STUDY ON VED ANALYSIS, STOCK-REVIEW & EOQ TECHNIQUES OF INVENTORY MANAGEMENT

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Abstract— **Inventory management system is important to ensure the quality and productivity of the organization. Advances in technology and well-designed software make inventory systems so easy to handle. Inventory management deals with demand forecasting, asset management of raw materials and commodities, movement of goods, forecasting, pricing of goods and recognition of goods to forecast future demand. In a sample of 12 high-speed machinery firms, this paper represents the methodology and calculates various variables of raw materials / products in relation to inventory management. Using the mentioned methodology, one can easily get an idea about the economic order quantity, the number of orders per year, and the total annual cost. For the advancement and rapid productivity in today's era, it is necessary for management to manage inventory so that proper supply of goods is maintained at the right time. Inventory management represents important decision variables, which will require all stages of product manufacturing, handling, distribution and sales, so that there is no shortage of material in the inventory.**

As India is becoming a global manufacturing hub. The increasing demand in domestic and international markets is opening a new world of opportunities for Indian industries. Increasing competition due to globalization is making it indispensable for Indian industries to provide cost-effective quality output with tight distribution schedules. Knowledge models are used to identify the process and to improve the inventory management techniques. The processes are VED analysis, stock review, EOQ etc. The case study is analyzed with the model. The model is found useful for assessing the current situation, practices of inventory management, identifying the development focus areas and its effects.

Keywords— Inventory analysis, Inventory management, Inventory modeling & techniques, Manufacturing system.

I. INTRODUCTION

Inventory management and supply chain management plays an important role in any operation of the business. With the advancement in technology and advanced software application process in the era, inventory management has gone through revolutionary and incredible changes. Functions are interconnected and interconnected in any business process of any organization and often they overlap. Some major aspects like logistics, inventory and supply chain management form the backbone of the business delivery function. Therefore, all these functions are also very important for marketing managers and finance controllers.

Inventory management is a very important and necessary step that determines the impact on supply chain functions as well as the financial and balance sheet. The basic strategy of any organization is to constantly strive to maintain inventory at optimal levels to meet requirements and to exceed inventory sources, which can affect the financial structure. Inventory must always be dynamic. Management of inventory requires external with internal factors and control through planning and review with constant observation and caution. In almost all organizations, the organization constituted a team or separate department or a set of job functions, called inventory planners. The job of these departments or teams is to continuously monitor, control and review the inventory and its interfaces with the procurement, production and finance departments.

Managing inventory is a difficult task, and if it is not handled and done properly the company may have to spend thousands of dollars. Continued growth with complexities increases sales volume and diversification of product assortment. The purpose behind inventory management techniques is to understand and imply the techniques in the manufacturing practices. The aim of the study is to review the available literature to gain an understanding of the inventory control processes followed by the manufacturing organization, as well as the strategy and factors influencing the success of inventory control.

Heavy research is being done in the field of inventory management and its techniques. This literature review focuses on various techniques with desired models of inventory control techniques that are used in various fields of

application. The main objective behind this project is to study the approach of integrated materials management for better inventory control. In day-to-day management of the firm, it is necessary to manage the inventory so that proper supply of goods is maintained at the appropriate time. The following are the inventory control methods, stock review, VED analysis, EOQ analysis etc.

A stock review is an analysis between the estimated future needs of the stock and the sources. The analysis can be done through manual review or by using the latest software available in the markets. The minimum stock level in the inventory will allow handlers to conduct regular inspections and reorder orders from suppliers. Some situations that arise like sellers taking longer than average to recoup shares will be taken into consideration. Using only-in-time ordering, where the inventory is held for a minimum or short time before proceeding to the next stage in the supply chain. The person cannot conduct a manual review and this is not possible because it may take too long and possibly cause errors. The organization is beginning to invest in software for automated review, and using the software methodology for automated review will help the organization keep track of its inventions, ensure deadlines, and avoid costly shortfalls.

VED analysis is the classification of items based on significance. The classification of items in VED analysis is in three groups namely important, necessary and desirable. The important category of items is surrounded by items that will prevent the unavailability of goods in the production line. Items in the required group include items that have a high stock cost and items in the desirable group, non-availability of items that do not cause immediate loss of production and slight disruption for short periods.

The economic order quantity is nothing but a methodology with a designed formula used for production to determine the most efficient and suitable goods that must be purchased according to the order level and carrying cost. In addition, economic order quantity represents the optimal quantity of inventory that the company must order in such a process that the costs associated with ordering and holding the inventory must be minimized. EOQ is an effective tool for any managers to find out what the maximum amount of inventory is and when to order as new sales must be generated.

II. LITERATURE REVIEW

The study intends to review the available literature in order to gain an understanding of the inventory control processes followed by the manufacturing organization, as well as the strategies and factors affecting the success of inventory control.

The "Dave Piasecki et al. (2001) focused on the mathematical modeling for calculating the optimal order quantity that used the Economic Order Quantity methods. He mentioned that most of the companies and the organizations are not using the economic order quantity because of the poor results from the inaccurate data input.

The "Botter and Fortuin et al. (2000)" showed that there are several aspects concur in making demand and inventory management for the spare parts to managed. To manage the stocks from its initial stage is the critical task and most of the time it's affects the entire chain.

In "Vereecke and Verstraeten et al. (1994), they showed that in industrial organization the proportion of the stocks range is devoted to spare parts is often considerable. The one cannot define the range of spare when there is no limit of orders set and comparison with each other.

In "John Schreibfeder et al. (1992) paper, reflects that in early 1990's many distributer recognize that they need helps for controlling and managing their largest assets of inventory. For these some companies developed comprehensive inventory management modules and system.

The "Lambrix and Singhvi et al. (1979) shows the idea about the working capital cycle approach in working capital management, also suggest that the investment in the working capital can be optimized and the process flow will be improved by reducing the time frame.

The study of "Krishna Murthy et al. (1964). dealt with the inventory in the private sector of Indian economy for the period of 1948-1961. The study shows the important of demand for the products and represent the importance of accelerator.

The study has been made on the inventory management practices of an Indian organizations and companies. The study suggests application of the modern

scientific inventory control techniques like operation research. The modern scientific inventory control techniques furnish the opportunity for the companies.

In 1960 the group of retailers mostly the grocery stores at first got together and came up with the new method for tracking inventory with the modern barcode. At that time there were several competing types of barcodes before they were standardized with the Universal Product Code (UPC) in the 1974.

They highlighted the connection between capacity utilization and inventory investment. The existing inventory stock was expected to adjust to the desired levels. Thus, the variable for the existing stocks of inventory was like essential to neglect for the desired stock.

In the paper "The Herman Holler et al. (1889) invented the first punch card that could be read the machines. By feeding sheet of paper in the machine with holes at specific place, people could get and record complex data for a variety of purpose from census taking to clocking in and out of work.

Inventory management is a particularly important function to any business, since inadequacies on top of things may result in serious problems. If inventories are managed in an inefficient manner, it's likely that delays in production, dissatisfied customers, or curtailment of capital will result.

III. PROBLEM DEFINITION

The purpose behind inventory management techniques is to understand and imply the techniques in the manufacturing practices. The aim of the study is to review the available literature to gain an understanding of the inventory control processes followed by the manufacturing organization, as well as the strategy and factors influencing the success of inventory control.

In a sample of 12 high-speed machinery firms, this paper represents the methodology and calculates various variables of raw materials / products in relation to inventory management. Using the mentioned methodology, one can easily get an idea about the economic order quantity, the number of orders per year, and the total annual cost.

IV. DATA COLLECTION TECHNIQUES

There are mainly two types of Data Collection Techniques.
A. Primary source of data

B. Secondary data source

The following information goes into detail about the data collection techniques.

A) Primary Source of Data:

Primary data is information collected or generated by the researcher immediately for the purposes of the project. For example, an investigator wants to know about the level of job satisfaction enjoyed by the labour industry. He can prepare a schedule and cater to a sample number of workers and ask their opinion. This is the information to be collected for the object of this study and therefore becomes primary in nature. When data is collected for the first time, the responsibility for processing the data rests with the original investigators. Typically, experiments and surveys constitute the main sources of primary data. Studies have to be done for better understanding of the nature of the primary sources of advantages and disadvantages of data.

How to collect primary data?

The primary data is the information generated to meet the less specific requirements of handheld testing. Thus, the investigator must collect data separately for the study. The following are three methods used to compile primary data.

(1) observation

(2) Schedule and Questionnaire

(3) Interview.

1) Observation.

It is one of the cheapest and more effective techniques of data collection. This approach to the collection of information is as old as mankind. Most of our knowledge about humans is collected through this process. Observation is not only mandatory in science, but observation also has its own utility in social science research. It is not always possible to quantify data and draw accurate conclusions based on such data. Thus, the observation method is usually adopted for hypothesis testing.

2) Schedule & Questionnaire.

The most commonly used method of data collection is the schedule and questionnaire. The increased use of schedules and questionnaires is due to the emphasis on quantitative measurement by the social scientist. Uniformly Accumulated Data.

3) Interview.

Interviewing is also a useful technique of data collection through primary sources. It is an oral method of acquiring data in field surveys. Information is obtained by interacting with the respondents.

This method is not applicable in this project, if any.

B) Secondary Source of Data:

Secondary data refers to information that has been collected by someone other than the researcher for the purposes involved in the research project at hand. There are various factors such as the nature of the study, the position of the investigator, the availability of financial resources, the accuracy of the desired results, and the degree of timing that have decided the choice of sources of data that enrich the usefulness of the study. This project has been studied with the help of secondary data.

1) Internal Source.
This data is collected from the organization.

1. With the help of storage data in the organization, as well as information from the store manager which gives proper idea about how inventory management is done in the organization.

2. By observing internal inventory related reports and documents like bin card, purchase order, goods receipt cum inspection note etc.

2) External Source.

Company website: Some information is collected from the company website.

Books: The textbook of logistics and supply chain management by DK Aggarwal and LC Jamb by Inventory Management is used during the study.
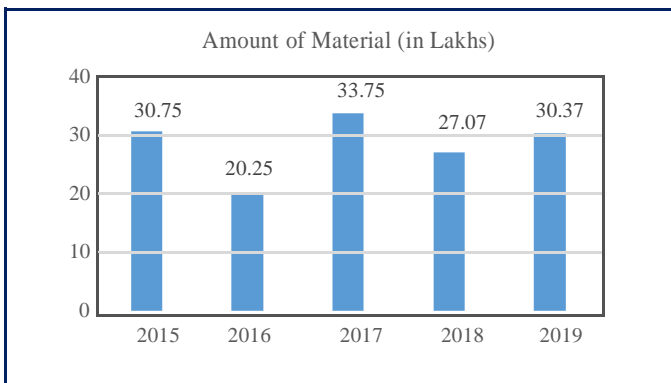
V. DATA ANALYSIS

The following data with the table & graph shows the collected material data from the respective sources.

A) Raw Material Records.

The following table and graph show the amount of materials in Lakhs for five years.

Table 1
Amount of Material (in L)

Year	Amount of Material (in Lakhs)
2015	30.75
2016	20.25
2017	33.75
2018	27.00
2019	30.37

Fig. 1. Amount of Material

Interpretation: The above graph shows the amount of materials at cost (in Lakhs). In 2015 the cost of material is ₹30.75. decreased in year 2016 and It is more increased to ₹33.75 in the year 2017 and again decreased in the year 2018 with the 2700 and in the year 2019 its increased to ₹30.37.

B) Economic Order Quantity (EOQ).

The firm requires below given units of material. The following are the details of their operation during 2018-2019.

Table 2
EOQ during 2018-19

Particulars	
Materials (M1)	62700 Qty (Mtrl)
Ordering cost per order	₹ 1800
Carrying cost	₹ 10%
Purchase price per unit	₹ 520

1. Calculation of EOQ:

Total units required (A) = 62700 Qty

The ordering cost per order (O) = Rs.1800 Carrying cost per unit (C) = 10% (i.e.) 10% of Rs.520 =Rs.52

$EOQ = (\sqrt{2AO})/C$

$\qquad = ((\sqrt{2*62700* 1800})/52$

$\qquad = $ Rs.288.92

2. Number of orders for the year: Number of orders for the year = A/EOQ

$\qquad = $ 62700/288.92

$\qquad = $ 217.01 Orders

3. Total annual cost:

Total annual cost = carrying cost + ordering cost

$\qquad = $ 41738.36 + 390618

$\qquad = $ Rs.432356.36

- Carrying cost = order size * average inventory

- Order size = A/no of orders

$\qquad = 62700/217.01$

$\qquad = 288.92$

- Average inventory = order size/2

$\qquad = 288.92/2$

= Rs.144.46

Therefore,

- Carrying cost = 288.92*144.46

=   Rs.41738.36

- Ordering cost = cost per order * no of orders

    =   1800*217.01

    =Rs.390618

C) Stock Level (SL).

The company requires 62700 units of material (M1) to manufacture for the year 2018-2019. EOQ is 289 units. The company makes safety stock equal to 30 days requirement and the normal lead time is 10-20 days. The company works a whole 365 days in a year without any stoppage except maintenance or any other.

Table 3
Stock Level during 2018-19

Year 2018-2019	
Material (M1)	62700
EOQ	289
Safety Stock	30 Days
Lead Time	10-20 Days
Working Days/Year	360

1. Reorder Level:

Reorder level = (lead time * Average usage) + safety stock

    =   (10*174.16) + 5225

    =   6966.6

Safety stock = usage * period of safety stock/ total working days in a year

    =   62700*30/360

    =   5225

Average usage = usage/total working days in a year

=   62700/360

=   174.16

2.Minimum Stock Level:

Minimum stock level = Re-order level – (Average usage * Average lead time)

    = 6966.6 – (174.16* 10+20/2)

    = 4354.2

3. Maximum Stock Level:

Maximum stock level = Re-order level + re-ordering quantity –

    (Minimum usage * minimum lead time)

=   6966.6+289-(174.16*10)

=   7255.6-1741.6

=   5514

4. Danger Level:

Danger level = Average usage * Maximum re-order period for emergency purchases

    = 174.16*20

    = 3483.2

5.Average Stock Level:

Average stock level = ½ (Minimum stock level + Maximum stock level)

    = (4354.2+5514)/2

    = 4934.1

VI.   CONCLUSION

The Data Analysis shows the calculation of Economic Order Quantity (EOQ) & Stock Level (SL) with respect to the amount of material. From the concluded results in analysis section compared with the past record, which reflects that there is reduction in loss of material and savings in cost of material which reflects the results in output of product and customer satisfaction. Today's market is a customer-oriented

market and customer satisfaction is the most important goal of every organization so it is inevitable to adopt an integrated inventory management approach to the new product development strategy. Financial - Materials management for any product is a dynamic decision-making process involving a series of inter-related activities.

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