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SIGNIFICANCE OF MATERIALS MANAGEMENT IN INDUSTRIES CONSTRUCTION

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ABSTRACT

As a result of LPG (Liberalization, Privatization and Globalization) the companies are searching for alternative ways to stay competitive. This study goes through the process of analyzing the company's current forecasting model and recommending an inventory control model to help them solve their current issue. As a result, an Economic Order Quantity (EOQ) and a Reorder Point was recommended to help them reduce their product stock outs. The shortage of raw material for production always makes the process discontinuous and decreases the productivity. The ABC analysis technique for the inventory control system is first used to identify the most important multiple products and then the economic order quantity (EOQ) of each product is developed to find their inventory model equation individually.

Keywords: *Demand and Sales, Economic Order Quantity, Inventory, Production.*

I. INTRODUCTION

Inventories represent the largest asset category for manufacturing companies, next only to plant and equipment. The proportion of inventories to total asset generally varies between 15 to 30 percent. Given substantial investment in inventories, the importance of inventory management cannot be overemphasized. The present study is intended to determine the industry practice in inventory management and to evaluate management performance in this regard. In order to evaluate the performance of the inventory management referring the annual reports of the organization the required data has been collected.

An effective inventory management should

- Ensure a continuous supply of raw materials to facilitate for continuous production.
- Maintain sufficient finished goods inventory for smooth sales operation and efficient customer services.
- Minimize the carrying cost and time.
- Control investment in investment in inventories and keep it at an optimum level.
- It permits a better utilization of available stocks by facilitating interdepartmental transfers with in a company.
- Maintain sufficient stocks of raw materials in periods of short supply and anticipated price changes.

ABC analysis is an inventory categorization method which consists in dividing items into three categories, A, B and C: A being the most valuable items, C being the least valuable ones. This method aims to draw managers' attention on the critical few (A-items) and not on the trivial many (C-items).

The ABC approach states that, when reviewing inventory, a company should rate items from A to C, basing its ratings on the following rules:

A-items are goods which annual consumption value is the highest. The top 70-80% of the annual consumption value of the company typically accounts for only 10-20% of total inventory items.

B-items are the interclass items, with a medium consumption value. 15-25% of annual consumption value typically accounts for 30% of total inventory items.

C-items are, on the contrary, items with the lowest consumption value. The lower 5% of the annual consumption value typically accounts for 50% of total inventory items.

II. OBJECTIVES OF THE STUDY

- To find out the economic order quantity of the various products of the company.
- To analyze the inventory management technique used in the company.
- To suggest ideas to manage the inventory level of the organization.

III. REVIEW OF LITERATURE

Inventory is the supply of raw materials, partially finished goods called work-in-progress and finished goods, an organization maintains to meet its operational needs. It represents a sizeable investment and a potential source of waste that needs to be carefully controlled. It managers keep too much inventory on hand, they will waste money storing it and lose money it inventories are damaged or stolen.

Inventory is defined as a stock of goods that is maintained by a business in anticipation of some future demand. (3) The quantity to which inventory must fall in order to signal that an order must be placed to replenish an item.

Using an extension of a standard inventory-dependent demand model provide a convenient characterization of products that require early replenishment. The optimal cycle time is largely governed by the conventional trade-off between ordering and holding costs, whereas the reorder point relates to a promotions-oriented cost-benefit perspective. The optimal policy yields significantly higher profits than cost-based inventory policies, underscoring the importance of profit-driven inventory management. (1)

To work towards perfect order metrics, there has to be aggressive inventory management, restructuring supply chain operations, and updating standards to the perfect standard. When updating the metrics, this would include the cases shipped vs. the orders on-time delivery,

data synchronization, damages and unusable products, days in supply, the ordering time cycle, and shelf level of service.

The Economic Order Quantity (EOQ) formula has been used in both engineering and business disciplines. Engineers study the EOQ formula in engineering economics and industrial engineering courses. On the other hand, business disciplines study the EOQ in both operational and financial courses. In both disciplines, EOQ formulas have practical and specific applications in illustrating concepts of cost tradeoffs; as well as specific application in inventory.

Inventory refers to the stock pile of the product a firm is offering sale and the components but make up the product. In other words, inventory is composed of asset that will be sold in the normal course of business operation. The assets which firms store as inventory in anticipation of need are raw materials, work-in-progress, finished goods. (5)

Carrying cost refers to the total cost of holding inventory. This includes warehousing costs such as rent, utilities and salaries, financial costs such as opportunity cost, and inventory costs related to perish ability, Shrinkage and insurance.

Inventory management is the continuing process of planning, organizing and controlling inventory that aims at minimizing the investment in inventory while balancing supply and demand.(2)

Safety stock is a term used by logisticians to describe a level of extra stock that is maintained to mitigate risk of stock outs due to uncertainties in supply and demand. Adequate safety stock levels permit business operations to proceed according to their plans.(4)

IV. RESEARCH METHODOLOGY

The data pertaining to March 2015 to February 2016 are considered for the analysis.

To be able to calculate a basic EOQ, certain assumptions are necessary: (6)

(i) That there is a known, constant, stock holding cost
(ii) That there is a known, constant ordering cost
(iii) That the rates of demand are known
(iv) That there is a known constant price per unit
(v) That replenishment is made instantaneously, that is the whole batch is delivered at once

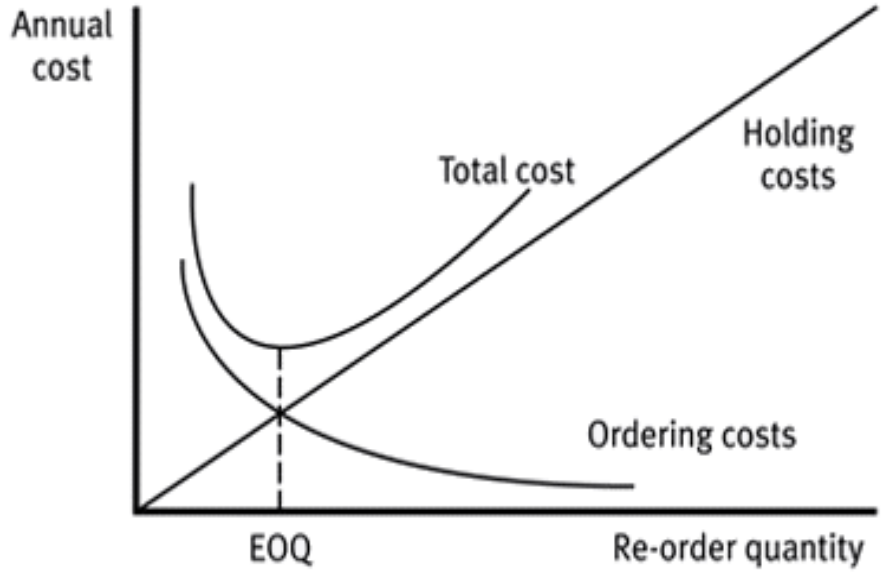

TABLE 1 FREQUENCY DISTRIBUTION FOR INVENTORY OF PRODUCTS

Sl. No	**Item**	**Month (2016-17)**												
		Mar	**Apr**	**May**	**Jun**	**July**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Total**
1	Bricks	1	2	1	1	-	1	-	1	-	1	1	1	**10**
2	Gravel	2	1	-	1	2	1	1	2	1	1	2	2	**16**
3	Cement	3	1	1	1	1	1	4	2	1	1	1	1	**18**
4	Sand	1	1	1	2	2	2	2	1	1	2	1	2	**18**
5	Steel	1	1	-	1	1	-	1	1	1	1	1	1	**10**

Source: Primary data

From the table 1 it is clear that the frequency of Cement and Sand is high, followed by Gravel, Bricks and Steel

HYPOTHESIS

Null Hypothesis: There is no significant difference of the mean of the different products

TABLE 2 ANOVA for SIGNIFICANT DIFFERENCE of the MEAN of the DIFFERENT PRODUCTS

Sl.No	Source of Variation	SS	df	MS	F	P-value	F crit
1	Between Groups	4.8	11	0.436364	**0.844575**	**0.597846**	**1.99458**
2	Within Groups	24.8	48	0.516667			
3	Total	29.6	**59**				

Source: Statistically analyzed data

Since F value < F crit value (ie) **0.844575 < 1.99458** the null hypothesis is accepted. Thus the means of the products are not equal. Also since P value is greater than 0.05, there is no significant difference between the means of products.

TABLE 3 ECONOMIC ORDER QUANTITIES (EOQ) for BRICKS

Sl.No.	Month	Quantity	Consumption	Carrying Cost	EOQ
1	March'16	1	15000	4000	102.06
2	April'16	2	19500	17500	78.7
3	May'16	1	14500	19500	45.4
4	June'16	1	10000	26750	32.19
5	July'16	0	12750	14000	50.25
6	August'16	1	2500	28250	15.66
7	September'16	0	14500	13750	54.06
8	October'16	1	0	31500	0.2
9	November'16	0	21300	10200	76.08
10	December'16	1	16550	11650	62.77
11	January'17	1	4150	23000	35.49
12	February'17	1	28000	10750	84.95
13	**YEARLY**	0	158750	138600	53.5

Source: Statistically analyzed data

From the table 3, it is clear that the highest EOQ value is in March 2016 (102.06) and followed by February 2017(84.95), April 2016 (78.7), November 2016 (76.08), December 2016 (62.77), September 2016 (54.06), July 2016 (50.25), May 2016 (45.4), January 2017 (35.49), June 2016 (32.19), August 2016 (15.66) and the least value is in October 2016 (0.2)

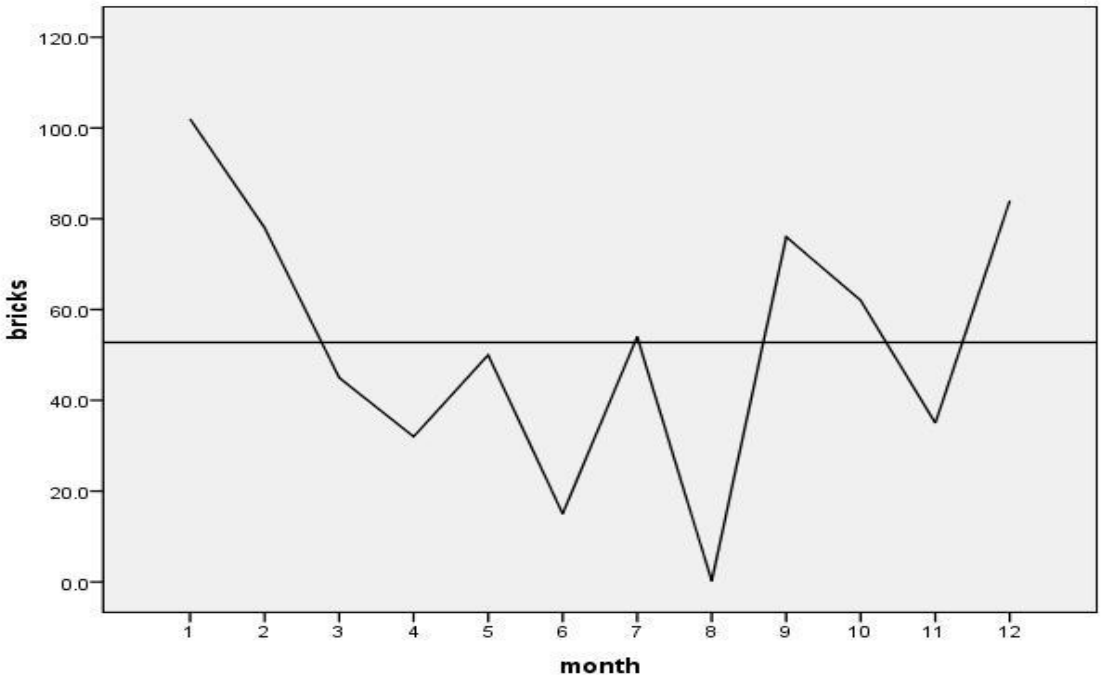

Fig. 2 Sequence Chart for EOQ of Bricks

TABLE 4 ECONOMIC ORDER QUANTITY (EOQ) for GRAVEL

Sl.No.	Month	Quantity	Consumption	Carrying Cost	EOQ
1	March'16	2	1700	1830	54.4
2	April'16	1	3500	1930	54.4
3	May'16	0	0	1930	0.9
4	June'16	1	2000	1730	43.6
5	July'16	2	5225	3180	71.4
6	August'16	1	1800	4880	24.17
7	September'16	1	3750	6710	29.7
8	October'16	2	5175	8435	44.08
9	November'16	1	4000	8085	28.0
10	December'16	1	7175	7160	38.2
11	January'17	2	5200	14710	33.46
12	February'17	2	6800	18650	33.99
13	**YEARLY**	0	46325	79230	38.025

Source: Statistically analyzed data

From the table 4, it is clear that the highest EOQ value is July 2016 (71.4), March 2016 (54.4), April 2016 (54.4), October 2016 (44.08), June 2016 (43.6), December 2016

(38.2), February 2017 (33.99), January 2017 (33.46), September 2016 (29.7), November 2016 (28.0), August 2016 (24.17), and the least value is May 2016 (0.9).

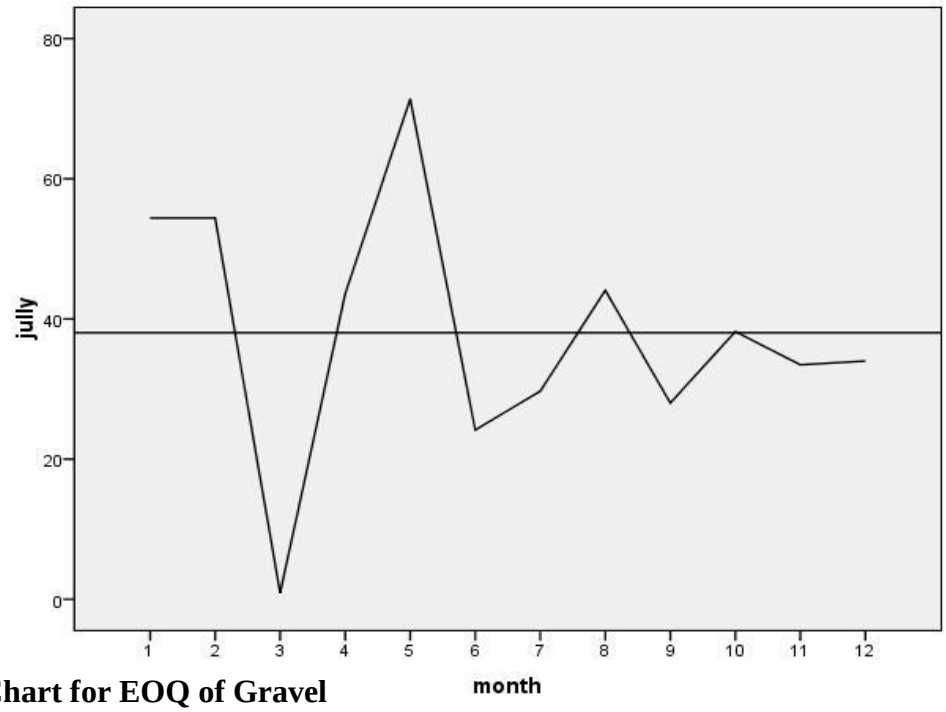

Fig. 3 Sequence Chart for EOQ of Gravel

TABLE 5 ECONOMIC ORDER QUANTITY (EOQ) for CEMENT

Sl.No.	Month	Quantity	Consumption	Carrying Cost	EOQ
1	March'16	3	102250	14300	288.91
2	April'16	1	70600	1700	402.36
3	May'16	1	49000	4200	213.49
4	June'16	1	44750	6700	161.29
5	July'16	1	63050	7650	179.12
6	August'16	1	45700	29950	77.03
7	September'16	4	51230	14720	232.68
8	October'16	2	40150	15445	142.22
9	November'16	1	45500	19445	95.39
10	December'16	1	63050	22395	104.66
11	January'17	1	46250	24895	85.0
12	February'17	1	660630	33045	67.8
13	**YEARLY**	0	0	194445	170.87

Source: Statistically analyzed data

From the table 5, it is clear that the highest EOQ value is for April 2016(402.36), March 2016(288.91), September 2016(232.68), May 2016(213.49), July 2016(179.12), June 2016(161.29), October 2016(142.22), December 2016(104.66), November 2016(95.39), January 2017(85.0), August 2016(77.03), and the least value is February 2017(67.8).

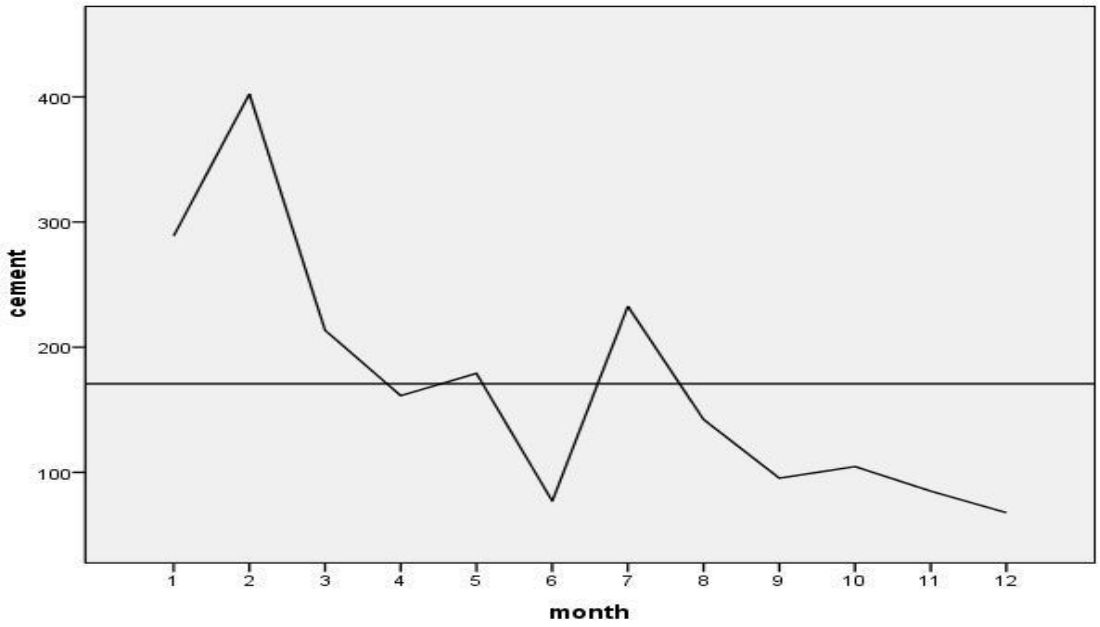

Fig. 4 Sequence Chart for EOQ for Cement

TABLE 6 ECONOMIC ORDER QUANTITY (EOQ) for SAND

Sl.No.	Month	Quantity	Consumption	Carrying Cost	EOQ
1	March'16	1	6350	850	145.5
2	April'16	1	3000	4200	42.64
3	May'16	1	6250	1200	117.85
4	June'16	2	7000	1400	160.27
5	July'16	2	8000	5900	83.4
6	August'16	2	8850	11050	64.16
7	September'16	2	6700	14950	47.98
8	October'16	1	5550	14900	30.9
9	November'16	1	5450	15950	29.61
10	December'16	2	8250	18450	47.92
11	January'17	1	9200	18250	35.97
12	February'17	2	10000	21250	49.15
13	**YEARLY**	-	84600	128350	69.08

Source: Statistically analyzed data

From the table 6, it is clear that the highest EOQ value is June 2016(160.27), March 2016(145.5), May 2016(117.85), July 2016(83.4), August 2016(64.16), February 2017(49.15), September 2016(47.98), December 2016(47.92), April 2016(42.64), January 2017(35.97), October 2016(30.9) and the least value is November 2016(29.61).

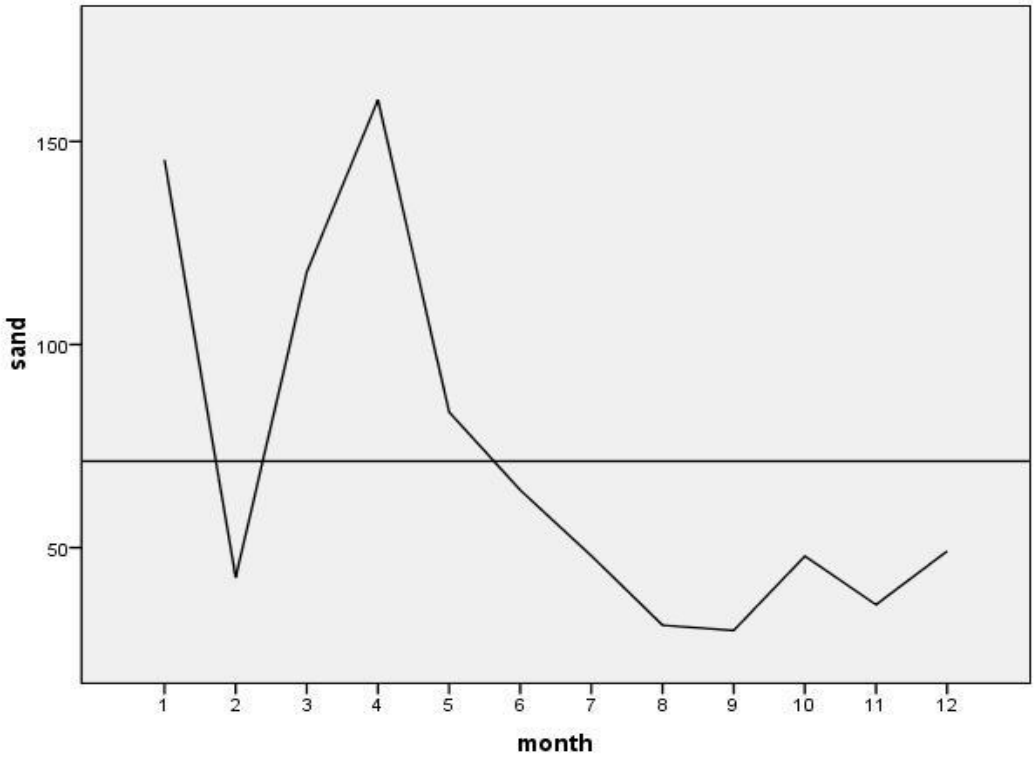

Fig. 5 Sequence Chart for EOQ of Sand

TABLE 7 ECONOMIC ORDER QUANTITY (EOQ) for STEEL

Sl.No.	Month	Quantity	Consumption	Carrying Cost	EOQ
1	March'16	1	66000	22000	183.03
2	April'16	1	97000	93605	107.49
3	May'16	0	47000	46605	106.03
4	June'16	1	76000	66005	113.3
5	July'16	1	125000	184005	87.01
6	August'16	0	137500	46505	181.58
7	September'16	1	118700	15405	293.38
8	October'16	1	141800	31909	222.60
9	November'16	1	74400	2409	586.89
10	December'16	1	41150	3759	350.47
11	January'17	1	51600	3759	392.46
12	February'17	1	47000	41259	112.07
13	**YEARLY**	0	1023150	557225	228.07

Source: Statistically analyzed data

From the table 7, it is clear that the highest EOQ value is November 2016(586.89), January 2017(392.46),December 2016(350.47), September 2016(293.28), October 2016(222.66), March 2016(183.03), August 2016(181.58),June 2016(113.3), February 2017(112.7), April 2016(107.49), May 2016(106.03) and the least value is July 2016(87.01)

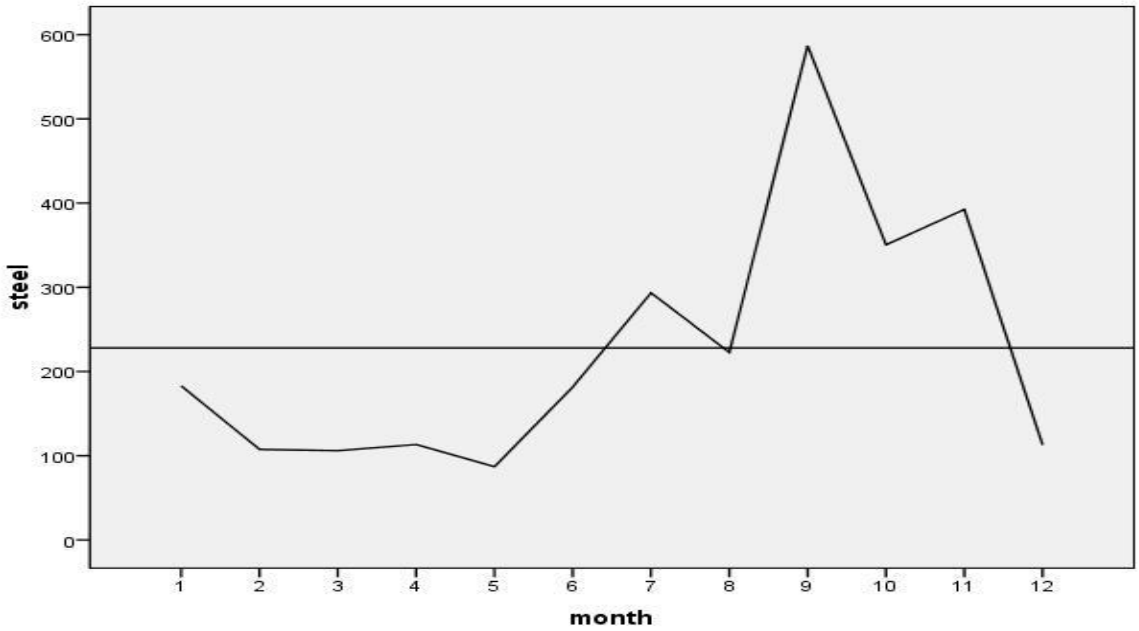

Fig. 6 Sequence Chart for EOQ of Steel

TABLE 8 ABC ANALYSIS of INVENTORIES

S.No	Product	Price	Unit	Annual consumption	Cumulative Annual Consumption	Class
1	Steel	50/kg	20463	1023150	1023150	A
2	Cement	300/Pack	2022	660630	1683780	B
3	Bricks	5unit	3150	158750	1842530	C
4	Sand	3000 load	28	84600	1927130	C
5	gravel	1800 load	25	46325	1973455	C

Source: Statistically analyzed data

From the table 8 Steel falls under 'A' which is the most valuable item of inventory. Cement falls under 'B' which is the average valuable item of the inventory. Bricks, Sand and Gravel fall under 'C' which has the lowest value of the inventory.

V. FINDINGS AND RECOMMENDATIONS

The researchers have found that Cement and sand is fast moving throughout the year. It is also very clear that Gravel, Bricks and Steel are given less importance in the stock. Materials management unit should also pay attention to sales growth over the years and thus take into consideration. More sophisticated techniques may be used to handle inventory management problem more efficiently and effectively. It is vivid that the EOQ of Bricks is high during the month March and low in October. During the month of July the EOQ of Gravel is high and Steel is low. Also during November EOQ of Steel is high and Sand is low. EOQ of Cement is high in the month of April and low in February. The sales and marketing department of the company should pay closer attention to the growth pattern of inventory usage and incorporate it in sales forecasting technique

The researchers have found that Steel being more valuable is considered high among the inventory. Cement comes under the average category. Bricks, Sand and Gravel are in the lowest category of the inventory. The management can expand the Go-down for storing the inventory. Effort must be made by the management to strike an optimum investment in inventory since it costs much money to tie down capital in excess inventory.

The management can take some measures for controlling wastage of raw inventories.

Emphasis can be normally placed on the economic order quantity model because it was seen to be in the best interest of organization to maintain an optimal level of materials in store. ABC may be maintained strictly.

VI. CONCLUSION

Inventory problems of too great or too small quantities on hand can cause business failures. If an organization experiences stock-out of a critical inventory item, production halts could result. Inventory management indicates the broad frame work of managing inventory. The inventory management technique is more useful in determine the optimum level of inventory and finding answers to problem of safety stock and lead time. Inventory management has become highly developed to meet the rising challenges in most Corporate entities and this is in response to the fact that inventory is an asset of distinct feature.

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