Inventory Control Analysis Using The Economic Order Quantity and Reorder Point Methods in Controlling Wheat Flour Raw Material Inventory at Ciki Bakery MSMEs

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Abstract

This study aims to determine the control of raw material inventory carried out by Ciki Bakery MSMEs and the comparison of the total cost of raw material inventory using the Ciki Bakery MSME policy with the Economic Order Quantity method. The data analysis method used in this study is qualitative with a descriptive approach. Data collection techniques with the method of literature study and direct observation. The results of the study found that the Economic Order Quantity method has optimal results compared to the method applied in MSMEs. This is evidenced by the frequency of bookings which have a considerable difference from 72 times to as many as 4 bookings during 1 year 2021. As well as less inventory costs, namely Rp. 291,000, the difference is Rp. 1,222,000 compared to the MSME method.
Keywords: Economic Order Quantity (EOQ) Method, Inventory Control, Reorder Point (ROP), Small and Medium Enterprises

INTRODUCTION

Knowledge of inventory management, both in the form of raw materials and products is very necessary for companies. Various companies realize the importance of managing the level of cycling to gain a competitive advantage. The higher the valuation rate than the competitor, the more competitive the competitive position will become very weak. There are three types of inventory, namely raw material inventory, half material inventory and finished goods inventory. Raw material inventory is used to meet the needs of the production process while the finished material is used to meet market needs (Chrisna, 2018).

Small and Medium Enterprises (MSMEs) must have inventory, because it is to anticipate market uncertainty. Because not all raw materials needed for the production process are always available. Too much inventory of raw materials will result in waste in storage costs, but if there is too little inventory, it will result in a loss of fortunes to make a profit (Daud, 2017).

The purpose of inventory control is to reduce ordering costs and storage costs to a minimum so that the performance and profits obtained can be optimal. To reduce these costs, proper inventory management is needed to avoid increasing inventory costs and maximize the proper management of MSME finances (Noerieana, 2021).

UMKM Ciki Bakery is one of the MSMEs from Semarang City that has a business in the bakery sector that has been running since 2015 until now. So far, MSMEs ciki bakery have implemented inventory control by purchasing raw materials in the form of wheat flour when they run out of raw materials. So it often runs out of stock and interferes with the production process.

The method that can be used in making decisions on the purchase of wheat flour raw materials is the Economic Order Quantity (EOQ) method. Economic Order Quantity or economic order quantity is an example of an inventory system that aims to determine the quantity of orders that will minimize annual inventory costs. This EOQ can be used easily and practically

to plan the number of times a material is purchased and in quantity how many times it is purchased (Dewi et al., 2020). MSMEs must also determine the Reorder Point or Reorder point to determine when to reorder by paying attention to the amount of safety stock and the amount of raw material use during the lead time (Ahmad & Sholeh, 2019).

Based on the background of the problems above, the purpose of this study is to determine the control of raw material inventory carried out by MSMEs Ciki Bakery. In addition, it is also to find out the comparison of the total cost of raw material inventory using the Ciki Bakery MSME policy with the Economic Order Quantity method.

Literature Review
Definition of Inventory

Inventory is the main part of working capital, because judging from the amount, usually inventory has the largest element of working capital (Sutrisno, 2017, p. 79). This can be understood considering that inventory is the most important factor in determining the smooth operation of the company. According to (Hansen & Mowen, 2009, p. 208) In inventory there are two main costs, namely if the inventory is in the form of raw materials or goods purchased from outside sources, then the costs associated with the inventory are ordering costs and storage costs. But if raw materials or goods are produced internally, then the cost is called the cost of preparation and the cost of storage.
1. Ordering Cost is the cost of placing and receiving an order. These costs include order processing fees, insurance costs for shipping, and unloading costs.
2. Preparation or setup Costs (Setp Cost) there are costs to prepare equipment and facilities so that they can be used to manufacture certain products or components.
3. Carrying Costs are the costs of storing inventory. These costs include insurance costs, cycling taxes, finances, opportunity costs, handling fees, and storage space (Wijaya et al., 2018).

Economic Order Quantity (EOQ) Method

According to (Hansen & Mowen, 2009, p. 211) The Economic Order Quantity method or economical order quantity is an example of an inventory system that aims to determine the quantity of orders that will minimize the cost of annual inventory. Meanwhile, according to Sutrisno, the Economic Order Quantity method is the quantity of quantity of materials purchased at each purchase kai with the least cost (Purnama, 2020). The formula for calculating EOQ is as follows:

$$EOQ = \sqrt{\frac{2DS}{H}}$$

Information: EOQ = Optimal quantity of goods per order
D = Annual demand for dosage goods, in units
S = Booking fee each time you book
H = Storage costs per message

Lead Time

According to (Hansen & Mowen, 2009, p. 213) states that the lead time or waiting time is the time required to receive an economical order quantity after the order has been placed or preparations have begun.

Reorder Point

According to Hansen and Mowen Reorder Point is the point in time at which a new order must be placed or preparations begin (Meirini & Praptiwi, 2017). Meanwhile, according to

(Carter, 2009, p. 319) The Reorder point is when the amount of available inventory and the amount of inventory to be received is equal to the amount of inventory to be used during the waiting time and the amount of safety supplies. The formula for calculating the Reorder Point is as follows:

$$ROP = (d \times L) + SS$$

Information: ROP = Reorder Point
d = Requests per day
L = Lead Time
SS = Safety Stock

RESEARCH METHODS

To collect data, efforts in completing this research, the author requires data using the following data collection techniques: Library research and Field work research (Observation, Interview and documentation).

RESULTS OF RESEARCH AND DISCUSSION
Raw Material Inventory Needs

MSMEs Ciki Bakery has data on the needs of the main raw materials in the form of wheat flour during 2021 as follows

Tabe 1. Order Wheat Flour in 2021

Month	Booking Frequency	Quantity Reserved (kg)	Price
January	2	45	Rp 540.000
February	3	60	Rp 720.000
March	2	76	Rp 912.000
April	10	95	Rp 1.140.000
May	6	35	Rp 420.000
June	9	80	Rp 960.000
July	2	42	Rp 504.000
August	9	70	Rp 840.000
September	9	80	Rp 960.000
October	9	70	Rp 840.000
November	2	40	Rp 480.000
December	9	89	Rp 1.068.000
Total	72	782	Rp 9.384.000
Mean	6	65,167	Rp 782.000

Source: CIKI Bakery MSME data

The highest need for wheat flour raw materials during 2021 was in April with an order voume of 95 kg, while the lowest need for ingredients was in the May buanl with an order voume of 35 kg. the amount of raw material needs for 1 year is 782 kg with an order frequency of 72 times. With an average per month is 65,167 kg and the frequency of orders is 6 times.

Raw Material Inventory Costs

Ciki Bakery incurs costs related to inventory consisting of storage costs and ordering costs. The booking fee consists of a telephone fee of RP 2,500 and a purchase transportation fee of IDR 12,000. The total cost of a message for one message is Rp. 14,500. So it is known that the cost of ordering for 1 year is IDR 14,500 x 72 = IDR 1,044,000. Meanwhile, the cost of storing wheat flour raw materials is the cost borne by CIKI Bakery MSMEs, which is 5% of the price of raw materials. Then it can be determined at IDR 12,000 x 5% = IDR 600 per kg or IDR 469,000 per year 2021.

From the data on ordering costs and storage costs, it can be seen that the total cost of inventory is:

Booking Fee	Rp 1.044.000
Storage Costs	Rp 469.000
Inventory Costs	Rp 1.513.000

Lead Time

Lead time is the time between the order is placed until the goods arrive. In purchasing wheat flour raw materials at MSMEs, Ciki Bakery has a waiting time of 2 days.

Calculation of Raw Materials with the Economic Order Quantity Method

$$EOQ = \sqrt{\frac{2DS}{H}} = \sqrt{\frac{2.(782)(14.500)}{600}} = 194,41 \text{ kg or } 194 \text{ kg}$$

Based on the calculation results, the amount of wheat flour raw materials based on the Economic Order Quantity method is 194.41 kg. While the frequency of purchases can be calculated as follows:

Purchase Frequency $= \frac{D}{EOQ} = \frac{782}{194} = 4,03$ or 4 kali. Which means that MSMEs of Ciki Bakery can purchase raw materials for wheat flour as much as 4 times a year.

The amount of time between bookings can be calculated as follows:

T $= \frac{D}{EOQ} = \frac{366}{4} = 91,5$ atau 91 hari sekali. Yang artinya pemesanan berikutnya diakukan 91 hari setelah pemesanan berikutnya.

Safety Stock

Before looking for safety supplies first calculate the average demand for wheat flour per day. That is by dividing the demand per year by the number of working days for 1 year. Here's a calculation of requests per day:

d $= \frac{D}{EOQ} = \frac{782}{312} = 2,5$ kg per day

Furthermore, to calculate the safety stock, namely by means of demand per day at times with lead time. In this case, MSMEs ciki Bakery are known to lead time for 2 days. Then the calculation is: Safety Stock = 2,5 kg x 2 day = 5 kg. This means that the security provision for MSME Ciki Bakery is 5 kg.

Reorder Point (ROP)

To find the reorder point or reorder point of wheat flour raw materials can be calculated in the following way:

ROP = (d x L) + SS
ROP = (2,5 X 2) + 5
ROP = 10 kg, this means that when the supply of wheat flour raw materials has reached 10 kg, it will place an order again and the order will come within 2 days.

Raw Material Inventory Cost Using Economic Order Quantity Method

Order Costs $= S \frac{D}{EOQ} = 14.500 \frac{782}{194} = $ Rp 58.448,44

Storage Costs = H $\frac{Q}{2}$ = 600 $\frac{194}{2}$ = Rp 58.200,00

Storage Costs for 1 year = Rp 58.200,00 x 4
                    = Rp 232.800,00

So that the cost of ordering or total cost is Rp 58.448,44 + Rp 232.800,00 = Rp 291.000

Comparison of Ciki Bakery's MSME inventory control with the Economic Order Quantity method

After calculating the inventory comparison using the MSME method and the Economic Order Quantity, the comparison between the two is:

Table 2. Total Inventory Costs Using The MSME Method

Information	Total
Orders during 2021	782 kg
Booking Frequency	72 kai
Total Order Cost For 72 times the order	Rp 1.044.000
Storage Costs	Rp 469.000
Total Inventory Cost	Rp 1.513.000

Table 3. Total Inventory Cost Using The EOQ

Information	Total
EOQ	194 kg
Safety Stock	5 kg
ROP	10 kg
Booking Frequency	4 kai
Total Order Cost For 4 times the order	Rp 58.200
Storage Costs	Rp 232.800
Total Inventory Cost	Rp 291.000

Based on these two tables, a comparison was obtained between the calculation of controlling wheat flour raw materials based on MSMEs and using the Economic Order Quantity method. In the calculation using MSMEs, the frequency of ordering wheat flour in the 2021 period was obtained 72 times, with an order fee of IDR 1,044,000 and storage costs of IDR 469,000. Then the total inventory cost during 2021 reached IDR 1,513,000 with an average order per month of 65,167 kg.

Meanwhile, the calculation using the Economic Order Quantity calculation method shows that the optimal order in 2021 is 194 kg. With the number of bookings in one year as many as 4 times and the intensity of bookings in 1 year there are 91 days. Calculated reorder (ROP), MSMEs of Ciki Bakery must reorder when the supply of wheat flour is 10 kg with the safety supply reaching 5 kg. Then the total inventory cost during the 2021 period is IDR 291,000. Inventory calculation using the Economic Order Quantity method has less order frequency so that it affects ordering costs and storage costs. This can save Ciki Bakery MSME expenses in allocating their funds into inventory costs.

CONCLUSION

In the calculation using MSMEs, the frequency of ordering wheat flour in the 2021 period was obtained 72 times, with an order fee of IDR 1,044,000 and storage costs of IDR 469,000. Then the total inventory cost during 2021 reached IDR 1,513,000 with an average order per month of 65,167 kg. Meanwhile, the calculation using the Economic Order Quantity calculation method shows that the optimal order in 2021 is 194 kg. With the number of bookings in 1 year as many as 4 times and the intensity of bookings in 1 year is once every 91 days. Then the total

inventory cost during 2021 reached IDR 291,000. The Economic Order Quantity method has optimal results compared to the method applied in MSMEs. This is evidenced by the frequency of bookings which have a considerable difference from 72 times to as many as 4 bookings during 1 year 2021. As well as less inventory costs, namely Rp. 291,000, the difference is Rp. 1,222,000 compared to the MSME method. Based on the conclusions from the results of research and discussion, the suggestion for CIKI Bakery MSMEs is that Ciki Bakery MSMEs should use the Economic Order Quantity (EOQ) method in controlling the supply of wheat flour raw materials to be more effective and optimal.

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