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Optimal Raw Material Supply Management (Empirical Study at a Bakery in Bali, Indonesia)

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ABSTRACT : This research was conducted at Gayatri Bakery to know the performance of inventory management. The data collection method uses the interview method. The data analysis techniques used are EOQ analysis, determining safety stock, determining to reorder points, determining optimal inventory, and calculating the total cost of inventory. Results show that the current inventory system is still ineffective. EOQ method can streamline the total inventory cost of flour and egg. Companies should carry out an inventory control system using the EOQ Method, provide a safety stock and place a reorder point.
Keywords: inventory, EOQ, safety stock, reorder point

I.   INTRODUCTION

Every company, especially manufacturing companies, of course, has an inventory that is stored for the smooth running of the production process. Inventory is defined as goods that are stored for use or sale at a future date or period(Djordjevic et al., 2019). The value of the inventory is the reason for the company to apply a good method to manage its inventory(Andira, 2016). Inventory management determines the smooth running of the company's activities as well as the effectiveness and efficiency of a company(Azarskov et al., 2017). The inventory required by the company varies depending on the volume of production and process(Kuik et al., 2016). Basically, all companies plan and control product inventory by minimizing costs and maximizing profits within a certain time(Putra & Rahyuda, 2019). Every company needs to control the inventory of raw materials appropriately to maintain its position or even increase its position in business competition. Besides, proper control of raw material inventories can also help companies to have a high level of efficiency in the use of raw materials(Wijaya et al., 2016).

Based on the results of interviews with the owner of Gayatri Bakery, the supply is too much and it is not balanced with the number of requests, causing raw materials such as mixed flour and eggs to experience a decrease in quality and even damage. Damage to raw materials, of course, results in losses for the company. Besides, sometimes there is a shortage of inventory due to the increasing number of requests on certain days and the insufficient stock of raw materials which causes a slow production process and double orders. The double order resulted in the cost of ordering raw materials to increase and had an impact on decreasing profits earned by Gayatri Bakery. After making observations, it turned out that this business was still not good at preparing raw material supplies, this problem was proven by the company still ordering back when the inventory in the warehouse was very low and did not set a safety stock to maintain inventory. As a result, the company experienced problems in the cake production process where the manufacture was not finished immediately but had to wait for the raw materials to be bought back. This has an impact on the quality of service to consumers because they cannot fulfill orders on time. Of course, this problem will reduce the profit that Gayatri Bakery will get.

Inventory management that is implemented in this company has not paid attention to the economic order quantity, safety stock, and also the reorder point for raw materials because this company sometimes has shortages of raw materials and excess supplies of raw materials(Putra & Purnawati, 2018). As a result of unstable inventory, there will be an excess or shortage of inventory (stock out). Conditions like this certainly have a risk of increasing the total cost of inventories that must be incurred by the company and reduced profits earned by the company as a result of inefficient inventory management implemented(Hertini et al., 2018). The company also does not take into account the storage costs in implementing its inventory management(Olgun et al., 2016). The performance or success rate of inventory management can be assessed from the total cost of inventory incurred by the company and also the value of its inventory turnover rate(Farris, 2018). The current method applied by the company still causes stock out, which is an indication of the lack of performance in

inventory management implemented by the company. So that further analysis is needed using existing methods in inventory management for this company(Pereira & Gomes Costa, 2017).

Inventory management certainly has methods that can be used as a reference by companies, including economic order quantity models, production order quantity models, quantity discount models, or just this time(Nissa & Siregar, 2017). In this study, the model to be used is the economic order point (EOQ) quantity, model. The application of the EOQ method can determine the most economical quantity of raw material orders according to their needs, as well as the frequency of purchasing raw materials. The company can also have a positive influence on the company's finances because this method can streamline the total cost of raw material inventory. EOQ which can reduce the total cost of inventory has certainly been supported by several previous studies, and the efficiency of EOQ does not only occur in manufacturing companies. Pradipto et al. (2019),Di Nardo et al. (2020), Jiraruttrakul et al. (2017), Senthilnathan (2019), Panday et al. (2020)found that the application of EOQ in these trading companies can reduce inventory costs. Meanwhile, Nugraha et al. (2016), Ali et al. (2020); Riza & Purba (2018); Citra et al. (2018); Panday et al. (2020), Willyanto et al. (2019), Yuliana & Devi (2020), Putri & Nurcaya (2020) found that the application of EOQ can reduce the total cost of inventory in manufacturing companies.
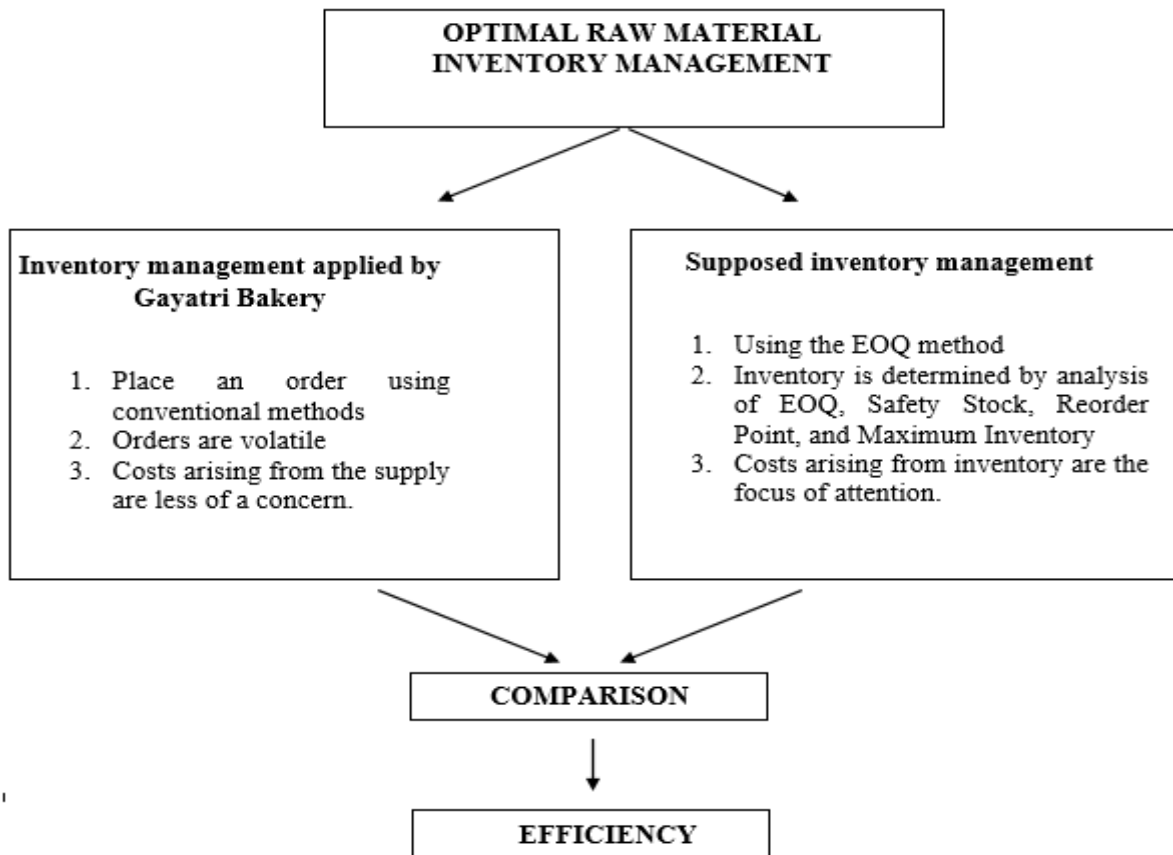

Fig. 1 Conceptual framework

II.   RESEARCH METHODS

Based on the problems studied, this research is a descriptive study. This research is a study at Gayatri Bakery which aims to determine the performance of inventory management in the company. This company was chosen because it does not have a good system for controlling its inventory, so it often runs out of raw material supplies. Data collection methods used in this research are observation and interview methods.

III.   RESULTS AND DISCUSSION

As a manufacturing company, inventory management at Gayatri Bakery is very important to maintain the smooth running of the production process. The method of determining the quantity of inventory order is adjusted to the available working capital.

Table 1. Total Inventories In 2019

No	Month	Mix flour (kg)			Egg		
		Target	Realization	(%)	Target	Realization	(%)
1	Januari	3,100	2,900	93,54	12,400	11,600	93,54
2	Februari	3,100	2,300	74,19	12,400	10,400	83,87
3	Maret	3,100	2,270	73,22	12,400	10,340	83,38
4	April	3,100	2,280	73,54	12,400	10,360	83,54
5	Mei	3,100	2,740	88,38	12,400	11,280	90,96
6	Juni	3,200	2,670	83,43	12,800	11,140	87,03
7	Juli	3,200	3,390	105,93	12,800	12,580	98,28
8	Agustus	3,200	3,240	101,25	12,800	12,280	95,93
9	September	3,200	3,490	109,06	12,800	12,780	99,84
10	Oktober	3,200	3,420	106,87	12,800	12,640	98,75
Total		**35,100**	**28,700**	**90,94**		**126,000**	**115,400**

In general, in the last ten months in 2019, the use of mixed flour raw materials in the Gayatri Bakery business has fluctuated. This is because the Gayatri Bakery business still uses conventional calculations, therefore one way to optimally control the supply of mix flour and eggs is to use the EOQ method.

The average purchase amount of mix flour in 2019 at Gayatri Bakery is 717.5 kg. The average number of purchases of eggs in 2019 at Gayatri Bakery is 2,885 items. Telephone Fee is IDR 500,000 and Transportation Fee is IDR 1,200,000. The cost of ordering raw materials for flour and eggs in the past year at Gayatri Bakery is IDR 42,500 and IDR 1,300,000. The storage cost for mix flour raw materials during 2019 is IDR 10,800,000. or IDR IDR. 376 / kg. The cost of storing raw materials for egg flour is IDR 93.58 / egg

Calculation of the purchase amount of mix flour raw materials, Given: R: 28,700 Kg, C: IDR 376 / Kg and S: IDR 42,500

$$\text{EOQ} = Q^* = \sqrt{\frac{2 \times 29,700 \times 42,500}{376}} = 2,547.91 \, kg$$

Calculation of the total purchase of raw materials for eggs, known: R: 115,400 Items, C: IDR 94 / item and S: IDR 42,500

$$\text{EOQ} = Q^* = \sqrt{\frac{2 \times 115,400 \times 42,500}{94}} = 20,325 \, eggs$$

Calculation of Optimal Purchase Frequency for Mix Flour, it is known: D = 28,700 Kg and Q * = 2,547.91 kg
F * = D / Q * = 28,700 / 2,547.91 = 11.27 times → 11 times
Calculation of the optimal purchase frequency for eggs, it is known: D = 115,400 items and Q * = 10,215 items
F * = D / Q * = 115,400 / 10,215 = 11.29 → 11 times
Optimal Total Cost of Raw material Inventory. It is known that: R: 28,700 Kg, C: IDR 376 / Kg, S: IDR 42,500 and Q: 2,547.
TIC = (Q / 2) (C) + (R / Q) S = (2,547.91 / 2) (376) + (28,700 / 2,547.91) (42,500) = 957,732.78. It is known that: R: 115,400 items, C: IDR 94 / item, S: 42,500 and Q: 10,215
TIC = 960, 232

Determining the Re-Order Point: L = 2 days, D = 461 items and SS = 1,533,201 Kg ROP = d x L + SS = (461 x 2) + 1,533,2 = 2,445,2 items
Determining the Re-Order Point, Given: L = 2 days, D = 114.8 Kg and SS = 766, 58 Kg ROP = dx L + SS = (114.8 x 2) + 766.58 = 996 , 18 Kg

Comparison of Raw Material Inventory between Company Policy and EOQ Method

Comparison of raw material supplies for mix flour and eggs with MSME policies with the EOQ method at Gayatri Bakery in the last ten months can be seen in table 2

Table 2 Comparison of Inventory between Company Policy and EOQ Method

Description	Flour		Egg	
	Company policy	**EOQ method**	**Company policy**	**EOQ method**
Purchase quantity	717.5 kg	2,547.91 kg	2,885unit	10,215 unit
Purchase frequency	40times	11times	40times	11times
Total inventory cost	IDR 1,834,537	IDR 957,732,78	IDR 1,835,959	IDR 960,232
Safety supplies	-	766.58 kg	-	1,533.2 unit
Reorder point	-	996.18Kg	-	2,455.2 unit

Based on Table 2 it can be seen that there are differences in the supply of raw materials between conventional Gayatri Bakery policies and the EOQ method where using the EOQ method is proven to be able to optimize the supply of mix flour and egg raw materials and be able to overcome problems that will arise such as unable to produce due to running out of ingredients. raw before ordering again. By using the EOQ method, it is proven that the Gayatri Bakery business owner will know the level of purchase of mix flour and egg raw materials and know how much roasting supplies and when to reorder points.

IV.   CONCLUSION

The supply management control system applied at Gayatri Bakery is currently not efficient. This is evidenced by the total inventory cost of the main raw materials for flour and eggs issued during 2019 using conventional methods, namely IDR 1,834,537 for flour and 1,835,959 for eggs. The application of the economic order quantity (EOQ) method at the company results in a total inventory cost of IDR 957,732.78 for flour and IDR 960,232 for eggs. Based on the total cost of inventory generated from each inventory, the EOQ method is more effective to be applied to Gayatri Bakery. The EOQ method can streamline the total cost of supplies by IDR 876,804.22 for flour and IDR875,727 for eggs. The company can review the method used and the policies applied by the company in handling its raw material inventory, considering the use of the EOQ method in handling its raw material inventory, because the application of the EOQ method can streamline inventory costs.

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