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Inventory Control Analysis Using The Period Order Quantity Method At CV. Adi Makmur Metalindo

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ABSTRACT

The scheduling raw material orders to avoid delays in fulfilling consumer demand can be analyzed using the Period Order Quantity (POQ) method so that the Company can schedule orders optimally and reduce ordering costs to several suppliers. The Company can control inventory and improve the ability to plan the duplication of goods according to consumer needs. The data used in the study is the demand period in January - December 2024. Data collection uses observation and interview techniques with company leaders and owners. After data collection and calculations using the Period Order Quantity method, the calculation results show that the company can make optimal raw material orders to avoid stock shortages when selling is an order made every 14 days with an ordering frequency of 19 pcs each time the order and the Company must have a safety stock of 8 pcs to anticipate an increase in the number of requests or can reorder when the remaining stock of goods is 29 pcs.

Keywords : Frequency of orders, POQ, Reorder point, Safety stock

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1. INTRODUCTION

CV. Adi Makmur Metalindo manufactures and orders various machine components widely used in palm oil processing and other industries. Throughout its operations, this business has fluctuated sales volume. Consequently, the company has not implemented a strategy to monitor inventory or customer demand to determine warehouse stock levels. This is due to the lack of a strategy for providing satisfactory service. By understanding customer needs and providing products and services that meet them, the company can build a good reputation and gain customer trust, ultimately driving business growth. Due to a lack of inventory, particularly for 10 mm thick steel plate, orders often occur in uncertain quantities, resulting in additional ordering costs. To ensure inventory is maintained and reduce uncertain ordering costs, it is necessary to implement a method that can accurately schedule orders and prevent shortages.

During the sales period from January to December 2024, the company experienced stock shortages and late orders, resulting in out-of-stock items and unable to meet customer demand. The stock levels and total sales are as follows.

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Table 1 Sales and Stock Data

No	Period	Total Sales (tons)	Warehouse Stock (tons)
1	January	50	20
2	February	35	15
3	March	40	31
4	April	55	18
5	May	43	25
6	June	35	20
7	July	44	17
8	August	25	22
9	September	30	15
10	October	51	24
11	November	38	21
12	December	48	22
Total		**494**	**250**
Average Value		**41,1**	**20,83**

The approach uses the concept of economic order quantity so that it can be used in discrete demand periods, this technique is based on the EOQ method. Inventory control aims to ensure that goods are available in the right quantities, at the right time, to meet customer demand without incurring excess costs.By taking the calculation basis of the economic order method, the amount of orders that must be made will be obtained and the ordering period interval is six months.

Inventory management encompasses the process of planning, controlling, and monitoring stored goods to support smooth operations and meet customer needs. Excessive inventory can increase holding costs, while understocking can lead to lost sales opportunities. Therefore, companies need to employ an effective approach to inventory management. Inventory control is the process of managing the quantity of goods stored to meet operational needs and market demand. One approach is a periodic order system, where orders are placed at specific intervals based on demand. This method combines operational efficiency with meeting customer demand.

The Period Order Quantity (POQ) method is an inventory control technique used to determine the order quantity for a specific period. POQ is designed to minimize total inventory costs, which consist of ordering costs and holding costs . This method is suitable for application in conditions where demand patterns fluctuate, thus enabling companies to make dynamic stock adjustments

Research shows that implementing the POQ method can improve inventory management efficiency, especially in industries with unstable demand. Furthermore, this method can also help reduce the risk of stockouts, which can potentially harm a company. Based on this theory, analysis of the application of the POQ method in inventory control is expected to provide strategic insight for companies to manage goods more efficiently.

The purpose of this research is to help reduce the total costs associated with ordering and storing goods, including storage costs, excess inventory costs, and shortage costs. In addition, the company can maintain optimal inventory levels, namely not too much (which causes high storage costs) and not too little (which causes the risk of running out of stock). And contribute to operational efficiency by ensuring that the ordering and procurement process runs smoothly and under control. Some of the benefits of implementing POQ are by determining the optimal order quantity, POQ helps reduce overall inventory

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costs and helps simplify the ordering and inventory management process, there by increasing operational efficiency and providing useful information for inventory-related decision-making, such as when to order and how much to order.

From 2022 to 2023, there was a shortage between raw material stock and raw material needs, especially for wardrobes, which was caused by fluctuations in product demand and the company's poor raw material control due to only estimates and simple Excel calculations. The calculation of raw material control for wardrobes used the EOQ, POQ, and Silver Meal methods and the implementation of the latest information system for more accuracy. The EOQ, POQ, and Silver Meal methods are methods that aim to reduce raw material inventory costs in the most economical way, then the best method was selected to be processed using the Inventory Stock Tracker Application.

The results of the Multiplicative Decomposition (Seasonal) calculation obtained a forecast for the period November 2023 - October 2024 for wooden boards, wood glue and handles. Then the calculation was carried out using the EOQ, POQ and Silver Mail methods. Of the three methods, the POQ method was chosen, which showed the smallest inventory cost of Rp. 15,658,619. Furthermore, it was compared with the company's method with an inventory cost of Rp. 22,962,749, so it can be concluded that the POQ method is more efficient than the company's method with an inventory cost difference of Rp. 7,304,130. The results of the information system design using the Inventory Stock Tracker Application, the company can enter raw material purchase data by writing the name of the item, quantity, purchase price and selling price, and can present input data to determine the amount of raw material demand and also the total purchase price that will be issued. Keywords: Raw Material Control, POQ, Information System[1].

Raw materials are a very important thing in production because if raw materials are lacking it will result in production stopping or excess raw materials will result in increased storage costs. The purpose of this study is to determine the total amount of raw material inventory costs using the EOQ (Economic Order Quantity) and POQ (Period Order Quantity) methods and to create a company inventory planning scenario. Previously the company ordered raw materials with an average of 2319 kg per order with an ordering frequency of 48 times in one year. The EOQ method can be used in the AS Berkah Putra Tofu factory because it gets a minimum total raw material inventory cost of Rp. 114,672. The ordering frequency in one year is 5 times with a quantity of 5,460 kg per order, this can minimize costs and control raw material inventory regularly.

In terms of resource processing, there should be scheduling and arrangements to accommodate requests because each request from several customers never knows when to prepare the needs of their requests because each component provided must go through the manufacturing process.

The companies face challenges in managing the inventory of lithos material, used as the main ingredient in lubricant packaging, often experiencing shortages or excess stock, potentially disrupting operations. This study aims to compare the effectiveness of two inventory control methods, namely Economic Order Quantity (EOQ) and Period Order Quantity (POQ), in minimizing inventory costs and ensuring smooth production. Lithos material throughput data in 2022 and forecasting results for 2023 were analyzed using both methods to determine the most efficient method. The results show that the EOQ method is more optimal in minimizing Total Inventory Cost (TIC) than POQ, both in 2022 and in the 2023 projection. Implementation of the EOQ method is recommended for lithos material inventory management improve the company's cost and operational efficiency. The manufacturing and trade industries face increasingly complex challenges. The rapid growth of international trade and technological innovation opens up new opportunities, but also increases pressure on companies to maintain a smooth supply chain. An efficient supply chain is crucial to meeting consumer expectations for fast and accurate delivery. In the production process, inventory is divided into several types, each with distinct characteristics and functions. Inventory types can be categorized into Raw Materials

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Inventory, Work-in-Process Inventory, Component Stock, Finished Goods Inventory, and Supplies Stock.

PTA is a compound that is not found in nature and is made from chemical synthesis. There are auxiliary raw materials needed to help the PTA production process run smoothly, such as Hydrobromic Acid (HBr) and Soda Ash Dense (Na2CO3). The company does not yet have a safety stock amount even though the company must control the inventory of auxiliary raw materials to avoid shortages and excesses of raw materials that cause the company to incur more costs. The calculation results show that the min-max stock method shows the safety stock amount of Hydrobromic Acid raw materials is 17.5 tons and for Soda Ash Dense is 5.41 tons. Determining the amount of inventory between company policy and the results of the min-max stock method calculation has several differences. From these differences, the company can save a total inventory cost of Rp 7,550,000.00 for Hydrobromic Acid and Rp 11,221,224.16 for Soda Ash. Too frequent ordering frequency with large order sizes causes the total inventory cost to be high. From these results, the company needs to apply the min-max stock method to control raw material inventory in order to save expenses.[2]

Challenges such as demand variability, supply uncertainty, global network complexity, and stringent regulatory requirements require an integrated strategy to ensure a smooth supply chain. This also impacts production and operations, ensuring a balance between meeting consumer demand and ensuring the company's certainty and sustainability in running its business. However, on the other hand, when determining ordering and delivery schedules, situations on the ground sometimes don't meet expectations. Therefore, coordination between related departments is essential to ensure effective coordination. Without coordination between departments, a company faces significant challenges, necessitating teamwork. Another important consideration is selecting suppliers to meet company demand. When placing an order, you must also know the supplier's situation, so that there are no delays in the product ordering process.[3] Referring to previous research that discussed is expected to provide recommendations regarding more efficient soybean inventory management in tofu factories, taking into account costs and production needs.[4]

Inventory of raw materials is the most important thing to produce the product. Inventory control of the raw materials quantity also refers to the production process at the factory. PT Semen Padang used raw materials including cement manufacturing clay, limestone, silica, gypsum, pozzolan and sand iron or copper slag. Among the raw materials, the most used is pozzolan. This research will be carried out data processing for inventory control using the EOQ (Economic Order Quantity) and POQ (Periodic Order Quantity) to compare with inventory control already implemented by the company. The data collected for this study include data processing is the use of historical data on pozzolan material per period in 2012 and 2013, the cost of raw materials ordering pozzolan, pozzolan storage costs of raw materials and lead time, receipt of pozzolan from suppliers to storage. Data processing is performed to determine the inventory control of raw materials sand pozzolan in 2014. [5]

Optimal inventory management is one of the key elements in supply chain management, especially for companies focusing on products with fluctuating demand, such as submersible water pumps. This study aims to analyze the planning and control of submersible water pump inventory at PT. XYZ using the Period Order Quantity (POQ) method.

The POQ method was chosen for its ability to determine the optimal order quantity based on actual demand periods, thereby minimizing inventory costs, including ordering and holding costs. The analysis process begins by identifying historical demand data, inventory costs, and other relevant parameters. Subsequently, the POQ method is applied to calculate the optimal order quantity for each period based on demand levels and the ordering cycle time. The study's findings indicate that implementing the POQ method can reduce total inventory costs compared to conventional methods employed by the company. Moreover, this method enhances inventory management efficiency by reducing ordering frequency and the risk of stockouts.[6]

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The growth of freight transportation in recent decades has been extraordinary, coupled with the Covid-19 pandemic that occurred in 2020, causing disruption to community activities, this was influenced by several regions implementing lockdowns. The Ministry of Transportation (KEMENHUB) continues to ensure the smooth running of logistics freight transportation amidst the Covid-19 pandemic that hit Indonesia. This study raises the issue of How to optimize goods logistics in terms of warehouse capacity Volume, weight, Warehouse Capacity and type of load, how the process of distributing goods through land transportation using a multimodal system (Train-Truck), how the series of goods logistics systems through logistics trains to storage warehouses.[7] The production process is very dependent on the availability of raw materials. An optimal calculation of raw material inventory is needed so that the company avoids the problem of lack or over stock of raw materials. This research aims to find out the quantity of raw material inventory, safety stock, and reorder point for ADC-12 raw materials.. This research uses a quantitative descriptive approach. Data sources obtained directly from the company. Analysis of the data used using the Economic Order Quantity method.[8]

Information is not only needed for decision-making, but also for planning and controlling. One of the most important information is inventory information. Inventory information will determine the survival of the company due to lack of inventory. Therefore, the company needs inventory control calculation, or excess inventory will have direct impact on the survival of the company. This paper has objective of sand material analysis for paving block production. Inventory control and material measures that will be used to analyze are Economic Order Quantity (EOQ) and Period Order Quantity (POQ).[13]

In determining the delivery and ordering schedule, it must be in accordance with the needs obtained, so that there are no misunderstandings in following up on the needs or requests from customers, because this will be a dilemma for the company if it does not carry out orders and deliveries of goods according to requests.

2. METHOD

This study uses a quantitative approach with a descriptive method to analyze inventory control using the Period Order Quantity (POQ) method. Based on this problem, an analysis will be conducted using the Period Order Quantity (POQ) method to control inventory planning at CV. Adi Makmur Metalindo. The formula used to calculate the inventory cost of 10 mm steel or iron plate using the POQ method is as follows:

A. Calculate the POQ order interval as follows:

$$\text{POQ} = \sqrt{\frac{2S}{DH}} \quad \text{or} \quad \text{POQ} = \sqrt{\frac{2S}{D(h\ x\ C)}} \tag{1}$$

Notes:

D = quantity of goods needed (pcs/month)

S = ordering costs (rupiah/pcs)

h = storage costs % to the value of goods

C = price of goods (rupiah/pcs)

H = h x C = storage costs (rupiah/pcs/month)

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B. Number of order frequencies (f)

$$f = \frac{D}{POQ} \quad (2)$$

Notes:

f = number of orders (time/month)

D = amount needed (pcs/month)

Q = Quantity

C. Safety Stock

Safety stock is a useful method to protect a company from all risks that can arise from inventory[12]. Safety stock is a crucial element of inventory management that helps businesses manage uncertainty and maintain smooth operations. By understanding the importance of safety stock and how to calculate it, companies can optimize their inventory, reduce risk, and improve customer satisfaction.

Calculating safety stock requires a service level plan with an assumption of 95%, so the constant (Z) is 1.65 and a lead time for a single order is 14 days. Meanwhile, demand data is monthly and is assumed to be 30 days per month. The lead time for a single order is 0.5 months.

To determine the amount of safety stock a company should have, the standard deviation value is needed. Standard Deviation: STDEV (raw material usage in one year) = 9.03

$$SS = Z\alpha \times SD \times l \quad (3)$$

Notes:

SS = Safety Stock

Zα = Service Level

SD = Standar Deviasi

l = Lead Time

D. Total cost of inventory

$$TC = (\text{Order frequencies} \times \text{Order Cost}) + ((\sum \frac{f}{2} + safety\ stock)\ x\ Saving\ cost) + \text{purchase costs} \quad (4)$$

E. Reoder Point

The reorder point is the point at which another order must be placed so that the ordered goods arrive or are received exactly when they are needed. Essentially, the reorder point is an inventory management tool whose primary goal is to minimize or eliminate the occurrence of stockouts. By correctly calculating the reorder point.

The true meaning of a reorder point is the point at which inventory of an item in the warehouse must be replenished before it runs out. Most novice retail businesses rely solely on instinct to replenish their

inventory. Actually, there is another precise way to calculate the number of items to order from suppliers, including the best time to reorder.

The calculation to obtain the ROP value is as follows:

$$ROP = d \times l + SS \quad (5)$$

Notes:

ROP = reorder poin

d = demand

l = lead time

SS = safety stock

3. RESULT AND DISCUSSION

To perform the analysis, we require the following data on purchasing costs, storage costs, and ordering costs. The company purchases raw materials from a supplier at a price of Rp 2,800,000 per piece, with a lead time of 14 days from order to finished goods. The following is a breakdown of the company's costs for ordering steel plates per order. The steps are as follows:

A. Determine material requirements for 10 mm plate.

B. Calculate average demand.

C. Calculate order costs.

D. Determine lead time.

Table 1.2 Cost Per Order

Cost Type	Total Cost (Rp)
Telephone/Internet Network	350.000
Administration	90.000
Total	**440.000**

Meanwhile, regarding storage costs, the company incurs several costs for storing steel or iron plate stock. The following details the costs for storing steel or iron plate.

Table 1.3 Cost Saving

Cost Type	Total Cost (Rp)
Electricity cost	400.000
Labor	2.000.000
Maintenance	250.000
Total	**2.650.000**

After obtaining all the data needed for processing using the POQ method, the following is a data calculation using the POQ method.

A. Calculate the POQ order interval

$$POQ = \sqrt{(2S/DH)} \text{ atau } POQ = \sqrt{(2S/(D(h \times C))} \quad (6)$$

$$POQ = \sqrt{\frac{2(440.000)}{41{,}1\ x\ (1{,}5x\ 2.800.000)}}$$

$$POQ = \sqrt{\frac{880.000}{172.620.000}} = 0{,}1$$

The result obtained is POQ = 0.1, meaning that orders are made every 14 days within 1 month, so the ordering frequency is 2.2 times a month.

B. Number of order frequencies (f)

$$f = D/POQ \quad (7)$$

$$f = \frac{41{,}1}{2{,}2}$$

$$f = 18{,}7 = 19 \text{ pcs}$$

C. Safety Stock

$$SS = Z\alpha \times SD \times l$$

$$SS = 1{,}65 \times 9{,}03 \times 0{,}5$$

$$SS = 7{,}5 = 8 \text{ pcs}$$

D. Total inventory cost (TC POQ):

Purchase cost = demand x price/unit

Purchase cost = 41,1 x 2,800,000,-

Purchase cost = Rp. 115,080,000

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TC = (Order frequency x Order Cost) + (($\sum \frac{f}{2} + safety\ stock$) $x\ Saving\ cost$) + Purchasing Cost

$$TC = (2{,}2 \times 440.000) + ((\frac{19}{2} + 8)\ x\ 2.650.000) + 115.080.000$$

$$TC = 968.000 + 46.375.000 + 115.080.000$$

$$TC = Rp\ 162.423.100$$

E. Reorder Point

$$ROP = d \times l + SS$$

$$ROP = 41{,}1 \times 0{,}5 + 8$$

$$ROP = 28{,}55 = 29\ pcs$$

Based on the results of the calculation analysis carried out, the company must reorder (Reorder Point-ROP) steel or iron plates when the inventory in the warehouse is at 29 pcs.

The results of the analysis carried out at the Company can determine the optimal ordering time to avoid stock shortages when making sales transactions is that orders are made every 14 days with an ordering frequency of 19 pcs each time the order is made and the Company must have a safety stock of 8 pcs to anticipate an increase in the number of purchases or can make an order, when the remaining stock of goods is 29 pcs and the total inventory cost is Rp. 162,423,000.

4. CONCLUSION

Based on the research that has been conducted, the following conclusions can be drawn.

1) Inventory control will facilitate efficient ordering by the company.
2) Applying the period order quantity (POQ) method can determine the quantity of goods ordered according to the company's needs, there by meeting the company's inventory needs.
3) Scheduled orders and having safety stock can prevent inventory shortages when sales increase.

The suggestions that can be conveyed from the results of this research are as follows

1) Companies should implement a system to manage inventory to prevent shortages when sales demand increases.
2) The POQ method can be used as a reference for controlling inventory orders going forward, allowing the company to understand the quantity of goods ordered and the costs incurred when ordering goods.

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