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ANALYSIS OF RAW MATERIAL INVENTORY MANAGEMENT USING THE ECONOMIC ORDER QUANTITY (EOQ) METHOD TO DETERMINE PERIODIC ORDER QUANTITY (POQ) AT EMI BAMBANG'S OPAK FACTORY

Nurul Hanifa Lubis[1]

[1]Department of Mathematics, UIN Sunan Kalijaga Yogyakarta, Yogyakarta, Indonesia

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ABSTRACT

The study aims to analyze the management of raw material inventory at Emi Bambang Opak Factory through the application of an effective method, namely Economic Order Quantity (EOQ) in determining Periodic Order Quantity (POQ). To determine the optimal order quantity, EOQ is used, while POQ is implemented to determine the efficient ordering interval. The results of this study are the determination of the POQ method at the emi bambang opak factory with a cost difference of Rp 30,717,480 for the cost of managing raw materials and ordering raw materials, this can provide solutions in more economical inventory management, to minimize the cost of storing and ordering raw materials without disrupting production continuity.

Corresponding Author:

Nurul Hanifa Lubis,
Department Of Mathematic,
UIN Sunan Kalijaga Yogyakarta
Email: nurulhanifalubis@gmail.com

1. INTRODUCTION

The increasing number of businesses increases the difficulty of competing in the corporate sector. Therefore, being the best in its sector is the goal of every organization. That is why, it is important for every company to develop and improve their performance in an efficient and effective way. A business owner must be careful in choosing a business direction in order to succeed in a competitive industry or market [1]. To maintain the existence of these companies and business ventures, careful supervision and maintenance of raw material availability is required, known as raw material availability control [9]. Raw material control can be used as a tool to determine when is the right time to order raw materials and how much to order to meet inventory needs. In this way, raw material control can help improve efficiency and effectiveness in raw material inventory management. Inventory management with the aim of maximizing efficiency and reducing operating costs. and profitability can be maximized. With proper management, companies can optimize resources and achieve better results.

Emi Bambang Opak Factory, located in Pancur Batu Village, Tuntungan II, is one of the leading opak producers. With a production capacity of around 30,000 kg per week, the factory has great potential to meet market demand. However, the availability of raw materials is a major challenge that can affect the factory's profits and losses.

Using conventional production methods, the factory often experiences difficulties in managing raw material inventory. As product demand increases, the factory has to place multiple orders for raw materials, which can lead to problems such as surplus or shortage of raw materials. Therefore, this factory needs to find ways to improve efficiency and effectiveness in managing raw material inventory.

Various methods are often applied in inventory management, such as the EOQ and POQ methods. The Economic Order Quantity method is designed to avoid problems of shortages or excess raw materials that can harm the company. In addition, this method also plays an important role in determining the right reorder point. Thus, companies can maintain inventory balance and ensure smooth operations[12]. The Economic Order Quantity (EOQ) method is a strategy that aims to reduce production costs by maintaining raw material inventory at a minimum level. This approach allows companies to optimally manage expenses while increasing operational efficiency [5]. POQ (Periodic Order Quantity) is used to determine the amount of demand in a certain period, but in principle, this method adopts logic in line with EOQ. The difference lies in replacing the number of orders with the number of ordering cycles. Thus, POQ helps in planning the procurement of raw materials more regularly according to the estimated needs. These various methods have been proven through a number of studies to effectively reduce total inventory costs. These studies show that the application of the right method can optimize cost management in inventory. In a study conducted on the management of raw material inventory at Nyusu Enak MSMEs [11], it was found that the application of the EOQ method resulted in much better efficiency and effectiveness compared to conventional approaches. This finding shows that the EOQ method not only improves operational performance, but also provides more optimal results in the management of raw materials.

Inventory is a current asset that includes important products to support the company's operational activities as well as being goods that will be sold to customers [8]. According to [6], inventory management includes various strategies designed to manage the amount of stock available while determining the right order time. The goal is to optimize production costs and maintain operational efficiency [4]. Inventory management can be done through periodic checks in the goods storage area [13].

Businesses with annual revenue of up to IDR 200,000,000 are considered micro-enterprises by Kwatono. A company's turnover is determined by the overall sales value for a given year [10]. MSMEs contribute significantly to reducing unemployment and reducing poverty through job creation, which in turn helps improve people's lives [2].

EOQ is a calculation methodology that can be used to find the best purchase quantity for maximum efficiency. [3]. According to [4] EOQ is a method that integrates considerations from ordering costs to storage costs. This method aims to make the amount of goods ordered more optimal and cost-effective[7]. The application of EOQ must have a significant impact on the efficiency of inventory management.

In this research, the author will adopt the EOQ, and POQ methods, which are widely known and often applied in various companies. Both methods are proven to be effective in managing raw material inventory, and can be implemented in various types of businesses, ranging from spare parts companies, culinary, food, to factories. By comparing these two methods, the author aims to find the most optimal inventory control solution, based on the actual conditions and data obtained from this factory.

2. RESEARCH METHODE

Emi Bambang Opak Factory. The factory is located in Tuntungan II, Pancur Batu District, Deli Serdang Regency, North Sumatra Province. This research was conducted in October 2024. In this study, secondary and primary data sources were used. Which were collected directly through interviews with relevant parties at the factory and data obtained from the factory. The information collected includes the problems faced by the factory and the process of managing the supply of raw materials, namely cassava. Usiing the efficient Economic Order Quantity (EOQ) method.

3. RESULT AND ANALYSIS

Information collected from observations and interviews for one year with the owner of Emi Bambang's Opak Factory, including demand data, raw material purchase data, and opak product demand data (starting from January to December 2023). The information is displayed in the table below.

Table 1: Raw Material Purchase Data and Opak Product Demand

Month	Cassava Raw Materials (Kg)	Opak Demand (Kg)
January	120.000	38.000
February	115.000	37.000
March	125.000	39.000
April	118.000	36.500
May	130.000	40.000
June	122.000	38.500
July	128.000	39.500
August	117.000	37.500
September	120.000	38.000
October	119.000	37.800
November	123.000	38.700
December	130.000	40.500
Total	1.467.000	461.000

1. Ordering Costs

Ordering everything from coordinating with suppliers to waiting for commodities to be prepared in the warehouse is part of the raw material ordering process, which adds costs. Transportation, communication, and loading and unloading costs are all part of this expense. In Table 2 below, you can see a breakdown of raw material ordering costs.

Table 2. Raw Material Ordering Cost

No	Description	Cost per Order (Rp)
1	Telephone/Communication	5.000
2	Transportation	520.000
	Total	Rp.525.000

2. Storage Costs

Warehouse operational costs, such as energy, warehouse maintenance, and security, are among the storage costs incurred by Emi Bambang's Opak MSMEs. You can see more information about product storage costs in Table 3 below.

Table 3. Raw Material Storage Cost

No	Description	Cost per Month (Rp)
1	Electricity	250.000
2	Warehouse Maintenance	300.000
3	Security	400.000
	Total	Rp 950.000

The purchasing strategy carried out by the Opak Factory is to estimate the number of purchases according to production needs. Cassava orders are made once per week, with cassava raw materials coming from suppliers outside the city. Until now, Opak Factory has not experienced problems in the quality of raw materials, such as defects or damage. However, the factory sometimes faces obstacles in the form of shortages or if excess raw material supplies are not managed properly, this can hamper the production process when there is a shortage of raw materials.

From the available table, it can be seen that Emi Bambang's Opak Factory has planned a basic inventory acquisition schedule. Purchases once a week amount to 6000 kilograms to meet production needs. Thus, the total purchase during the period July to September in 2024 reached 72,000 kilograms.

3. Raw Material Usage

From the purchase of raw materials made, based on information obtained from the owner of the Opak Factory, the consumption of cassava raw materials in the period January to December 2024 was 1,385,000 kilograms with a purchase frequency of 48 times in 12 months.

Table 4.2 Purchase of Cassava Raw Materials for the July-September 2024 Period

Month	Cassava Raw Material Usage (Kg)
January	100.000
February	110.000
March	105.000
April	120.000
May	115.000
June	125.000
July	110.000
August	130.000
September	105.000
October	115.000
November	120.000
December	130.000
Total	1.385.000

4. Ordering Frequency

Order frequency refers to the time interval between each order of cassava raw materials. Data regarding the frequency of orders at Emi Bambang Opak Factory can be seen in the following table:

Table 4 Ordering Frequency for Cassava Raw Materials for the Period of 2024

Pembelian	Frekuensi
January	4
February	4
March	4
April	4
May	4
June	4
July	4
August	4
September	4
October	4
November	4
December	4
Total	48

Emi Bambang's Opak Factory places orders every week, which means that in one year, there are 48 orders.

5. Analysis of Cassava Raw Material Inventory Management

1. EOQ calculation on cassava
Total usage needs per year (D) = 1,467,000
Cost per order (S) = 525,000
Storage cost per unit per period (H) = 0.686
Formula:

$$EOQ = \sqrt{\frac{2.D.S}{H}}$$

Substitute a value:

$$EOQ = \sqrt{\frac{2 \text{ x } 1.385.000 \text{ x } 520.000}{0.686}}$$

$$EOQ = \sqrt{\frac{1.441.600.000.000}{0.686}}$$

$$EOQ = \sqrt{2.101.460.058.309.04} \approx 1.449.641 \text{Kg}$$

So, the optimal order quantity (EOQ) is about 1,449,641 Kg per order.
EOQ Total Cost:

1. Purchase Cost
Purchase cost = D x Price per Kg = 1,385,000 x 2000 = Rp.2770,000,000

2. Storage Cost

$$\text{Average storage} = \frac{EOQ}{2} = \frac{1.449.641}{2} = 724.820{,}5 \text{ Kg}$$

Storage cost = 724.820,5 Kg x 0.686 = Rp 497.506.263

3. Ordering Cost

$$\text{Order frequency} = \frac{D}{EOQ} = \frac{1.385.000}{1.449.641} \approx 0.956 \approx 1 \text{ time a month}$$

Ordering cost = 12 x 520.000 = Rp.6.240.000

Total Cost EOQ = Purchase Cost + Storage Cost + Ordering Cost
= Rp.2.770.000.000 + 497.506.263 + 6.240.000
= Rp.2.776.737.506,263

6. POQ Calculation on Cassava

Formula:

$$POQ = \sqrt{\frac{EOQ}{D}}$$

Based on the value of D = 28,854.17 kg per week

$$POQ = \sqrt{\frac{1.449.641}{28.854.17}} \approx 50.25 \approx 50 \text{ Hari}$$

With this result, the optimal ordering interval (POQ) is once every 50 days (about 7 times a year).
Total Cost POQ = Purchase cost + Storage cost + Ordering cost
= Rp.2770.000.000 + 497.506.263 + 3.640.000
= Rp. 2.774.137.506,263

7. Conventional calculation on Cassava
Assuming the factory makes 48 purchases once a year with a smaller amount, which is about 28,854.17 Kg per order (1,385,000 / 48), then:

Ordering Cost

Convensional purchase cost = 48 x 520.000 = Rp 24.960.00

Storage cost =

Conventional inventory averages = $\frac{28.854,17}{2} = 14.427.084\ Kg$

Convensional storage cost = 14.427.085 x 0.686 = Rp. 9.894.986

Total conventional cost = Purchase cost + Storage cost + Ordering cost
= 2.770.000.000 + 9.894.986 + 24.960.000
= 2.804.854.986

4. CONCLUSION

It can be concluded that the overall cost calculation of the Economic Order Quantity is Rp. 2,776,737,506.263 and many orders once a month while in the Periodic Order Quantity calculation the overall cost is Rp. 2,774,137,506.263 with an ordering interval of 50 days once, so it is determined that by using the POQ approach, this factory can achieve savings of Rp. 30,717,480 in storage costs and ordering raw materials.

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