299710 kg at a time 1 order in a year.

2. Calculation of EOQ (Table Method)

Table 4.10

No. of order	1	2	3	4	5
Order size (kg)	405000	202500	135000	101250	81000
Average inventory	202500	101250	67500	50625	40500
Ordering cost (Rs.)	115000	230000	345000	460000	575000
Carrying cost (Rs.)	209992.5	104996.2	69997.5	52498	41998.5
Total cost (Rs.)	324992	334996	414997	512498	616998

From the above table 4.9, the ordering cost (115000 kg), carrying cost (2099925) at 1 no. of order are nearly about equal and it is minimum cost of inventory i.e. Rs. 32499255. So the EOQ is 405000 and no. of order to be placed in a year is 1. If the company placed 2, 3, 4, and 5 no. of order, total cost will be increased. So the company should place 1 order in a year i.e. 405000 kg at a time where the company can minimize the total inventory cost.

B. Re-order Level (ROL)

Maximum usage rate = 1620 kg/day

Maximum lead time = 37 days

Working days = 250 days/year

Calculation of Re-order level (ROL):

ROL = Maximum usage rate × maximum lead time

= 1620× 37

= 59940 kg

C. Cycle Time

$$\text{Cycle time} = \frac{\text{Annual working days}}{\text{No. of order}}$$

$$= \frac{250}{1}$$

= 250 days

From the above, when the level of inventory reaches to 59940 kg another new order should be placed. By the use of EOQ table we have calculated the EOQ 405000 kg and no. of order to be placed 1 times in a year. So the new order for 405000 salt should be placed after 250 days of the first order when the level of inventory reaches to 59940 kg.

Soap Stone Powder

A. Economic Order Quantity

Annual requirement = 850000 kg

Materials cost = 850000 × 21.5= Rs. 18275000

Ordering cost per order

1. L/C charge = Rs. 4150
2. Bank charge = Rs. 1450
3. Clerical charge = Rs. 29000
4. Transportation cost = Rs. 100400

Total = Rs. 135000

Carrying cost

1. Insurance = Rs. 112000
2. Storage = Rs. 36800
3. Spoilage = Rs. 27000
4. Interest on capital = Rs. 103000

Total = Rs. 610000

Carrying cost per kg = $\frac{\text{Rs. } 610000}{\text{Rs. } 850000} = 0.717$ per kg

1. Calculation of EOQ (Formula Method)

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

where,

EOQ = Economic order quantity

R = Annual requirement

O = Ordering cost per order

C = Carrying cost per kg

By fitting above mentioned data in EOQ formula,

$$EOQ = \sqrt{\frac{2 \times 850000 \times 135000}{0.717}}$$

$$= 565365 \text{ kg}$$

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

$$= \frac{850000}{565365} = 1.5 \text{ i.e. } 2 \text{ times}$$

The above calculation shows that EOQ should be 565365 kg where carrying and ordering costs are minimum. So if the company needs to minimize inventory cost the company should place an order of 565365 kg at a time 2 order in a year.

2. Calculation of EOQ (Table Method)

Table 4.11

No. of order	**1**	**2**	**3**	**4**	**5**
Order size (kg)	850000	425000	283333	212500	170000
Average inventory	425000	212500	141667	106250	85000
Ordering cost (Rs.)	135000	270000	405000	540000	675000
Carrying cost (Rs.)	305150	125575	101717	76287.5	61030
Total cost (Rs.)	440150	422575	506717	616287.5	736030

The above table shows carrying cost, ordering cost, and total cost of respective order size and no. of order. By the table, if the company placed only 1 no. of order in a year for 850000 kg soap stone, the ordering, carrying, and total cost will be Rs. 135000, Rs. 305150, and Rs.

440150. if placed 2 no. of order in a year, the carrying, ordering, and total cost will be Rs. 270000, Rs. 125575 and Rs. 422575 and so on.

So it is clear that if the company tends to minimize the inventory cost and investment on inventory, the company should place 2 no. of order in a year i.e. 425000 kg at a time where total cost inventory is minimum.

B. Re-order Level (ROL)

ROL = Maximum usage rate × lead time

= 3400 × 42 = 142800 kg

C. Cycle Time

$$\text{Cycle time} = \frac{\text{Annual working days}}{\text{No. of order}}$$

$$= \frac{250}{2}$$

= 125 days

From the above, when the level of inventory reaches to 142800 kg another new order should be placed. So the new order for soap stone powder should be placed after 125 days of the first order.

Soap Color

A. Economic Order Quantity

Annual requirement = 250000 kg

Materials cost = 250000 × 39 = Rs. 9750000

Ordering cost per order

1. L/C charge = Rs. 3500
2. Bank charge = Rs. 1500
3. Clerical charge = Rs. 25000
4. Transportation cost = Rs. 90000

Total = Rs. 120000

Carrying cost

1. Insurance = Rs. 97000
2. Interest on capital = Rs. 90000
3. Storage cost = Rs. 330000
4. Spoilage = Rs. 13000

Total = Rs. 530000

$$\text{Carrying cost per kg} = \frac{\text{Rs. } 420000}{\text{Rs. } 40500} = 1.037 \text{ per kg}$$

1. Calculation of EOQ (Formula Method)

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

$$EOQ = \sqrt{\frac{2 \times 530000 \times 120000}{2.12}} = = 168231.64 \text{ kg}$$

$$\text{No. of order} = \frac{A}{EOQ} \frac{250000}{168231.64} = 1.48 \text{ i.e. } 2 \text{ times}$$

The above calculation shows that EOQ should be 168231 kg where the combination of carrying and ordering are equal/minimum. Total cost of inventory is also minimum. So the company should place an order of 168231 kg at a time 2 order in a year.

2. Calculation of EOQ (Table Method)

Table 4.12

No. of order	1	2	3	4	5
Order size (kg)	250000	125000	83333	62500	50000
Average inventory	125000	62500	41666.67	31250	25000
Ordering cost (Rs.)	120000	240000	360000	480000	600000
Carrying cost (Rs.)	265000	132500	88333	66250	53000
Total cost (Rs.)	385000	342500	448333	546250	653000

From the above table, the ordering cost (240000 kg) and carrying cost (265000) at 2 no. of order are minimum and it has minimized also cost of inventory i.e. Rs. 342500. So the EOQ is 125000 and no. of order to be placed in a year is 2. If the company placed 1 no. of order, the total cost will be Rs. 385000 which exceeds by (Rs. 385000 - Rs. 342500) Rs. 42500. If company placed 3, 4, and 5 no. of order in a year for 25000 kg soap color by dividing order size, the total cost will increase. So the company should place 2 no. of order in a year i.e. 125000 kg at a time where total cost is minimum.

B. Re-order Level

Maximum usage rate = 1000 kg/day

Maximum lead time = 30 days

Working days = 250 days/year

ROL = Maximum usage rate × maximum lead time

= 1000× 30

= 30000kg

C. Cycle Time

$$\text{Cycle time} = \frac{\text{Annual working days}}{No.\text{ of order}}$$

$$= \frac{250}{2}$$

= 125 days

From the above calculation, when the level of stock reaches to 30000 kg another new order should be placed. So the new order for 125000 kg soap color should be placed after 125 days of the first order.

Caustic Soda

A. Economic Order Quantity

Annual requirement = 530000 kg

Materials cost = 530000 × 31.06= Rs. 16461800

Ordering cost per order

1. L/C charge = Rs. 4025
2. Bank charge = Rs. 1575
3. Clerical charge = Rs. 28750
4. Transportation cost = Rs. 95650

Total = Rs. 130000

Carrying cost

1. Insurance = Rs. 114000
2. Interest on capital = Rs. 31060
3. Storage cost = Rs. 390000
4. Spoilage = Rs. 100000

Total = Rs. 635060

$$\text{Carrying cost per kg} = \frac{\text{Rs. } 635060}{\text{Rs. } 530000} = 1.198 \text{ per kg}$$

1. Calculation of EOQ (Formula Method)

$$\text{EOQ} = \sqrt{\frac{2AO}{C}} = \sqrt{\frac{2 \times 530000 \times 130000}{1.198}} = 339153.4 \text{ kg}$$

$$\text{No. of order} = \frac{A}{EOQ} = \frac{530000}{339153} = 1.56 \text{ i.e. } 2 \text{ times}$$

The above calculation shows that EOQ should be 339153.4 kg where combination of carrying cost and ordering costs are minimum. So if the company needs to minimize the inventory cost the company should place an order 339153.4 kg at a time or place 2 order in a year.

2. Calculation of EOQ (Table Method)

Table 4.13

No. of order	**1**	**2**	**3**	**4**	**5**
Order size (kg)	530000	265000	176666	13250	106000
Average inventory	265000	132500	88333	66250	5300
Ordering cost (Rs.)	130000	260000	390000	520000	650000
Carrying cost (Rs.)	317470	158735	105823	79367	63494
Total cost (Rs.)	447470	418735	495823	599367	713494

The above table shows the carrying cost, ordering cost, and total cost of respective order size and no. of order. According to the table, if the company placed only 1 no. of order in a year for 530000 kg of caustic soda, the ordering cost, carrying cost, and total cost will be Rs. 130000, Rs. 317470, and Rs. 447470 respectively. If the company placed 2 no. of order in a year for 530000 kg of caustic soda by splitting into two equal halves, the ordering cost, carrying cost and total cost will be Rs. 260000, Rs. 158735, and Rs. 418735 respectively and so on.

In the above table, the ordering cost (Rs. 260000) and carrying cost (Rs. 158735) at 2 no. of order are nearly about equal and it is the minimum cost of inventory i.e. Rs. 418735. So the economic order quantity is 265000 and order to be placed in a year is 2. if the company placed only 1 no. of order for caustic soda, the total cost will be Rs. 447470. Likewise if the company placed 3, 4, and 5 no of order the total cost of stock will be maximized.

B. Re-order Level

Maximum usage rate = 2120 kg/day

Maximum lead time = 36 days

Working days = 250 days/year

Calculation of Re-order level (RL):

ROL = Maximum usage rate × maximum lead time

= 2120× 36

= 76320 kg

C. Cycle Time

$$\text{Cycle time} = \frac{\text{Annual working days}}{\textit{No.}\ \text{of order}} = \frac{250}{2} = 125\ \text{days}$$

From the above calculation, it is found that when the level of inventory reaches to 76320 kg another new order should be placed. By the use of EOQ table we have computed the EOQ 265000 kg and no. of order to be placed 2 times in a year. So the new order for 265000 kg caustic soda should be placed after 125 days of the first order when the level of inventory reaches to 76320 kg.

4.9 Inventory Turnover Ratio (ITR)

Inventory turnover ratio is a most important tools and techniques to control inventory of raw materials and other goods. It is essential to compare the turnover of different kind of raw materials to find out the relationship between purchase and stock level of raw materials and helpful to manger for controlling inventory. If inventory turnover ratio is high, it indicates the fast moving stock and less investment in stock less inventory turnover ratio means the over investment in inventory (stock) and could not convert it into revenue. It is calculated in this way.

$$\text{Inventory turnover ratio} = \frac{\text{Cost of goods sold}}{\text{Average inventory}}$$

In J.K. Soaps & Chemicals Industries Pvt. Ltd., there are different types of inventories available i.e. acid oil, soda, salt, color, etc. the compositions of them in rupees are as follows:

Inventory position of J.K. Soaps & Chemicals Industries Pvt. Ltd.

Table 4.14

Fiscal Year	Opening inventory	Closing inventory	Average Inventory	Cost of goods sold	ITR
2063/64	14050250	15000000	14525125	81467800	5.61
2064/65	15000000	17550500	16275250	111050750	6.82
2065/66	17550500	13050250	15300375	121025250	7.9
2066/67	13050250	21275150	17162700	138522200	8.07
2067/68	21275150	17580200	19427675	158800000	8.17

Average inventory turnover ratio = 7.312

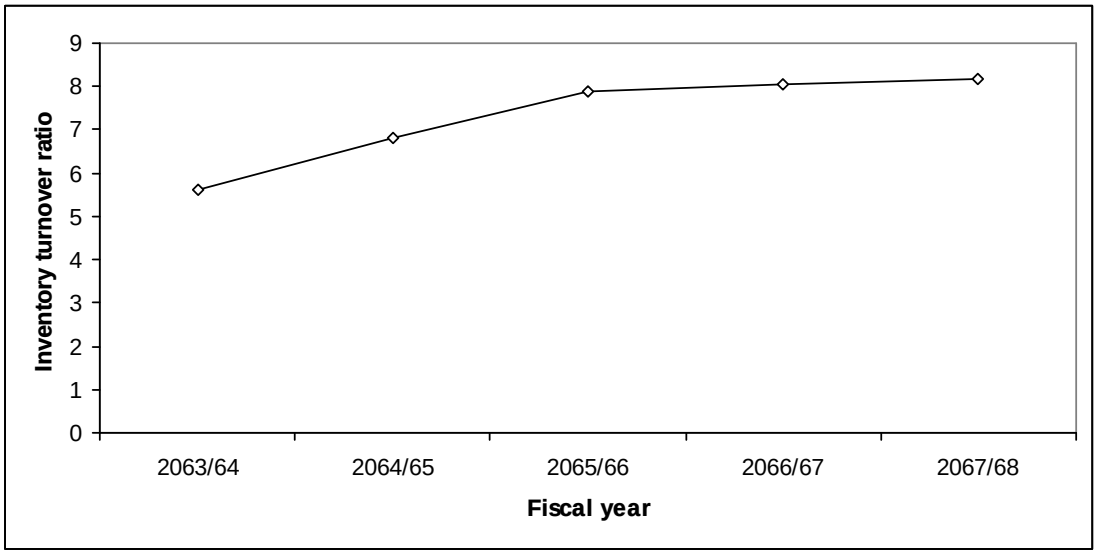
Standard deviation (δ) = 0.985

Coefficient of variation (C.V.) = 13.471

From above table, it indicates that fiscal year 2063/64 the inventory turnover ratio is minimum of 5.6 times. The highest inventory turnover ratio was 8.17 times in last year 2067/68. The trend of inventory turnover ratio of J.K. Soaps & Chemicals Industries Pvt. Ltd. is flexible and in increasing trends. In fiscal year 2061/62 average inventory ratio, standard deviation and coefficient of variation of the company are 7.312, 0.985, and 13.47 respectively. Above table gives the higher inventory ratio, which indicates how rapidly the inventory is turned into the receivable through the sales. In the above table, in fiscal years 2065/66, 2066/67, and 2067/68 it was higher inventory turnover ratio than the average ratio i.e. 7.312 times. This indicates the possibility of company in the future to earn great amount of revenues from the inventory. This table also gives the picture, which gives actual trend of the inventory turnover ratios of the company.

Trend Line of Inventory Turnover Ratio in J.K. Soaps & Chemicals Industries Pvt. Ltd.

Figure 4.7



From the above trend line, it clearly shown that the trend of inventory turnover is increasing. It gives the possible sign to J.K. Soaps & Chemicals Industries Pvt. Ltd. in the future to convert inventory in revenues fast.

4.10 ABC Analysis

Division of inventory items according to ABC analysis

Table 4.15

Group	Classification with description
A	Items having high value with low quantity
B	Items having medium value with medium quantity
C	Items having low value with high quantity

ABC Classification of Inventory (Ranking of Inventory Items)

Table 4.16

S. No.	Items	Annual Requirement	Units	Value (Rs.)	Ranking
1	Palm acid	1825000	28	51100000	1
2	Soap stone powder	850000	21.5	18275000	2
3.	Palm fatty acid oil	502000	33	16566000	3
4.	Caustic soda	530000	31.06	16461800	4
5.	Salt	405000	23	9315000	6
6.	Soap color	250000	39	9750000	5

Classification of inventory according to cumulative percentage of items and cost volume

Table 4.17

Ranks	S. No.	Percentage items (%)	Cum. % items	Cost Volume (Rs.)	Cum. cost vol.	Cum. % of cost volume	Remarks
1	1	16.66	16.66	51100000	51100000	42.068	A
2	2	16.66	33.32	1827500	69375000	57.11	
3	3	16.66	49.98	16566000	85941000	70.75	B
4	4	16.66	66.64	16461800	10240402800	84.30	
5	6	16.66	83.3	9315000	111717800	91.97	C
6	5	16.66	100	9750000	121467800	100	

In the above table, it is clearly shown that the items first i.e. palm acid oil for 16.671 of the items but it account for 42.06% of the total cost volume of inventory so it is grouped as ‘A’ and other items (Rank 2 to 4) for 50% of total items, but account for 84.30% of total inventory cost. Again items, but account for 100% of total inventory cost of items. So these types of items groups as ‘C’.

From the given table, it is clear that it must be classified as follows:

Group A: Palm fatty acid oil

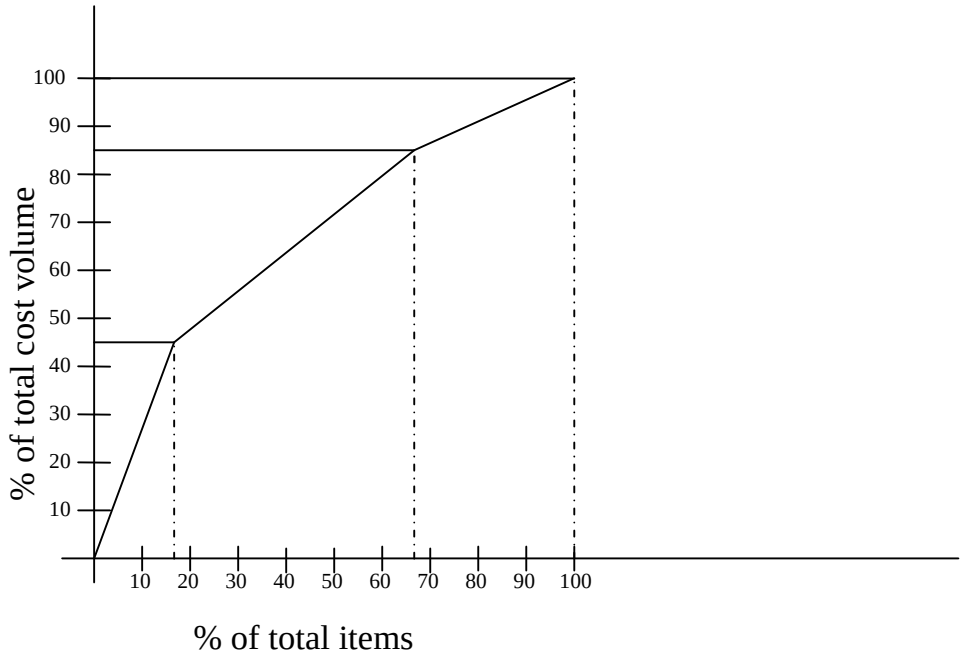
Group B: Stone powder. Fatty acid oil, caustic soda

Group C: Salt and soap color

From the above table, we put the values in a graph that shows the ABC inventory control system more clearly.

ABC Classification of Inventory of J.K. Soaps & Chemicals Industries Pvt. Ltd.

Figure 4.8



From the above figure, J.K. Soaps & Chemicals Industries Pvt. Ltd. must classify its main inventory i.e. palm fatty acid oil, palm acid oil, soap stone, soap color, caustic soda, salt, and inventory of ABC which id fined as previously above table.

(i) 'A' Item (Palm Acid Oil)

Economic order quantity should be calculated carefully and the usage rate and the procurement cost should be reviewed continually. Lastly, the store in charge must give attention to control the inventory cost of palm acid oil through controlling its damage and high or low stock. He/she must keep the record of receipts of the palm acid oil and maintain close control.

(ii) 'B' Item (Soap Stone Powder, Palm Fatty Acid Oil, Caustic Soda)

Moderate control of the inventories must be placed orders based on inventory usage and keep record of receipts and uses, make moderate effort to reduce lead-time and order the items frequently but in less order size.

(iii) 'C' Item (Salt and Soap Color)

Specific order quantity calculation is not required, rough tables are used that will be sufficient for long periods of year or more are ordered. Inventories are checked physically once every 3 months or 6 months a year and ordered the quantities based on inventory level. There is no need of keeping records and make effort to control lead time.

4.11 Major Findings from the Study

On the basis of data presentation and their financial and statistical analysis of J.K. Soaps & Chemicals Industries Pvt. Ltd. the major findings related to this study are given below.

I. Raw materials required for the production of different types of soaps are imported from foreign countries like Malaysia, China, Australia and India.

II. Letter of credit is used to import raw materials from foreign countries.

III. The store control device adopted by J.K. Soaps & Chemicals Industries Pvt. Ltd. is bin card, store ledger and ABC analysis techniques to control various types of inventory in the store.

IV. The company has not determined the re-order level, maximum stock level, and minimum stock level.

V. There is no cost classification system so it is difficult to determine the ordering and carrying cost.

VI. The company has not followed scientific inventory management technique i.e. economic order quantity model for purchasing different types of raw materials.

VII. The company has purchased more raw materials than the requirement.

VIII. The investment on inventory of J.K. Soaps & Chemicals Industries Pvt. Ltd. is very large and the value of inventory is increasing year to year as compared to the production and sales.

IX. The company's purchase position for different types of raw materials is highly differing from year to year.

Chapter V

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Summary

Organizational success basically depends on the systematic and scientific inventory management. It is impossible to achieve the goal of any enterprise without proper management of inventory. So it is one of the most important functions of any organization to achieve its objectives.

J.K. Soaps & Chemicals Industries Pvt. Ltd. is a manufacturing company which was established on 24th Falgun 2054 under Company Act 2049. It supplies the quality product at right time in a reasonable price. To earn profit it is necessary to run the company efficiently, economically and profitably. To ensure this situation in J.K. Soaps & Chemicals Industries Pvt. Ltd. the efficient management of inventory takes vital role. So this study is concerned within what extent the company is applying the inventory management techniques to minimize the cost of inventory which directly affect the price of product.

Most of manufacturing and trading companies invest a huge amount of money in the form of inventory. J.K. Soaps & Chemicals Industries Pvt. Ltd. is being the manufacturing company invests huge amount of capital in form of inventory and cost of carrying inventory is higher out of total inventory cost. The cost of inventory directly affects the cost of production and profitability of company. It means slight reduction in cost of inventory decreases the production cost and ultimately increases the profitability at remarkable rate. For this, the efficient management of inventory is desirable.

This study is based on the inventory management of J.K. Soaps & Chemicals Industries Pvt. Ltd. It is done with a view of solving the problem arising on achieving the objectives of J.K. Soaps & Chemicals Industries Pvt. Ltd. Here the main objective of the study is to analyze the inventory practices and to analyze the inventory management system followed by J.K. Soaps & Chemicals Industries Pvt. Ltd. To make this study, the related literatures have been reviewed. Review of literature gives the concept of inventory management and frameworks from various books, journals, and articles.

The basic objective of the study is to examine the management of inventory of J.K. Soaps & Chemicals Industries Pvt. Ltd. to fulfill the objective as described, appropriate research methodology has developed. It consist the research design, population and sample, nature and method of analysis. In order to carryout the study data have been basically collected from secondary sources such as annual report, official report and financial statement provided by J.K. Soaps & Chemicals Industries Pvt. Ltd. the primary data is also collected from direct interview with concerned staffs of the company to find out the problem of company and then the collected data are tabulated and presented as the stated methodology. Then the analysis has been made using the descriptive analysis of inventory management and other analytical tools. This study covers only five years of financial data i.e. from 2063/64 to 2067/68 and various inventory tools have been used to analyze the available data.

Descriptive analysis consists of the purchase procedure practice in J.K. Soaps & Chemicals Industries Pvt. Ltd. store control device practice and issuing materials. Inventory management analysis is done by the analysis of AR and AP. The company has poor estimation of AR. So the company should make the purchase budget.

The company does not purchase the raw materials based on the economic order quantity. So if company wants to minimize the inventory cost the company should use EOQ model. To find out the future trend, the trend analysis of purchase, sales, purchase of raw materials, inventory, work-in-progress, and finished gods has been done.

5.2 Conclusion

The primary objective of this study is analyzing the inventory management practices of J.K. Soaps & Chemicals Industries Pvt. Ltd. and problems faced by this company in the management of inventory. For the purpose of this study the data and the necessary information were collected from the records and annual reports provided by the company.

J.K. Soaps & Chemicals Industries Pvt. Ltd. has applied only bin cards , store ledger and ABC analysis as the inventory control techniques . The company does not classify the inventory cost into carrying cost and ordering cost. The company does not follow the economic purchase order so the tool cost of carrying and ordering inventory is higher. By the analysis, actual inventory cost is greater than the economic order size of inventory cost.

By making the overall study it can be concluded that J.K. Soaps & Chemicals Industries Pvt. Ltd. should maintain the economic order size which helps to minimize the inventory cost and to increase the profit of the company.

5.3 Recommendation

To achieve t organizational goal of J.K. Soaps & Chemicals Industries Pvt. Ltd. the efficient management is essential. The management of inventory in J.K. Soaps & Chemicals Industries Pvt. Ltd. is needy for the betterment of the company. So it has to initiate the steps for appropriate management of inventory to attend its set objectives successfully. On the basis of the study, the following suggestions may be recommended for consideration.

I. Purchase plan should be prepared for different types of raw materials by seeing production plan and with the proper cooperation and coordination among purchasing, storing, marketing, sales and other concerned departments to avoid the huge investment in the raw materials.

II. In purchasing procedure, purchase manager should maintain all the necessary records keeping in mind the most important objectives of the purchase department i.e. purchasing right quantity and quality of materials at the cheapest rate at proper time to help smooth running of the production functions.

III. Once materials received by the store, it is issued by the concerned department as per t quantity demanded in the requisition from previously provided to the store department.

IV. The scientific management technique should be applied by the company for purchasing different types of raw materials so as to maintain optimum level of inventory and to minimize the total inventory cost.

V. Re-order, maximum level and minimum level for each type of materials should be maintained by the company to avoid the overstocking of materials.

VI. The selective inventory model (ABC analysis) should be applied by the company for the control of 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 control for different group of inventory, minimize the investment of inventory and minimize the cost of storage.

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

VIII. Specific policy on inventory should be defined and comprehensive system of inventory management has to be introduced.

IX. The top level management should pay its attention to the overall management, purchasing, production and financial aspect of factory.

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Appendix-I

Calculation of Standard Deviation of Inventory Turnover Ratio

FY	Inventory Turnover Ratio (X)	X^2
2063/64	5.6	31.36
2064/65	6.82	46.51
2065/66	7.9	62.41
2066/67	8.07	65.1249
2067/68	8.17	66.748
Total	$\Sigma X = 36.56$	$\Sigma X^2 = 272.1529$

N = 5

We know that,

$$\text{Mean } \left(\bar{X}\right) = \frac{\Sigma X}{N} = \frac{36.56}{5} = 7.312$$

$$\text{Again, Standard Deviation } (\delta) = \sqrt{\frac{\Sigma X^2}{N} - \left(\frac{\Sigma X}{N}\right)^2}$$

$$= \sqrt{\frac{272.1529}{5} - \left(\frac{36.56}{5}\right)^2}$$

$$= 0.985$$

Coefficient of variation (C.V)

$$\text{C.V.} = \frac{\delta}{\bar{X}} \text{x} 100\%$$

$$= \frac{0.895}{7.312} \text{x} 100\%$$

$$= 13.47\%$$

Appendix-II

Bin Card of J.K. Soaps & Chemicals Industries Pvt. Ltd.

Butwal

Mate Code…….

Folio……

Bin Card No…….

Location……

Description:

Date	Reference	Receipt	Issued	Balance	Signature

Minimum Level…… Re-order Level…… Re-order Quantity…...

Appendix-III

Store Ledger of J.K. Soaps & Chemicals Industries Pvt. Ltd.

Butwal

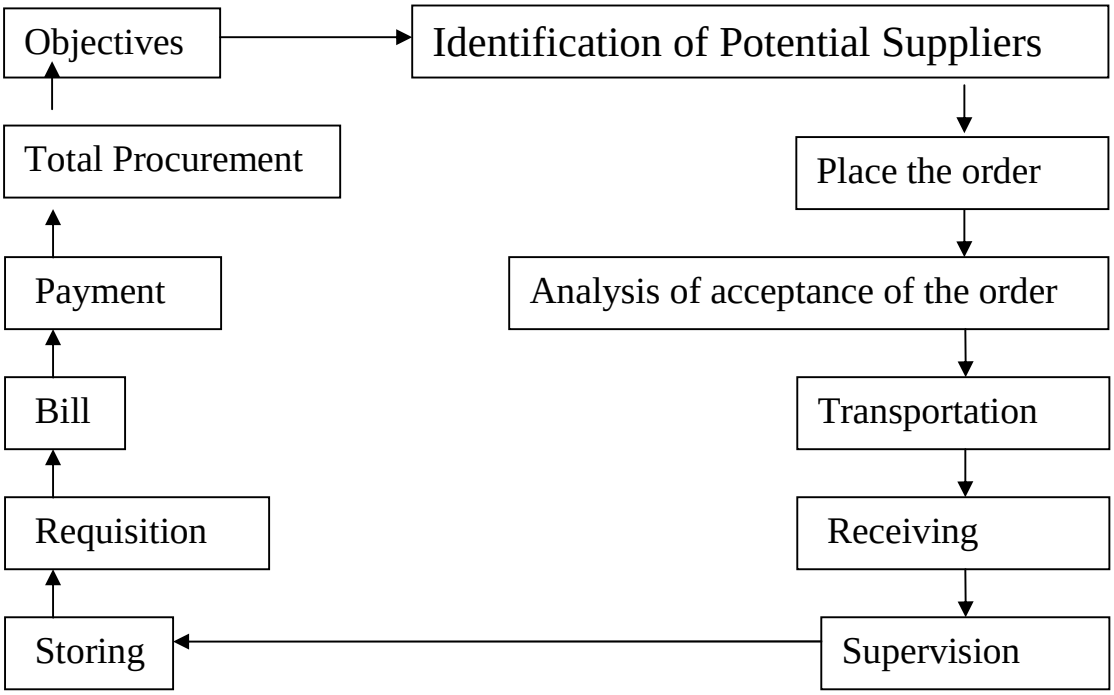
Purchase Consumption during the period 20… to 20…

Stock Ledger

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

Appendix-IV

Purchasing Cycle of J.K. Soaps & Chemicals Industries Pvt. Ltd. Butwal



The cycle clearly shows that purchasing cycle begins from the objectives and ends with the total procurement.