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Raw material inventory control analysis with economic order quantity method

To cite this article: R Susanto 2018 *IOP Conf. Ser.: Mater. Sci. Eng.* **407** 012070

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Raw material inventory control analysis with economic order quantity method

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Abstract. The purpose of this research is to minimize the total cost of raw material inventory more economically in accordance with the production needs. Economic Order Quantity is the method used to support this research. For this purpose, this method generates total inventory cost consisting of a minimum ordering cost and carrying cost. From this result, the inventory level and the number of raw material demand become more economic suitable with the production needs. It is because this method applies two types of cost, carrying cost and ordering cost that make the total inventory cost become more economically. So, this method can use to get the most economical total inventory cost and reduce storage cost swelling.

1. Introduction

Inventory control is the activity that organise the availability of items to customers [1]. Inventory usually occurs in the form of finished goods or raw material that will be used to particular purpose [2]. The main function of inventory is to ensure the smoothness of the fulfilment of consumer needs but does not require large storage cost [3]. Tom Jos *et al* [4] states that Inventory control is the most important function of inventory management and it forms the nerve centre in any inventory management organization

Inventory management is an important component in supply chain management. The fast response of customer demands affects inventory level. However, many enterprises cannot cope with the problem of increasing stock requirement that lead to increased cost, Wiśniewski [5]. Ryzin et al [6] states that efficiency of all costs related to inventory and is closely related to the sale transaction. However, this research not discuss the ordering cost to suppliers because focus to direct point of sale. On the research, Yang et al [7] present that Just in Time is an integrated inventory model to minimize the sum of ordering cost. However, the disadvantage of this method is that the ordering cost becomes higher because the order is made every will production.

In fact, the increased inventory of raw materials leads to increased total inventory costs. Enterprise need to consider the ordering cost and the carrying cost of raw materials so that the total inventory cost is not increased. Therefore, the purpose of this research is to minimize the total cost of raw material inventory that is more economical suitable with the production needs using Economic Order Quantity method this method can generate maximum ordering with low ordering cost [8]. This method applies two types of cost, carrying cost and ordering cost that make the total inventory cost become more economically. In addition, the inventory level and the number of raw material demand become more economic suitable with the production needs.



2. Research Method

The approach used in this research is quantitative approach by using descriptive method that conducts a comparative study to compare the phenomena that have been found [9]. First steps, found and formulated the problems and data by way of interview, observation and literature study for theory in this research.

The second steps are collection data and analysed. The data used for this research from CV. XYZ is a company engaged in the industry for a variety a special work items made of wood. This research used data of standard door leaf product demand from August 2016 until March 2017. Next step is determined the needs of each raw material based on the result of product needs that used Single Exponential Smoothing method. After that, calculated ordering cost and carrying cost per month for each raw material. Ordering Cost derived from the calculation of telephone and transportation charges of each material every month and the carrying cost of each raw material obtained the total Carrying cost divided by total raw material requirement. The next step is calculated the level economical stock used Economic Order Quantity formula. The formula is [4]:

$$Q = \sqrt{\frac{2SD}{H}} \quad (1)$$

Where D is total demand of raw material, S is ordering cost and H is carrying cost.

Next step is calculated ordering time (t) and ordering frequency (f) based on the calculation of the level economical stock (Q). Ordering time is quotient from level economical stock and total demand while ordering frequency is the opposite [4, 10]. After that, calculated the total cost (TC) and total incremental cost (TIC). TC is generated by adding ordering cost and carrying cost and the formula of TIC is:

$$TIC = \sqrt{2DSH} \quad (2)$$

The last step is to conclude the result of the research in accordance with the objectives that have been achieved.

3. Results and Discussion

Based on product demand data from August 2016 until March 2017, it is known that the number of product demand for next month is 7 units. This result is obtained from forecasting process using single exponential smoothing method. Of the total demand, can be generated the amount of each requirement of raw materials. Bill materials from this product is Woods 6x12x200, Woods 8x8x200, Sandpaper, Putty, Wooden Pencil, Wood Glue and Handle.

The calculation on material inventory includes Ordering Cost and Carrying Cost. Ordering Cost for one month are generated from telephone and transportation costs and the carrying cost of each raw material obtained the total Carrying cost divided by total raw material requirement. The conclusion of ordering cost and carrying cost are list in table 1. Based on formula, the calculation of the level economical stock (Q) for Wood 6x12x200 raw materials is:

$$Q = \sqrt{\frac{2SD}{H}} = \sqrt{\frac{2 \cdot (14) \cdot (7500)}{31500}} = \sqrt{\frac{210000}{31500}} = \sqrt{6,6667} = 2,58 \approx 3 \text{ stems} \quad (1)$$

Next step is calculated ordering time (t) and ordering frequency (f) based on the calculation of the level economical stock (Q). Based on formula, t and f for Wood 6x12x200 raw material is 6 days and 5 times per month. From the calculated, can be seen that the level of economic inventory for Wood 6x12x200 is 3 stems with ordering time is 6 days and ordering frequency for that raw material is 5 times per month. For the same calculated, the result of EOQ calculations for all raw materials requirement are found in table 1.

After know the calculation of Q, so we can calculate the Total Cost (TC) and Total Incremental Cost (TIC) for each raw material requirement. Total Cost (TC) consist of Ordering Cost and Carrying Cost, so before we calculate Total Cost we must calculate each cost. For example, calculate Wood 6x12x200 raw materials. After we calculated both, we can calculate Total Cost (TC), the conclusion of TC for each raw material are list in table 1.

Last steps are calculated Total Incremental Cost (TIC) for Wood 6x12x200:

$$TIC = \sqrt{2DSH} = \sqrt{2 \cdot (14) \cdot (7500) \cdot (31500)} = \sqrt{661500000} = 81.333, -/month \quad (2)$$

With same calculated, the result of D, t, f, S, H, TC and TIC for each raw material requirement are found in table 1.

Table 1. Total Cost Recapitulation for each raw materials.

Raw Material	D	Q	S	H	t	f	TC	TIC
Woods 6x12x200	14	3	7.500	31.500	6	5	39.000	81.333
Woods 8x8x200	21	4	7.900	21.000	6	5	28.900	83.473
Sandpaper	21	3	3.650	21.000	4	7	24.650	56.739
Putty	7	1	2.900	63.000	3	7	65.900	50.575
Wooden Pencil	7	1	1.700	63.000	3	7	64.700	38.722
Wood Glue	7	1	2.150	63.000	3	7	65.150	43.547
Handle	7	1	3.150	63.000	4	7	66.150	52.710

Table 1 is a simple model used to obtain economical inventory level by taking ordering cost and carrying cost. The economical inventory level of raw materials for standard door leaf product using EOQ method is woods 6x12x200 = 3 stems, woods 8x8x200 = 4 stems, Sandpaper = 3 sheets, putty = 1 cans, Wooden pencil = 1 pieces, wood glue = 1 packs and handle = 1 pieces. Total inventory cost for each raw materials is Rp39.000, Rp28.900, Rp24.650, Rp65.900, Rp64.700, Rp65.150 and Rp66.150. Based on these results, the company can more easily do the control of raw materials because the level of inventory and the amount of demand for raw materials become more economical in accordance with the production needs.

Why companies need this model? It because the main function of inventory is to ensure the smoothness of the fulfilment of consumer needs but does not require large storage cost [3]. Based on other research's [6,7,8], this model not only to minimize the sum of ordering cost which leads to an increase ordering cost and focus only on the sale transaction and can also generate maximum ordering with low ordering cost. So, with the economical inventory costs the company will get the maximum profit and customer needs remain fulfilled.

4. Conclusion

The conclusion for this research is the EOQ method can be used to minimize the total inventory cost of ordering with a minimum surcharge and total incremental cost for each raw material. So, the company doesn't spend more for each process of procurement and inventory and also the company can get maximum profit.

Acknowledgements

I thank you to Universitas Komputer Indonesia that have supported this research. Also I thank to my family who always supported me until this research completed.

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