A STUDY ON INVENTORY CONTROL OF HIGH VALUE INDIGENOUS BOUGHT-OUT ITEMS FOR TATRA VEHICLES AT BEML, PALAKKAD

by

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KCT BUSINESS SCHOOL

BONAFIDE CERTIFICATE

Certified that this project report titled, **"A STUDY ON INVENTORY CONTROL OF HIGH VALUE INDIGENOUS BOUGHT-OUT ITEMS FOR TATRA VEHICLES AT BEML, Palakkad"** is the bonafide work of **Mr. Krishna Prasad. S (**1120400049**)** who carried out the project under my supervision. Certified further, that to the best of my knowledge the work reported herein does not form part of any other project report or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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Internal Examiner	External Examiner

DECLARATION

I affirm that the project work titled "**A STUDY ON INVENTORY CONTROL OF HIGH VALUE INDIGENOUS BOUGHT-OUT ITEMS FOR TATRA VEHICLES AT BEML, PALAKKAD**" being submitted in partial fulfillment for the award of Master of Business Administration is the original work carried out by me. It is not a part of any other project work submitted for the award of any degree or diploma, either in this or any other university.

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I certify that the declaration made above by the candidate is true.

Signature of the Guide

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CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION TO THE STUDY:

In this fast moving business environment the industries and companies find it really difficult to cope up with the changing business environment, increasing competitors and technological improvement. Therefore, any manufacturing company may try to cut expenditure by proper allocation of its resource and a refined inventory control planning.

The company which adopts survives and the company which doesn't adopt finds it really difficult to sustain in the industry or completely comes to an end.

In this study we are going to go through such a company, which has sidelined all the obstacles put in front of them. The BEML (Bharat Earth Movers Limited) was able to make it possible by quickly taking effective measures according to the changing scenario.

1.2 COMPANY PROFILE:

Company Name: BEML Limited (formerly Bharat Earth Movers Limited)

Company Logo:

Company Vision:

The Company has drawn up VISION – 2013 with an ambitious growth rate of 12% CAGR for crossing 5,000 Cr turnovers With this emerging prospects, BEML has plans to cross ` 5,000 Cr in the next 2 years and is poised to achieve ` 10,000 Cr mark by 2016-17 and the company is gearing up with necessary infrastructure for achieving the same.

Company Website: http://www.bemlindia.com

Company History:

BEML Limited (formerly Bharat Earth Movers Limited) was established in May 1964 as a Public Sector Undertaking for manufacture of Rail Coaches & Spare Parts and Mining Equipment at its Bangalore Complex. The Company has partially disinvested and presently Government of India owns 54 percent of total equity and rest 46 percent is held by Public, Financial Institutions, Foreign Institutional Investors, Banks and Employees.

BEML Limited, a 'Miniratna-Category-1', plays a pivotal role and serves India's core sectors like Defence, Rail, Power, Mining and Infrastructure. The Company started with a modest turnover of ` 5 Cr during 1965 and today, thanks to its diverse business portfolio, the company has been able to achieve a turnover of more than `3,500 Cr. Its three major Business verticals viz., Mining & Construction, Defence and Rail & Metro are serviced by its nine manufacturing units located at Bangalore, Kolar Gold Fields (KGF), Mysore, Palakkad and Subsidiary - Vignyan Industries Ltd, in Chikmagalur District. BEML's products are sold and serviced through its large Marketing Network spread all over the Country. BEML's products are exported to more than 56 countries. As part of company's globalization strategy, the company has expanded its global reach by opening local company at Indonesia and Brazil recently in addition to Malaysia and China offices.

The company operates under three major Business verticals - viz. Mining & Construction, Defence and Rail & Metro. Each of the above Business is headed by a Director who acts as CEO of the Business and reports to the Chairman & Managing Director of the company. In addition to the above, Technology Division of the company provides end-to-end technology solutions in Auto, Aero, Defence and Rail & Metro related areas. Trading Division deals in non-company products. BEML manufactures and supplies Defence Ground Support Equipment such as Tatra based High Mobility Trucks, Recovery Vehicles, Bridge Systems, Vehicles for Missile Projects, Tank

Transportation Trailers, Milrail Wagons, Mine Ploughs, Crash Fire Tenders, Snow Cutters, Aircraft Towing tractors, Aircraft Weapon Loading Trolley.

The company also plans to take up overhaul and up gradation of Battle Tanks with a view to assemble and roll out the products. Under Mining and Construction Business, the company manufactures and supplies Mining & Construction equipment like Bull Dozers, Excavators, Dumpers, Shovels, Loaders and Motor Graders to various user segments and under Rail & Metro Business, manufactures and supplies Rail Coaches, Metro Cars, AC EMUs, OHE Cars, Steel and Aluminium Wagons to the rail sector.

The company has a dedicated R&D infrastructure and team in line with consistent policy of the company to meet the technological demands through in-house R&D and strategic technical tie-ups with global players.

BEML operates on three major business verticals for associated equipment manufacturing:

- Mining & Construction
- Defence
- Rail & Metro

In addition to the above there are three Strategic Business Units (SBUs):

- Technology Division for providing end-to-end engineering solutions
- Trading Division for dealing in non-company products
- International Business Division for export activities

The company has 9 manufacturing units spread over the following locations:

- Kolar Gold Fields (KGF) Complex (around 100 Km from Bangalore)
    - Earth Moving Division
    - Rail Coach Unit II
    - Heavy Fabrication Unit

- Hydraulic & Powerline Division

❖ Mysore Complex (around 130 Km from Bangalore)
- Truck Division
- Engine Division

❖ Bangalore Complex - Rail & Metro Division

❖ Palakkad Complex

❖ Vignyan Industries, a subsidiary located at Tarikere (around 300 km from Bangalore) - Steel Castings.

BEML's nationwide network of sales offices enables buyers with ready access to its wide range of products. Also, the full-fledged service centers and parts depots offer total equipment care, maintenance contracts and rehabilitation services.

The company has been registering consistent growth in sales and profits and has made a turnover of ` 3,558 Cr in 2009-10 registering a growth of 18% over the previous year with a Profit Before Tax of ` 320 Cr and has orders on hand of over `5,000 Cr as of end March 2010.

Product Variants:

1. BEML - Tatra Trucks 12x12, 10x10,8x8, 6x6, 4x4 & Variants
2. Pontoon Bridge System
3. Ground Support Vehicles for Guided Missile Programme
4. Heavy, Medium and Light Recovery Vehicles
5. 50T Trailer for Tank Transportation
6. Mil Rail Coaches and Mil Wagons

Apart from the above, Railway parts and aggregates are planned for manufacture.
Major customers include Ministry of Defence, DRDO, BEL, BDL, RDE, VRDE, Indian Railways, etc.

1.3 Objectives of the study:

1. To analyze the EOQ, lead time, reorder level, safety stock in the inventory management of high value items for 3 months.
2. To identify the problems related to inventory management.

1.4 Scope of the study

Effective inventory management is all about knowing what is on hand, where it is in use, and how much finished product results.

Inventory management is the process of efficiently overseeing the constant flow of units into and out of an existing inventory. This process usually involves controlling the transfer in of units in order to prevent the inventory from becoming too high, or dwindling to levels that could put the operation of the company into jeopardy. Competent inventory management also seeks to control the costs associated with the inventory, both from the perspective of the total value of the goods included and the tax burden generated by the cumulative value of the inventory.

Balancing the various tasks of inventory management means paying attention to three key aspects of any inventory. The first aspect has to do with time. In terms of materials acquired for inclusion in the total inventory, this means understanding how long it takes for a supplier to process an order and execute a delivery. Inventory management also demands that a solid understanding of how long it will take for those materials to transfer out of the inventory be established. Knowing these two important lead times makes it possible to know when to place an order and how many units must be ordered to keep production running smoothly.

Calculating what is known as buffer stock is also key to effective inventory management. Essentially, buffer stock is additional units above and beyond the minimum number required to maintain production levels. For example, the manager

may determine that it would be a good idea to keep one or two extra units of a given machine part on hand, just in case an emergency situation arises or one of the units proves to be defective once installed. Creating this cushion or buffer helps to minimize the chance for production to be interrupted due to a lack of essential parts in the operation supply inventory.

Inventory management is not limited to documenting the delivery of raw materials and the movement of those materials into operational process. The movement of those materials as they go through the various stages of the operation is also important. Typically known as a goods or work in progress inventory, tracking materials as they are used to create finished goods also helps to identify the need to adjust ordering amounts before the raw materials inventory gets dangerously low or is inflated to an unfavorable level.

Finally, inventory management has to do with keeping accurate records of finished goods that are ready for shipment. This often means posting the production of newly completed goods to the inventory totals as well as subtracting the most recent shipments of finished goods to buyers. When the company has a return policy in place, there is usually a sub-category contained in the finished goods inventory to account for any returned goods that are reclassified as refurbished or second grade quality. Accurately maintaining figures on the finished goods inventory makes it possible to quickly convey information to sales personnel as to what is available and ready for shipment at any given time.

In addition to maintaining control of the volume and movement of various inventories, inventory management also makes it possible to prepare accurate records that are used for accessing any taxes due on each inventory type. Without precise data regarding unit volumes within each phase of the overall operation, the company cannot accurately calculate the tax amounts. This could lead to underpaying the taxes due and possibly incurring stiff penalties in the event of an independent audit.

Chapter 2:
Review of Literature

2.1 Literature review

1. **Economic Ordering Decisions with Market Choice Flexibility:** One of the oldest and best known optimization problems in inventory control is the Economic Order Quantity (EOQ) model. The EOQ formula has stood the test of time and is widely used due to its simple structure and robust performance under conditions that violate the basic model assumptions. The EOQ approach assumes a fixed and exogenously determined market demand rate, which often leads to criticism of the model. Despite this criticism, the model has endured in textbooks, the operations modeling literature, and in practice over the past 90 years for several reasons. One reason for the continued focus on EOQ-related models is that the model and resulting formula are extremely robust to errors in parameter estimation.(Joseph Geunes, Zuo-Jun Shen, H. Edwin Romeijn)

2. A review of inventory management research in major logistics journals: Themes and future directions: This paper is to provide a review of inventory management articles published in major logistics outlets, identify themes from the literature.(Brent D. Williams, (Department of Marketing and Logistics, Sam M. Walton College of Business, University of Arkansas, Fayetteville, Arkansas, USA),Travis Tokar, (The Ohio State University, Fisher College of Business, Marketing and Logistics, Columbus, Ohio, USA))

3. **Inventories in Indian - 51 – Manufacturing:** In this paper Krishna Murthy and Sastry have studied inventory behaviour of 21 industries comprising 91 per cent of output and 96 per cent of inventories of the group of the industries covered by the census of manufacturers. The study deals only with inventory holdings of the manufacturers and the analysis is mainly in terms of the prices prevailed during the study period.(Krishna Murthy K. and Sastry D.U., 1970)

4. Perishable inventory management and dynamic pricing using RFID technology: Perishable inventory management: The objective of perishable inventory management is to obtain optimum returns considering the useful life of the product. In the literature, inventory models have been formulated for perishable products subjected to the various demand conditions and life considerations. (A CHANDEC , S DHEKANE, N HEMACHANDRA and N RANGARAJ)

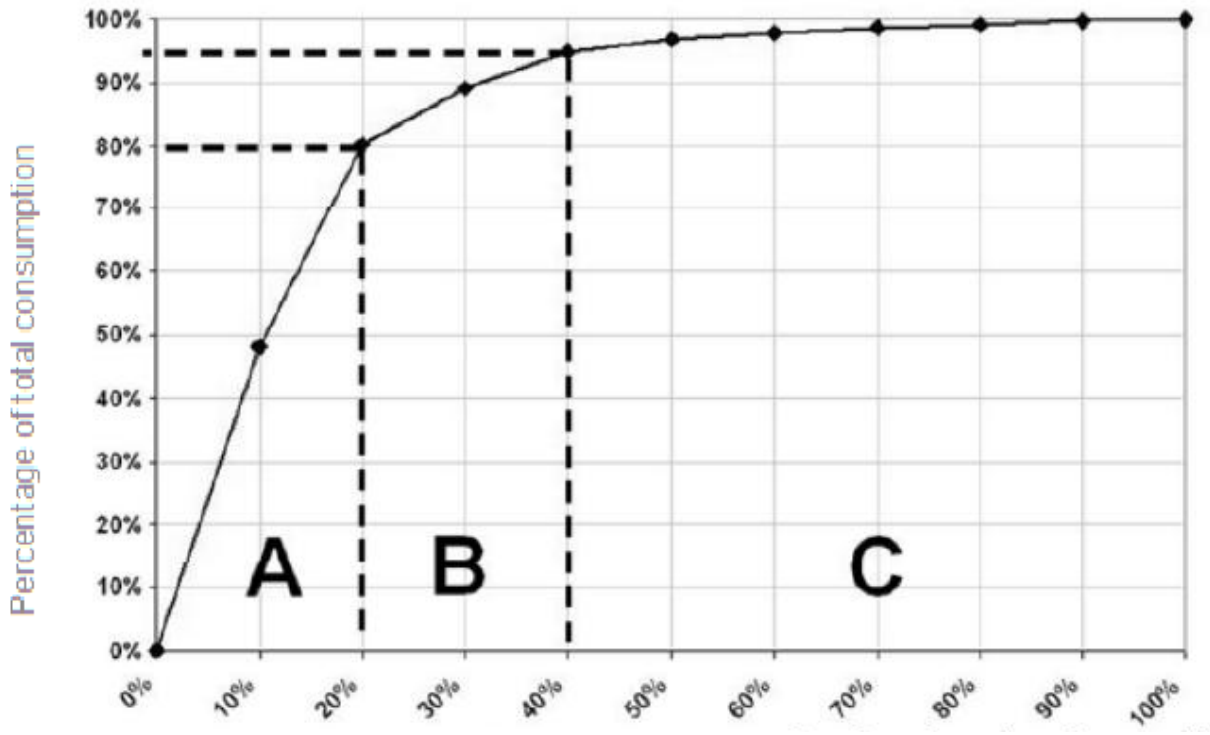
Chapter 3

Research Methodology

3.1 Tools used in this research

ABC Analysis - Technique of Inventory Control

Graphical Representation of ABC Analysis



Percentage of total quantity

Graphical Representation of ABC Analysis

ABC Analysis

ABC analysis is a type of analysis of material dividing in three groups called A-group items, B-Group items and C-group items For the purpose of exercising control over materials. Manufacturing concerns find it useful to divide materials into three categories.

An analysis of the annual consumption of materials of any organization would indicate that a handful to top high value items (less than 10 per cent of the total number) will account for a substantial portion of about 70 per cent of total consumption value. Remember: 10% of total number of items carries 70% of value. - "A" group items Similarly, a large number bottom items (over 70 per cent of the total number of items) account for only about 10 percent of the consumption value. Remember: 70% of total number of items account for only about 10% of consumption value-"C"-group items. Between these two extremes will fall those items the percentage number of which is more or less equal to their consumption value. Remember: 20% of total number of items account for only about 20% consumption value - "B" group items.

Items in the top category are treated as "A" items, items in the bottom category are called as "C" category items and the items that lie between the top and the bottom are called "B" category items. Such an analysis of materials is known as **ABC analysis or Proportional parts value analysis.**

Classification of items into A, B and C categories

The logic behind this kind of analysis is that the management should study each item of stock in terms of its usage, lead time, technical or other problems and its relative money value in the total investment in inventories.

Critical items i.e., high value items deserve very close attention and low value items need to be devoted minimum expense and effort in the task of controlling inventories.

The Material Manager by concentrating on "A" class items is able to control inventories and show visible results in a short span of time. By controlling "A" items and doing a proper inventory analysis, obsolete stocks are automatically pinpointed.

ABC analysis also helps in reducing the clerical costs and results in better planning and improved inventory turnover. ABC analysis has to be resorted to because equal attention to A, B and C items will not be worthwhile and would be very expensive.

The following steps will explain to you the classification of items into A, B and C categories.

1. Find out the unit cost and and the usage of each material over a given period.
2. Multiply the unit cost by the estimated annual usage to obtain the net value.
3. List out all the items and arrange them in the descending value. (Annual Value)
4. Accumulate value and add up number of items and calculate percentage on total inventory in value and in number.
5. Draw a curve of percentage items and percentage value.
6. Mark off from the curve the rational limits of A, B and C categories.

Stock Levels

Maintenance of proper stock of each item of materials is one of the main functions of stores department. Large quantity of material in store lead to huge investments, deterioration in quality, large space requirement etc. Less stock also leads to higher costs, frequent purchases and loss of production etc. Therefore, it is important to maintain stock level. One of the best way to maintain stock is to determine the minimum and maximum stock levels as per the necessity and maintain it regularly.

Store keepers usually use scientific technique of material management to ensure optimum quantity of material in store and make purchases accordingly. In order to do that following levels are fixed in advance:

1. Maximum Stock Level
2. Minimum Stock level
3. Re-ordering level
4. Danger level

Reordering Level

Re-ordering level is a level at which the storekeeper will initiate the steps to

purchase fresh supplies. This level is called re-ordering level or ordering level. This level usually lies between minimum and maximum stock level. This level will usually be higher than the minimum stock level to cover unexpected delay in delivery of fresh supplies or abnormal usage of materials. Following points need to be taken into consideration while fixing the re-ordering level

1. Economic Ordering Quantity
2. Rate of consumption
3. Time required for the delivery of fresh supply.

Following formulas can be used for calculating the re-ordering level.
Reorder level = Maximum consumption x Maximum re-order period
or
Reorder level = Minimum level + consumption during the time required to get fresh deliveries

Minimum Stock Level

Minimum stock level is a level of stock which must be kept in store at all times. This is a level of an item of material below which the stock in hand is not allowed to fall. The objective of this limit is to avoid the possibility of interruption of production due to shortage of material. The following points needs to be taken into consideration while fixing the minimum stock level.

1. Time required for the fresh supply of material - Lead time
2. Rate of consumption of material during the lead time.
3. Reorder level

Following formula can be used for determine the minimum stock level
Minimum stock level = Reorder level - (Normal consumption x Normal reorder period)

Maximum stock level

Maximum stock level is a quantity of material above which the stock of any item should not be allowed. To avoid blocking of working capital and making undue

investments in stock, maximum stock level is to be fixed. It also helps to maintain proper quality of raw materials. Following points must be taken into consideration while fixing maximum stock level:

1. Availability of storage space
2. Cost of carrying the inventory
3. Amount of working capital available
4. Economic ordering quantity
5. Possibility of change in market trend
6. Normal rate of consumption of material during the reordering process.
7. Time necessary for fresh delivery of materials.
8. Possibility of loss due to deterioration/evaporation etc.
9. Price fluctuation.
10. Insurance costs if any.

Following formula is normally in use for calculating Maximum stock level.

Maximum stock level = Reorder level + reorder quantity - (maximum consumption X minimum re-order period)

Danger Level

Danger level is a level below the minimum level. This is a level at which urgent action must be taken to procure new stock otherwise the stock may exhaust and could affect the production. This level is calculated by taking into account the time required to get the materials by the shortest possible means. Generally following formula is used to calculate the Danger level:

Danger level = average consumption x Maximum reorder period for emergency purchase.

Average stock level

Average stock level can be determined by using the following formula:

Average Stock Level = 1/2 of (Maximum stock level + Minimum Stock level) or

Average Stock Level = Minimum stock level + half of reorder quantity)

Reorder Quantity or Economical order Quantity

It is better to determine in advance how much is to be purchased when the material reaches reorder level. This quantity is called reorder quantity. It is the quantity when it received, it will not exceed the maximum stock level. It is also called Economic Order Quantity because purchase of this quantity of material is most economical as well. Frequent purchase will result in increase in cost of transportation. Too much of goods may block the working capital for a long time. Following points needs to be taken into consideration while fixing the reorder quantity.

1. Cost of transportation
2. cost of storage (warehouse rent, insurance, heating and lighting expenses)
3. cost of ordering
4. Availability of working capital
5. Minimum and maximum consumption for the lead time.
6. Time necessary to obtain deliveries
7. Possibility of loss due to evaporation or deterioration
8. Changes in the fashion trend.
9. Interest on investment
10. Obsolescence losses,
11. Store staff expenses.

Economic Order Quantity (EOQ):

Definition and Explanation:

Economic order quantity (EOQ) is that size of the order which gives maximum economy in purchasing any material and ultimately contributes towards maintaining the materials at the optimum level and at the minimum cost.

In other words, the economic order quantity (EOQ) is the amount of inventory to be ordered at one time for purposes of minimizing annual inventory cost.

The quantity to order at a given time must be determined by balancing two factors: (1) the cost of possessing or carrying materials and (2) the cost of acquiring or ordering materials. Purchasing larger quantities may decrease the unit cost of acquisition, but this saving may not be more than offset by the cost of carrying materials in stock for a longer period of time.

The carrying cost of inventory may include:

- Interest on investment of working capital
- Property tax and insurance
- Storage cost, handling cost
- Deterioration and shrinkage of stocks
- Obsolescence of stocks.

Formula of Economic Order Quantity (EOQ):

The different formulas have been developed for the calculation of economic order quantity (EOQ). The following formula is usually used for the calculation of EOQ.

$$EOQ = \sqrt{\frac{2 * A * Cp}{Ch}}$$

- **A= demand for the year**
- **Cp = cost to place a single order**
- **Ch = Cost to hold one unit inventory for a year**
- *=x

Underlying Assumptions of Economic Order Quantity:

1. The ordering cost is constant.
2. The rate of demand is constant
3. The lead time is fixed
4. The purchase price of the item is constant i.e no discount is available
5. The replenishment is made instantaneously; the whole batch is delivered at once.

3.2 Data and Sources of Data

Data

The data collected was provided by the company which included the products sales, holding cost, ordering cost and unit price for their previous two years. The company has been established in the year 2010 therefore data from then has been provided. The first step taken was to sort out 9 products out of 75 high value items and insert their historical demand into an excel spreadsheet to analyze the product's behavior.

Economic Order Quantity

Most of the data was provided by the company to calculate the economic order quantity for each product. In the data gathered, as mention in our literature review, an EOQ is used to minimize stock outs and find the optimal order quantity while minimize total cost associated with each product. The holding cost and order cost are equal when the optimal order quantity is obtained. As mention in the literature review, all the variables needed in order to calculate the optimal order quantity are illustrated in the Appendix D. For their current method, to calculate the ordering cost for each product

additional data was collected. The additional data collected was the number of orders placed per year, quarter and monthly. Only the orders placed per quarter were useful since all the calculations were done in based on quarter demand. With this data, the holding cost and the ordering cost was determined in order to compare the cost estimates from their current method and the recommended method. This portion of the project was the most challenging to complete because there was some reverse engineering involved to get the total cost for each product. This data is shown in Appendix D.

Before proceeding in calculating the EOQ some assumptions needed to be established;

- The calculated forecast would be the Demand
- The calculated forecast would be different for each product due to trend demand
- Fix order cost was provided by the company
- Holding cost was provided by the company
- Unit price was different for each product

Once the assumptions were satisfied, the calculations of the economic order quantity were done for each product. The results are shown in the Appendix D. The EOQ indicates that in order for the holding cost and the ordering cost to equal, the recommended amount should be order every time and order is placed to minimize the cost. In the recommended results, the optimal order quantity for each product was high which meant that their holding cost would increase. One advantage was that the fix order cost was reduced since there would be less orders placed throughout the quarter.

Along with the economic order quantity, lead time, reorder point and safety stock was provided. The lead time, reorder point and safety stock was provided by considering the delivery schedules and the production plan created by the company. The lead time is the number of days it takes to receive the product when an order is placed. The reorder point states that an order needs to be placed once the product falls below a certain amount of units. Furthermore, the reorder point maintains enough stock to satisfy the demand between orders.

Chapter 4

Analysis and Interpretation

4.1 Calculation of Carrying Cost

Carrying cost is calculated by identifying the percentage of loss happening due to:

- Tax
- Storage
- Handling
- Damage
- Administration
- Deterioration
- Obsolescence.

Once all the percentage is identified, the sum total of all these is found out and the carrying cost for each item is found out by multiplying the so found out percentage with the total cost.

The percentage of total cost is determined by a tabular column as follows:

Material Description	**Tax**	**Storage**	**Handling**	**Damage**	**Admin**	**Deterioration**	**Obsolescence**	**Total**
	2%- 6%	2%- 5%	2% - 5%	1% - 3%	3% - 6%	3% - 6%	6% - 12%	
Product 1	2	4	2	2	3	5	6	24
Product 2	2	2	2	1	3	5	6	21
Product 3		2	2	1	3	3	6	17
Product 4		2	2	1	3	3	6	17
Product 5	6	2	2	2	3	3	6	24
Product 6	5	4	2	1	3	3	6	24
Product 7	6	2	2	2	3	5	6	26

Product 8	6	2	2	1	3	4	6	24
Product 9	2	2	2	1	3	3	6	19

Table 4.1.1 Calculation of Carrying Cost

The carrying cost is found out by multiplying this total percentage with the total cost for each of the item.

4.2 Calculation of Annual Demand, Lead Time, Reorder Level, Safety Stock and Ordering Cost

Annual demand is determined as per the company's production plan. From the production plan the number of vehicle to be manufactured is determined. It is then multiplied with the quantity per equipment to get the annual demand of each equipment. The annual demand for each object is as follows:

Material Description	**Annual Demand(NO)**
Product 1	418.00
Product 2	836.00
Product 3	418.00
Product 4	418.00
Product 5	418.00
Product 6	418.00
Product 7	418.00
Product 8	418.00
Product 9	1,672.00

Table 4.2.1 Calculation of Annual Demand

Lead time and reorder level was identified from the SAP software of the company and also from the delivery schedules prepared by the company. These two parameters vary according to the demand and so cannot be identified by using a specific formula. The data was provided by the company as such.

Material Description	Lead Time	Safety Stock
Product 1	4 weeks for 75	30.00
Product 2	4 weeks for 50	60.00
Product 3	5 Weeks for 15	30.00
Product 4	8 to 10 Weeks	30.00
Product 5	8 Weeks for 75	30.00
Product 6	8 Weeks for 200	30.00
Product 7	2 Weeks	30.00
Product 8	5 weeks for 75	30.00
Product 9	5 Weeks for 30	120.00

Table 4.2.2 Calculation of Lead Time, Safety Stock.

The ordering cost for the company, as per the data given is RS 4500.

4.3 Calculation of Economic Order Quantity

Economic order quantity (EOQ) is calculated by using a formula:

$$EOQ = \sqrt{\frac{2(\text{Annual usage in units})(\text{Order cost})}{(\text{Annual carrying cost per unit})}}$$

Annual usage is otherwise called as the annual demand per year.

EOQ for product 1 is calculated as follows

Annual demand = 418

Carrying cost per unit = rs1022.232

Ordering cost = rs4500

EOQ = 60.665

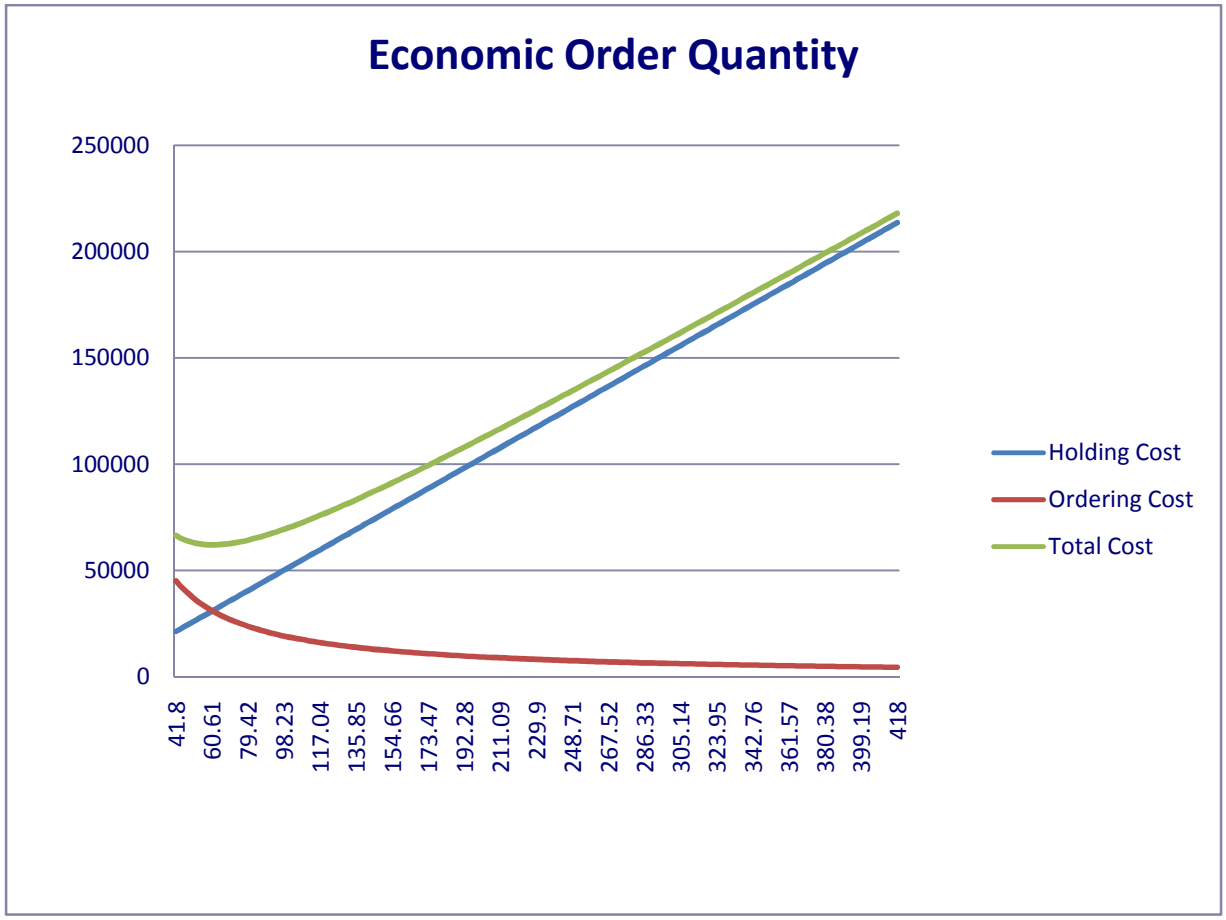


Figure 4.3.1 EOQ chart of product 1

Interpretation

The ordering cost declines continuously for three months and the holding cost increases for the same duration due to increase in holdings. The total cost initially declined but shows increasing trend later due to increase in holding cost.

EOQ for product 2 is calculated as follows

Annual demand = 836

Carrying cost per unit = rs628

Ordering cost = rs4500

EOQ = 109.46

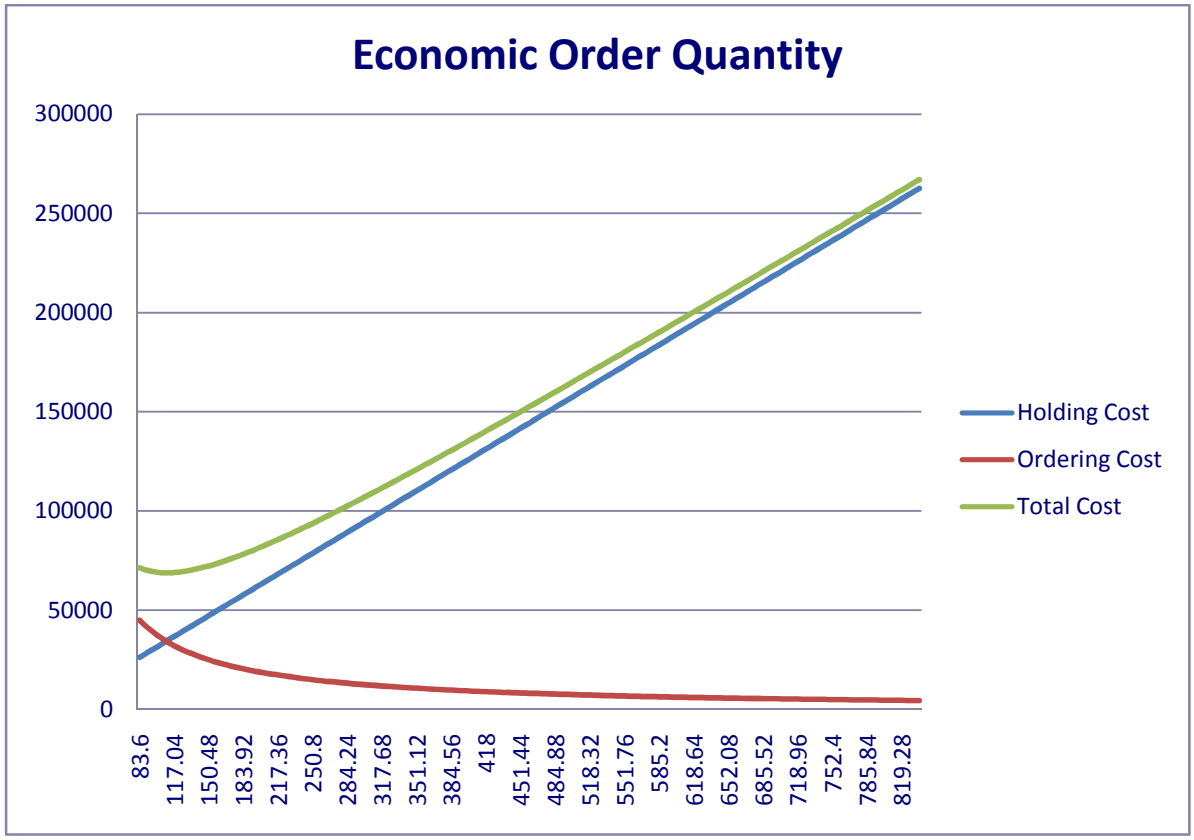


Figure 4.3.2 EOQ graph of product 2

Interpretation

The ordering cost declines continuously for three months and the holding cost increases for the same duration due to increase in holdings. The total cost initially declined but shows increasing trend later as the holding cost increased.

EOQ for product 3 is calculated as follows

Annual demand = 418

Carrying cost per unit = rs1069

Ordering cost = rs4500

EOQ = 59.32

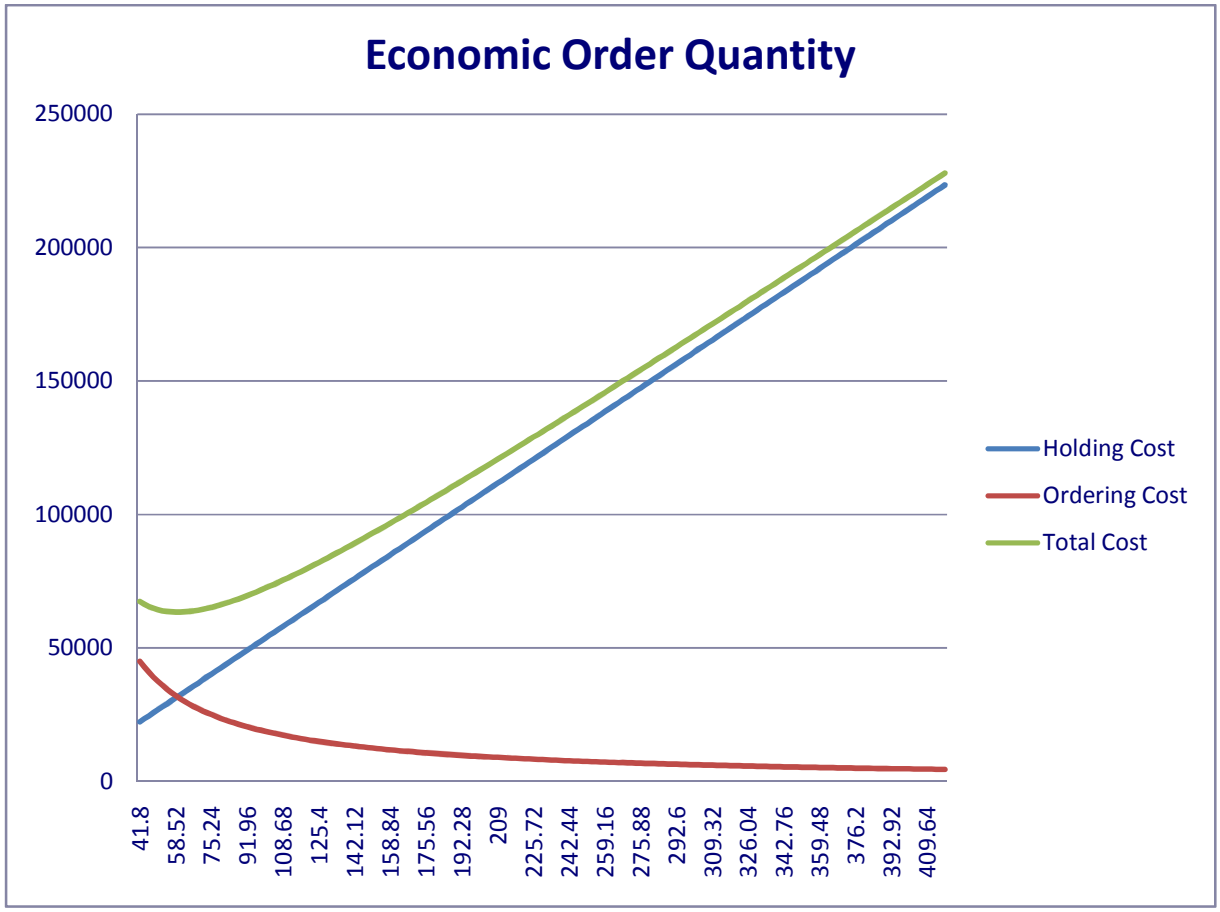


Figure 4.3.3 EOQ graph for product3

Interpretation

The ordering cost declines continuously for three months and the holding cost increases for the same duration due to increase in holdings. The total cost initially declined but shows increasing trend later due to increase in holding cost.

EOQ for product 4 is calculated as follows

Annual demand = 418

Carrying cost per unit = rs428

Ordering cost = rs4500

EOQ = 93.75

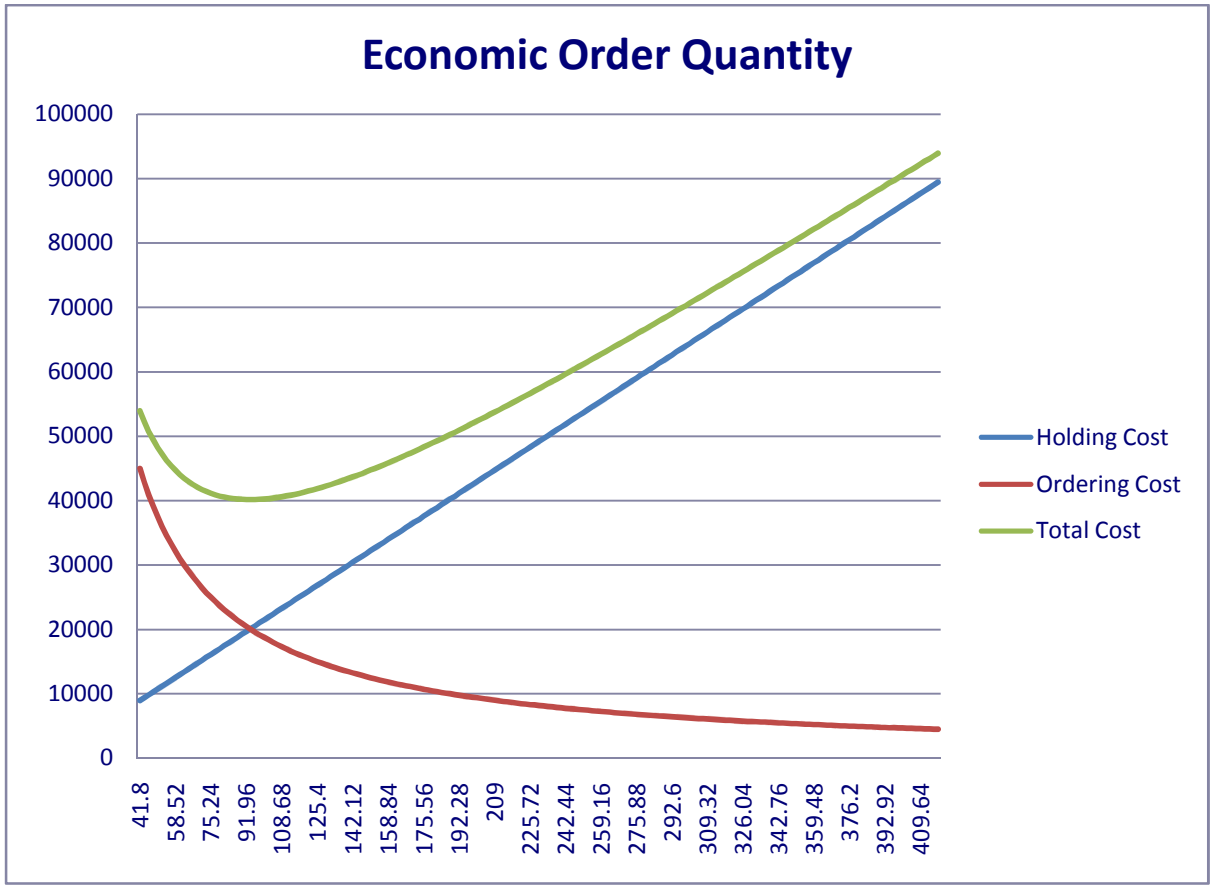


Figure 4.3.4 EOQ graph for product 4

Interpretation

The ordering cost declines continuously for three months and the holding cost increases for the same duration due to increase in holdings. The total cost initially declined but shows increasing trend later due to increase in holding cost.

EOQ for product 5 is calculated as follows

Annual demand = 418

Carrying cost per unit = rs1879

Ordering cost = rs4500

EOQ = 44.75

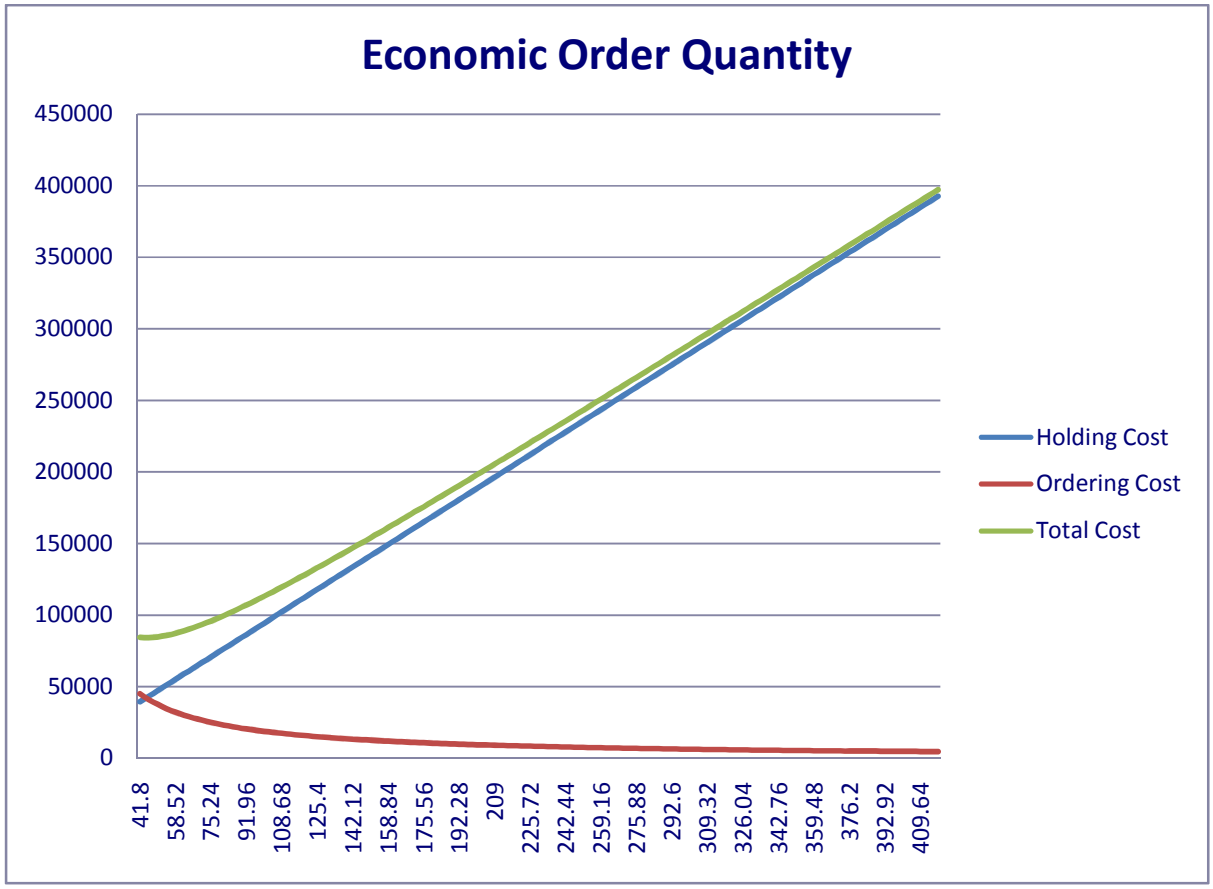


Figure 4.3.5 EOQ graph for product 5

Interpretation

The ordering cost declines continuously for three months and the holding cost increases for the same duration due to increase in holdings. The total cost initially remains unchanged but shows increasing trend later due to increase in holding cost.

EOQ for product 6 is calculated as follows

Annual demand = 418

Carrying cost per unit = rs1996

Ordering cost = rs4500

EOQ = 43.41

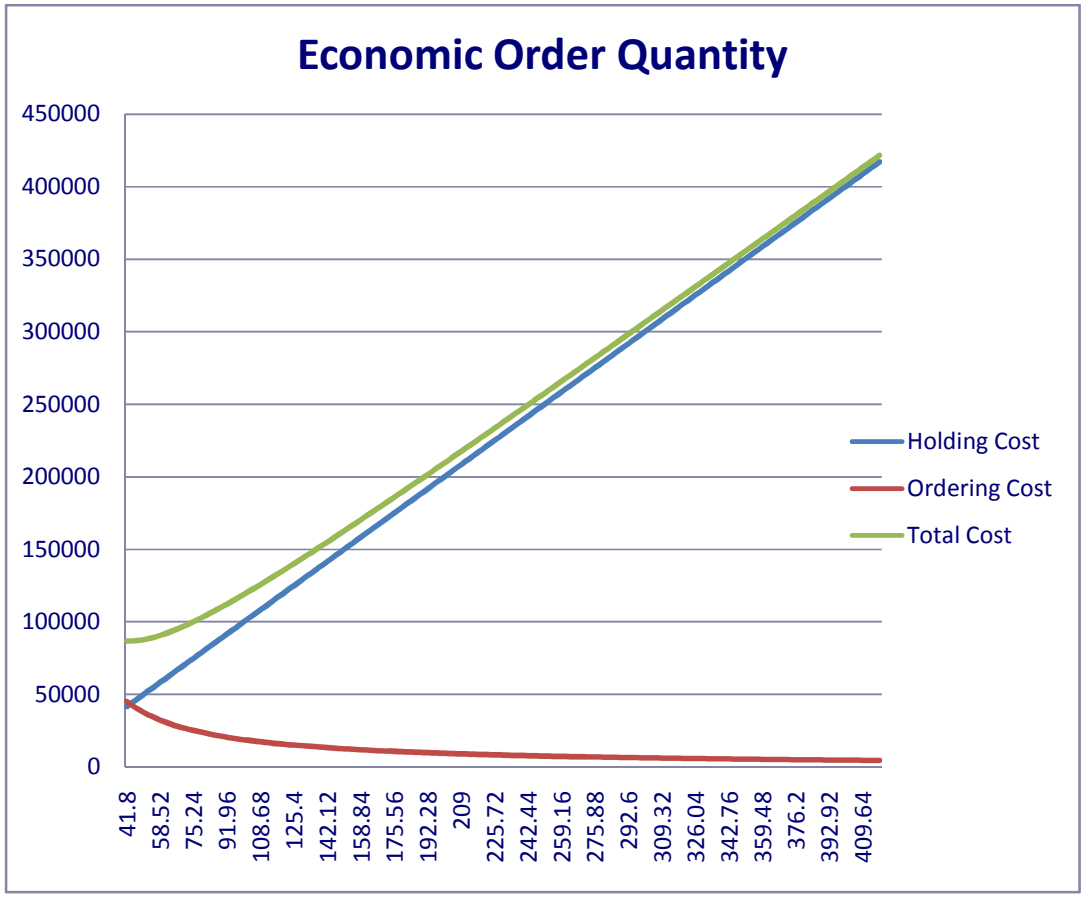


Figure 4.3.6 EOQ graph for product 6

Interpretation

The ordering cost declines continuously for three months and the holding cost increases for the same duration due to increase in holdings. The total cost initially remains unchanged but shows increasing trend later due to increase in holding cost.

EOQ for product 7 is calculated as follows

Annual demand = 418

Carrying cost per unit = rs706

Ordering cost = rs4500

EOQ = 73

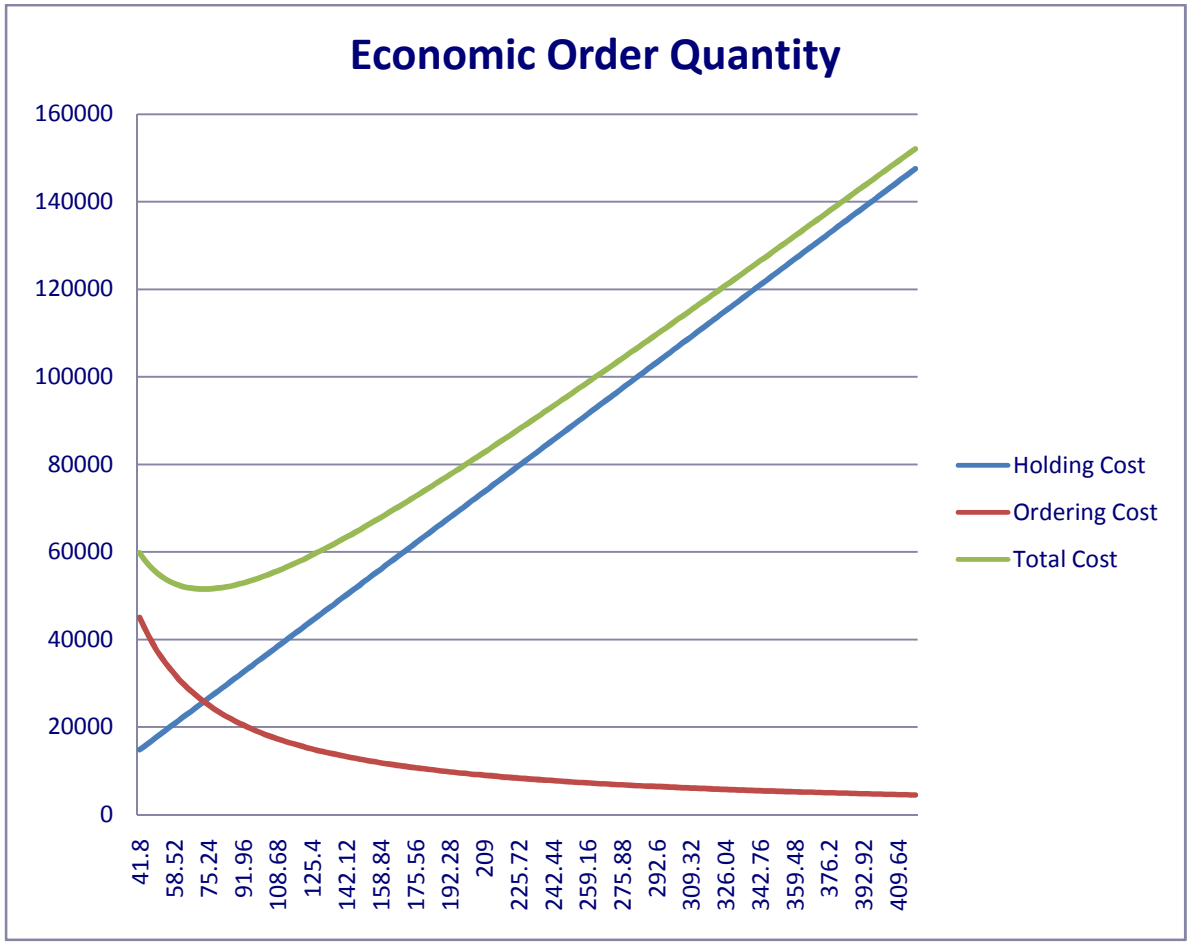


Figure 4.3.7 EOQ graph for product 7

Interpretation

The ordering cost declines continuously for three months and the holding cost increases for the same duration due to increase in holdings. The total cost initially declined but shows increasing trend later due increase in holding cost.

EOQ for product 8 is calculated as follows

Annual demand = 418

Carrying cost per unit = rs1818

Ordering cost = rs4500

EOQ = 45.49

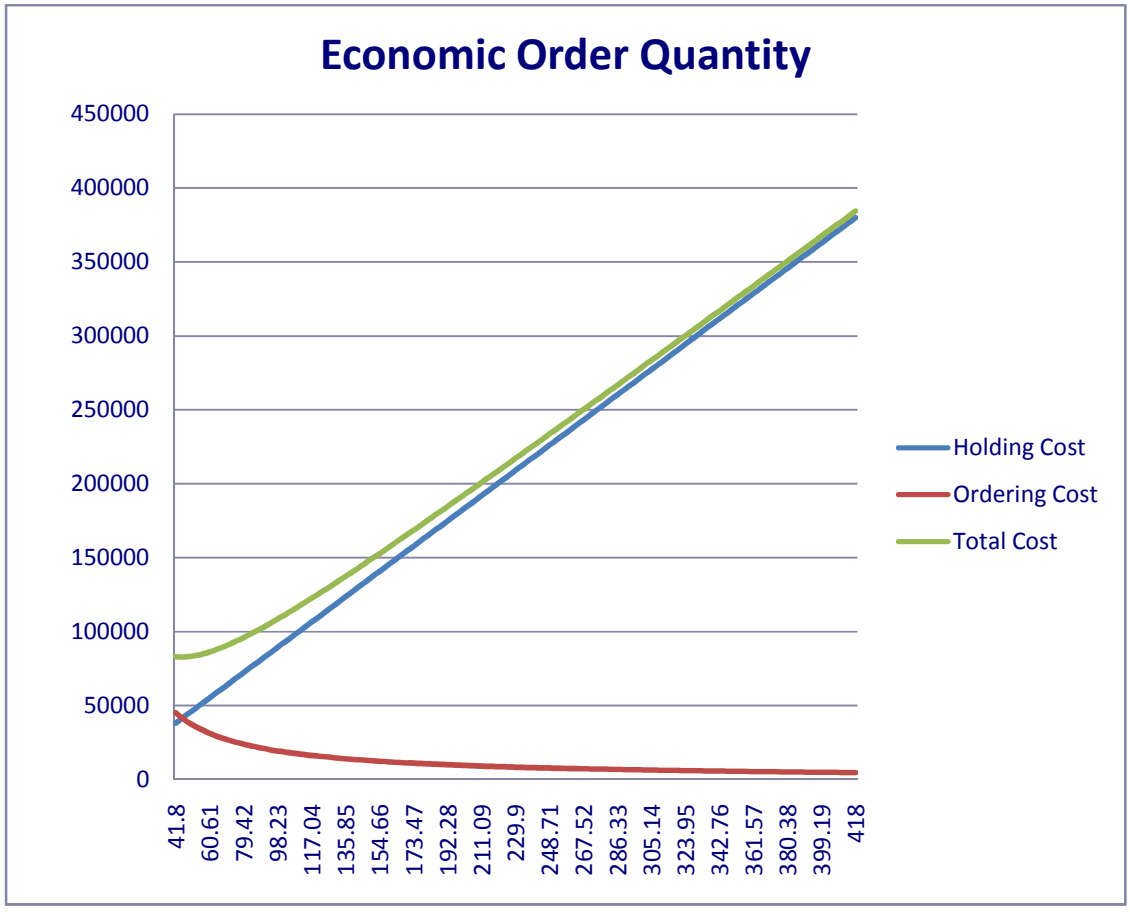


Figure 4.3.8 EOQ graph for product 8

Interpretation

The ordering cost declines continuously for three months and the holding cost increases for the same duration due to increase in holdings. The total cost initially remains unchanged but shows increasing trend later due increase in holding cost.

EOQ for product 9 is calculated as follows

Annual demand = 1672

Carrying cost per unit = rs483

Ordering cost = rs4500

EOQ = 176.51

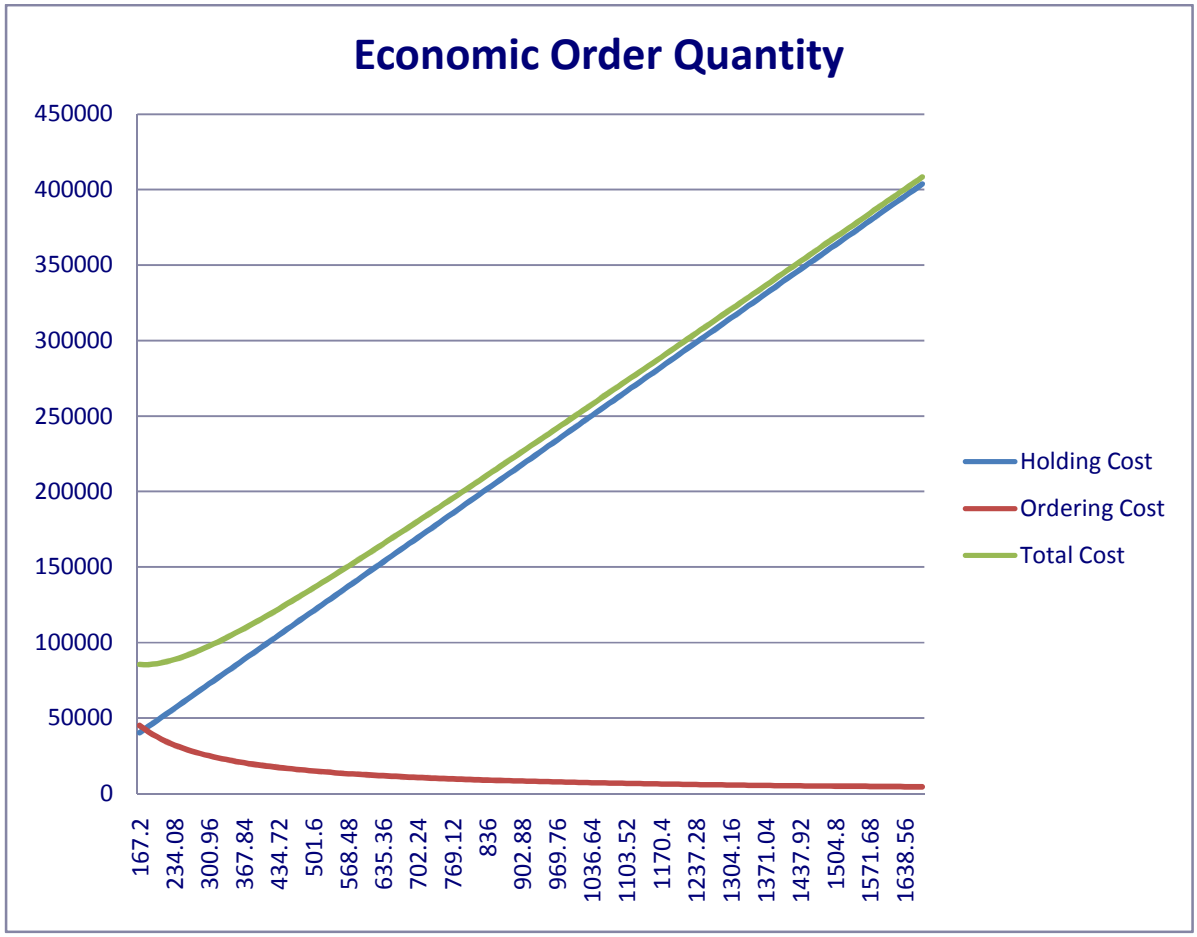


Figure 4.3.9 EOQ for product 9

Interpretation

The ordering cost declines continuously for three months and the holding cost increases for the same duration due to increase in holdings. The total cost shows increasing trend later due to increase in holding cost.

CHAPTER: 5

FINDINGS AND CONCLUSION

5.1 Findings

1. The EOQ, lead time, reorder level and the safety stock for nine items have been determined. EOQ have been identified by using a formula

$$EOQ = \sqrt{\frac{2 * A * Cp}{Ch}}$$

- **A= demand for the year**
- **Cp = cost to place a single order**
- **Ch = Cost to hold one unit inventory for a year**
- *=x

The EOQ, lead time, safety stock and reorder level have been determined and are as follows:

Material Description	EOQ	Lead Time	Safety stock	Reorder level
Product 1	60.665	4 weeks for 75	30.00	300
Product 2	109.431	4 weeks for 50	60.00	200
Product 3	48.354	5 Weeks for 15	30.00	75
Product 4	93.709	8 to 10 Weeks	30.00	
Product 5	44.736	8 Weeks for 75	30.00	600
Product 6	43.404	8 Weeks for 200	30.00	1600
Product 7	72.965	2 Weeks	30.00	
Product 8	45.484	5 weeks for 75	30.00	375
Product 9	176.464	5 Weeks for 30	120.00	150

Table 5.1.1 Calculation of EOQ, Lead Time, lead time, Reorder Level and Safety Stock.

2. The dead inventory in is excess.
3. Ordering cost is very high(RS 4500/-)

5.2 Conclusions

As a result of this study, EOQ for 9 high value bought out indigenous items have been calculated and their respective EOQ graphs have been plotted. Form the inferences obtained and also from the observations, it is found that the main disadvantage of this facility is the excess inventory they possess. It is evident that the inventory management process at BEML palakkad is in the beginning process. Hence, the Inventory management process must be designed in such a manner that the excess inventory can be avoided and thereby increasing the overall efficiency and reduce the inventory holding costs.

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