A COMPARATIVE ANALYSIS BETWEEN ORTHODOX AND ECONOMIC ORDER QUANTITY MODEL FOR INVENTORY CONTROL OF TOOLING

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Abstract

Inventories consist of raw material, work-in-process and finished goods which are held by a business in ordinary course of business, either for sale or for the purpose of using them in the process of producing goods and services. Inventory management is a science primarily about specifying the shape and percentage of stocked goods. It is required at different locations within a facility or within many locations of a supply network to precede the regular and planned course of production and stock of materials. The problem being faced by my concerned industry was about mismanagement of tooling. The industry in the business of manufacturing cold forged nuts &bolts. The solution of this problem was obtained by implementing Economic Order Quantity Technique .In this model the complete data of tooling was maintained& sagrigated.Then the mathematicalmodeling was applied. Economic order quality is referred to that size of order which gives maximum economy in purchasing the materials. It is also known as optimum or standard order quality or EOQ offers solutions to inventory problems. . EOQ is the point of minimum cost at which the ordering cost will be just equal to the carrying cost such that neither excess material is ordered, nor too many orders are placed for the same material during a period in time.

Key Word: - Economic order quantity,Optimum lot size, No. of orders per year, Cost of inventory

1. Introduction

The Study of inventory problems dates back to 1915, when F. N. Harris developed a very simple but nonetheless useful model of an inventory problem (Shore, 1980). Inventory is the total amount of goods or materials contained in a store or factory at any given time. A store owner needs to know the exact number of items on the shelves control losses. Inventory management is a science primarily about specifying the shape and percentage of stocked goods. It is required at different locations within multiple locations of a supply network, to protect the regular and planned course of production against the random disturbance of running out of the materials or goods. Inventory management also concerns fine lines between the replenishment lead time, carrying costs, asset management, inventory forecasting, valuation of inventory, future inventory price forecasting, physical inventory, inventory visibility, available space for inventory, quality management, replenishment, returns ,defective goods and demand forecasting.

Possessing high amount of inventory for long periods of time is not usually good for a business because of inventory storage, obsolescence, and expiry, spoilage costs. On the other hand, the possessing of too little inventory isn't good either, because the business can face the risk of losing out on potential sales and potential market share as well. Undoubtedly more business failures are caused by an overstocked or under stocked condition than any other factor. Inventory management strategies, such as a (J.I.T) just-in-time, is a tool which can help minimize inventory costs because goods are created or received only when needed. Inventory management systems are mostly applied in manufacture settings, where its viability and potential economic value are duly attained. The average business has 30% of its working capital tied up in inventories, while as, about 70% of its investment is in the plant and equipment (Sharma, 1984). It is an admitted fact that the carrying of inventories involves an exorbitant cost. According to the findings of Professor Alford and Bangs, “the annual cost of carrying a production inventory averages approximately 25 percent of the value of the inventory”. Ever ell Welch has also found that, “the annual carrying cost of inventory average somewhat 20 percent of the total inventory value, exhibiting a range of some 10 to 34 percent”.

2. Literature Review

Rosenblatt (1977) stated that the cost of maintaining inventory is included in the final price paid by the customer. Good in inventory represent a cost to their owner; the manufacturer has the expense of materials and lab ours. The wholesaler also has funds tied up. Therefore, the basic goal of the manufacturers is to maintain a level of inventory that will provide optimum stock at lowest cost.

Pawan Kumar (1998) stated that the Inventories are viewed by most of the business world as a large potential role and not as a measure of wealth as was prevalent in old days. The inventory stocked in excess of demand may lead to drastic price cuts, so as to be saleable before it becomes worthless because of obsolescence. The inventory stocked less than the demand may lead to the business out of the market. There is a constant fear in the minds of businessmen because of uncertainty in the market situations, whether to stock or not to stock. With rather tight monetary market, optimization of resources through proper inventory control becomes one of the major challenges for the material managers in every organization. Widening gulf between theory and practice has become remarkable phenomena in this age of science and technology. When the frontiers of knowledge are widening and the theory is developing at fast rate, the practice is lagging far behind. This is probably true about all branches of knowledge and especially true for inventory management area. Inventories play essential and pervasive role in almost every.

Ghosh and Kumar (2003) described that the Inventory management is primarily about specifying the size and placement of stocked goods. Inventory management is required at different locations within a facility or within multiple locations of a supply network to protect the regular and planned course of production against the random disturbance of running out of materials or goods. The scope of inventory management also concerns the fine lines between replenishment lead time, carrying costs of inventory, asset management, inventory forecasting, inventory valuation, inventory visibility, future inventory price forecasting, physical inventory, available physical space for inventory, quality management, replenishment, returns and defective goods and demand forecasting. Balancing these competing requirements leads to optimal inventory levels, which is an on-going process as the business needs shift and react to the wider environment; inventory control is the activity which organizes the availability of item to the customers. It coordinates the purchasing, manufacturing and distribution functions to meet the marketing needs.

Anju Mathew (2013) discussed that the current forecasting model in place at Company has brought problems due to ineffective forecasting that resulted in inaccurate inventory level. In order to help them reduce their stock outs, a forecasting model was provided along with an economic order quantity. Finally, the economic order quantity is, optimized the order quantity for each product when an order is placed, reducing the company's product stock out issue. By providing and recommending the inventory control model, the results have shown improvements in forecasting as well as in cost reduction. So, if the company follows through and implements the recommended inventory model, they would be able to reduce the total cost by approximately 20%which is a cost reduction of for top selling products. In the end, the issues the company faces would be reduced by implementing the recommended inventory model. The model will ensure the product is in stock, which would drive product sales and would allow the company to increase profit by forecasting accordingly. The recommended analysis showed that simple, yet complex techniques are the key for retail success which could give them the competitive edge.

Tom Jose ET. Al. (2013) found that, there is a variation in the EOQ & no. of unit purchased. It is understood that the company is not following EOQ for purchasing the materials. So, the inventory management is not satisfactory. From calculation of safety stock, we can able to determine how much the company can hold the inventory in reserve stock per annum From the classification A classes are those whose unit value is more than Rs.100 and constitutes 45% of total components. B classes are that whose unit value is between Rs.25-100 constitutes 35% of total components and C classes are those whose unit value is less than Rs.25 constitutes 30% of total components. It is good that the company maintains its inventories based on its value using controlling techniques. From the classification F items are those which moves fatly and constitutes 43% of total components. S items are those which moves slowly constitute 57% of total components and N items are those which don't move (Non-moving items). According to data given, there are no Non-moving items. It is not good as the company maintains low percentage in fast moving items in compared to slow moving inventories based on movements using controlling techniques.

3. Mathematical Modeling

$Q_0 = \sqrt{(2 * C_3 * R)/C_1}$

$T_0 = \sqrt{2 * C_3/C_1 R}$

$N_0 = 1/T_0 * 12$

$C_0 = C * R + \sqrt{2 * C_1 * C_3 * R}$

$P = (C_2 - C_0) * 12$

Where

Q_0 is new the optimum lot size of the inventory of tooling.

T_o is the time period after which the tooling is required to be ordered in an year.

N_o is the number of orders required to be placed in an annum.

C_o is the new economic cost of inventory against the old one calculated monthly.

P is profit of the tooling inventory calculated per annum.

C = Cost per piece of tooling.

C_1 = Holding cost per piece.

C_2 = Cost of inventory per month.

C_3 = Ordering cost of the monthly tools.

R = Required no. of pieces per month.

4. Result and Discussion

Sr. No.	Size of Tool (mm)	Cost of inventory per month(rupees) "C_2"	Optimum lot size(pieces) "Q_0"	Time period of q_0(months) "t_o"	No. of orders per year"n_o"	Economic cost of inventory(rupees) "C_o"	ProfitPer year(rupees) $P=(C_2-C_O)*12$
1.	24	12750	52	1.73	6.92	12165	6980
2.	20	8025	50	2	6	7850	2700
3.	18	7950	42.43	2	6	7800	1800
4.	16	7390	66.14	1.89	6.35	7265	1500
5.	15	4825	53	2.12	5.66	4715	1320
6.	14	3460	51.64	2.56	4.69	3355	1260
7.	12	4130	71.41	2.38	5.04	4040	1080
8.	10	4230	77.46	1.94	6.18	4155	1020

Table 1. Punches (High Speed Material)

Table 1.Shows the plant data of punches of different sizes & the calculation of optimum lot size of number of pieces required for a time interval. The number of orders to be placed per annum is calculated & the new cost of inventory which is less than the present value comes out. Finally the economic cost per annum using E.O.Q model is calculated.

Table 2. Shows the plant data of taps used in threading of different sizes & the calculation of optimum lot size of number of pieces required for a time interval. The number of orders to be placed per annum is calculated & the new cost of inventory which is less than the present value comes out. Finally the economic cost per annum using E.O.Q model is calculated.

Sr. No.	Size of Tool (mm)	Cost of inventory per month(rupees) "C_2"	Optimum lot size(pieces) "Q_0"	Time period of q_0(months) "t_o"	No. of orders per year"n_o"	Economic cost of inventory(rupees) "C_o"	ProfitPer year(rupees) $P=(C_2-C_O)*12$
1.	16*2	15650	64.8	1.31	9.16	15458	2304
2.	16*1.5	10220	52.78	1.54	7.80	10074	1752
3.	5/8unc	9150	37.8	1.14	10.53	9033	1404
4.	12*1.75	12500	69.28	1.15	10.43	12346	1848
5.	12*1.5	7100	49	1.63	7.36	6995	1260
6.	1/2BSW	7375	52.71	1.51	7.95	7264	1332
7.	10*1.5	6360	63.24	1.58	7.59	6253	1284
8.	10*1.25	3280	44.72	2.23	5.38	3179	1212

Table 2. Taps (High Speed Steel)

Sr. No.	Size of Tool (mm)	Cost of inventory per month(rupees) "C_2"	Optimum lot size(pieces) "Q_0"	Time period of q_0(months) "t_o"	No. of orders per year"n_o"	Economic cost of inventory(rupees) "C_o"	ProfitPer year(rupees) $P=(C_2-C_O)*12$
1.	24	7425	59.16	1.69	7.1	7296	1548
2.	23.75	6400	54.77	1.81	6.63	6373	324
3.	23.5	5325	44.72	1.79	6.7	5223	1224
4.	23	4300	40	2	6	4200	1200
5.	18	4820	54.77	1.82	6.6	4719	1212
6.	17.5	4050	50	2	6	3950	1200
7.	17	3280	44.72	2.23	5.3	3179	1212
8.	16	3840	54.77	1.81	6.63	3764	784
9.	15	2725	50	2	6	2650	900

Table 3. Dies High Carbon High Chrome Material

Table 3.Shows the plant data of dies of different sizes & the calculation of optimum lot size of number of pieces required for a time interval. The number of orders to be placed per annum is calculated & the new cost of inventory which is less than the present value comes out. Finally the economic cost per annum using E.O.Q model is calculated.

Sr. No.	Size of Tool (mm)	Cost of inventory per month(rupees) "C_2"	Optimum lot size(pieces) "Q_0"	Time period of q_0(months) "t_o"	No. of orders per year"n_o"	Economic cost of inventory(rupees) "C_o"	ProfitPer year(rupees) $P=(C_2-C_O)*12$
1.	24	20480	13	3.16	3.8	20353	1424
2.	23.75	15560	12	3.64	3.3	15424	1632
3.	23	23050	15	3	4	22800	3000
4.	18	17925	15	3.05	3.94	17725	2400
5.	17.5	9995	12	3.94	3.12	9775	2640
6.	17	12410	14	3.41	3.5	12205	2460
7.	16	12860	16	3.16	3.8	12690	2040
8.	15	11350	17	3.46	3.46	11170	2160

Table 4. Die Block (Hot Die Steel)

Table 4. Shows the plant data of die-blocks of different sizes & the calculation of optimum lot size of number of pieces required for a time interval. The number of orders to be placed per annum is calculated & the new cost of inventory which is less than the present value comes out. Finally the economic cost per annum using E.O.Q model is calculated.

5. Conclusions

After applying the various mathematical modeling under Economic Order Quantity Technique we came to very important conclusions under which the cost & time period of greatly influenced. The conclusions are as under:

1. The implementation of E.O.Q Model on High Speed Punches tooling revealed that the costing of this tooling was reduced by an amount of Rs.17660.Moreover the number of orders to be placed yearly was reduced.
2. In case of High Speed Taps the difference of Rs.12396 was observed. The new costing of the same was decreased by the above amount per annum.Moreover the number of orders to be placed yearly were reduced.
3. The high carbon high chrome material dies showed a reduction of Rs. 9604 from previous amount. The period of orders were greatly influenced.
4. The next process of economy was implemented on hot die steel die blocks which have lesser quantity but higher rates. The costing of this inventory was reduced by Rs.17756 .The Time period between orders was greatly influenced.

6. References

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