



Analysis of Plate Raw Material Control with Continuous Review System Method

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Abstract

In today's era of globalization, many new companies have emerged, both companies engaged in services, manufacturing, and trade. One of the largest assets in the company PT. XYZ is raw material inventory. Raw material inventory is goods that are stored and used for the production process that are adjusted to the usage schedule. Therefore, in order to avoid high raw material inventory costs, the company must have a proper raw material inventory system by using the proposed method as a comparison, namely the continuous review system method. Plate inventory control was obtained in August 2023 - July 2024 with a total inventory cost using the company method of IDR 292,324,000 and the Continuous Review (s, Q) System method of IDR 144,722,000 with cost savings of IDR 147,602,000 and a cost reduction percentage of 50.4%. After forecasting the plate requirements for August 2023 - July 2024, plate inventory control was obtained with an order quantity of 6,560 sheets and a reorder point of 846 sheets with a total inventory cost of IDR 220,902,000.

Introduction

Inventory is a current asset in the form of goods or equipment intended to support the operational activities of the regional government, and goods intended to be sold or delivered in the context of public service (Osborne et al., 2013). According to ayu Purnamawati & Sulindawati (2017), Inventory or inventory of goods, the main element of working capital, is an asset that is always in a state of rotation where it continues to change. Meanwhile, according to Ajao & Small (2012), inventory is an asset that includes goods owned by the company with the intention of being sold in a certain business period or inventory of goods that are still in the process of being worked on or in the production process, even inventory of raw materials that have been waiting for use in the production process. In inventory, there are certainly things that need to be known, including the purpose of the inventory itself. The purpose of the inventory policy is to plan the optimal level of inventory investment, and maintain that optimal level through inventory Arvan & Moses (1982). Another goal is for the order process to run efficiently (Hikam, 2022). Types of inventory are raw material inventory, goods in process, finished goods, auxiliary materials. Costs in inventory are storage and ordering costs.

Raw materials are the main materials that form an inseparable unit of the finished product and are the main cost in the product manufacturing process. Companies need to control raw materials, so that when the company knows how much raw material inventory is available, how much raw materials to buy and how much raw material is ready to be processed. According to Abramovitz (1950) stated that raw materials are goods purchased for use in the production process.

According to Andrawina & Santosa (2017) the continuous Review method is a method that controls inventory levels by reordering when the inventory has reached the reorder point or below which is done continuously. Meanwhile, according to Stanger et al. (2012), the Continuous Review System method is an inventory model that determines the optimal blood demand and blood demand time to get the best total inventory cost. According to Alim & Suseno (2022) the continuous review method controls inventory levels continuously. In this system, when the inventory level reaches the reorder point or below, a product order will be made. This method involves inventory monitoring carried out periodically at fixed time intervals, where reorders are made each period with quantities that may vary but with a fixed interval between two consecutive orders (Rahayu & Safirin, 2020). Meanwhile, according to Wan & Cao (2018), the continuous review method controls inventory levels continuously.

According to Corbett (2001) Safety stock is a safety stock to anticipate uncertainty in demand. According to Jesselyn & Dewi (2024) forecasting is a calculation analysis technique carried out with a qualitative or quantitative approach to estimate future events using past data references to minimize the influence of uncertainty. The forecasting method according to Gea et al. (2024) that there are two general approaches to forecasting as two ways to overcome forecasting models are divided into two main categories, namely qualitative methods and quantitative methods. The types of forecasting according to (Jeong et al., 2021) are short-term, medium-term and long-term forecasting.

Time series data is a series of observations arranged sequentially according to time with the same interval. This type of data is commonly found in everyday life because it is collected through time intervals, such as daily, weekly, or monthly (Widiarti et al., 2020). The naïve method is a forecasting approach based on the assumption that the estimated demand for the next period will be the same as the demand in the previous period (Syahanifadhel et al., 2023). Simple Moving Average which is one of the simplest types of Moving Average indicators. The weighted moving average method requires weighting for the most recent data from the existing series. Furthermore, the largest weighting is multiplied by the latest demand or sales data, followed by the next weighting, after which the multiplication is added up.

The forecast error test is used by comparing the forecast results with the actual data. The smaller the error value, the higher the level of forecast accuracy, and vice versa. Statistical Process Control (SPC) is a statistical technique widely used in industry to ensure that the manufacturing process of products or services meets established quality standards. The main purpose of SPC is to monitor the consistency of the production process to obtain a controlled process. By using SPC, companies can identify deviations from the desired process and take corrective actions to ensure that the products or services produced meet the expected quality standards (Nofirza et al., 2023). According to Heizer and Render in Nadiyah & Dewi quote, (2022), there are 7 tools in implementing SPC including Pareto diagrams, fishbone diagrams, scatter diagrams, histograms, check sheets, control charts, and flow charts. One of the most widely used methods with aggregate data to estimate claim reserves is the Chain Ladder method introduced by Mack. The initial stage of this method is to form a cumulative aggregate run-off triangle which can be obtained using the equation.

Methods

This research was conducted at PT. XYZ in March 2024 until the research data was sufficient. The method used is quantitative analysis with the dependent variable in the form of the minimum total inventory cost and independent variables including data on plate purchases and usage, unit plate price, total plate price, shipping costs, and storage costs. Data were collected through direct observation of the company and interviews with related parties to obtain the required information. This study uses the Continuous Review System (s, Q) approach to control plate inventory with the aim of reducing total inventory costs. Data were

analyzed through a comparison between the company's method and the Continuous Review System and through the calculation of the accuracy of the forecasting method using MSE (Mean Squared Error). The calculation results are used to determine future plate needs and optimize inventory costs.

Results and Discussion

Data collection was obtained by conducting observations to companies related to collecting the required data and conducting direct interviews. From the results of the observation, it is known that during August 2023 to July 2024 there was an excess and shortage of inventory.

Table 1. Plate Purchase and Usage Data

Month	Number of purchases (plate sheets)	Number of uses (plate sheets)	Advantages (plate sheets)	Disadvantages
August 2023	238	217	21	0
September 2023	211	201	10	0
October 2023	331	240	91	0
November 2023	356	243	113	0
December 2023	221	197	24	0
January 2024	415	240	175	0
February 2024	174	155	19	0
March 2024	1.115	1.000	115	0
April 2024	400	235	165	0
May 2024	592	559	33	0
June 2024	474	389	85	0
July 2024	515	458	57	0
TOTAL	5.042	4.134	908	0

Source: Company Data

Table 2. Unit Price and Plate Purchase

items	Purchase price for plate sheets	Total plate purchases	Total
Plate	Rp 22.000	5.042	110.924.000

Source: Company Data

Plate order data is data on the costs incurred by the company in ordering plates in one order. The ordering costs incurred by the company for one plate order are as follows:

Table 3. Plate Order Cost Data

Description	Details
Administration Fee	Rp 10.000
Telephone Fee	Rp 50.000
Transportation Fee:	
Fuel	Rp 6.400.000
Toll Fee	Rp 1.000.000
Truck Rental Fee	Rp 4.500.000
Consumption Fee	Rp 300.000
Loading and Unloading Fee and Inspection Fee	Rp 2.740.000
Total Order Fee	Rp 15.000.000

Source: Company Data

From the table above, it can be seen that the plate shipping cost of Rp 15,000,000 in each plate shipment is Rp 15,000,000 / year

In the storage cost data, the amount of storage cost / kg each year if there is a plate that has excess inventory and is stored in the warehouse. The plate storage costs are as follows:

Table 4. Plate Storage Cost Data

Items	Storage Costs
Plate	Rp 7.000 /sheet

Source: Company Data

In August 2023 to July 2024, the order frequency data is as follows:

Table 5. Order Frequency Data

Items	Order Frequency	Average Inventory
plate	12	210 /sheet

Source: Company Data

In August 2023 to July 2024, the plate lead time data is as follows:

Table 6. Lead Time Data

Lead time	0,083 / 1 month
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Source: Company Data

Table 7. Comparison of Total Inventory Cost of Continuous Review System with company method

	Company Method	Continuous Review system method
Total Inventory Cost	Rp 292.324.000	Rp 144.722.000

Source: Company Data

From the analysis results above, it can be seen that the total inventory cost using the Continuous Review (s,Q) System method provides a minimum total inventory cost for Plate. At this stage, the total inventory cost using the Continuous Review (s,Q) System method will be compared with the company's method. If the total inventory cost using the Continuous Review (s,Q) System method is lower than the company's method, it will proceed to the forecasting stage.

Based on the table above, it can be seen that the total inventory cost using the company method is IDR 292,324,000 and the total inventory cost using the Continuous Review (s, Q) System method is IDR 144,722,000. From the calculation results, it can be seen that the Continuous Review (s, Q) System method provides a total plate inventory cost that is more minimal than the company method with a cost reduction of IDR 147,602,000 and a cost reduction percentage of 50.4%. So the Continuous Review (s, Q) System method is used for planning plate quantity orders. The Continuous Review (s, Q) System method provides a total plate inventory cost that is more minimal with a service level of 99%.

To overcome the increase and decrease in plate needs, forecasting is carried out as a step to anticipate it so that the company can determine the steps in making the right purchase needs so that there is no excess or shortage of inventory.

Table 8. Comparison of MSE Values

Forecasting Methods	MSE
ARIMA	76.625,9
Moving Avarage	143.534
Linear Regreasion	153.084

Source: Company Data

From the table above, the smallest MSE is then selected based on the forecasting method used. By considering the smallest MSE value, the proposed forecasting method that is appropriate for forecasting plate needs during August 2024 to July 2025 is the Arima method with an MSE value of 76,625.9.5, so the next step is to verify the data using the Arima method forecasting data.

Table 9. Plate requirements from August 2024 to July 2025

Month	Needs (sheet)
August 2023	718
September 2023	740
October 2023	761
November 2023	783
December 2023	804
January 2024	826
February 2024	848
March 2024	869
April 2024	891
May 2024	912
June 2024	934
July 2024	955
TOTAL	10.041

Source: Company Data

From the table above, it can be seen that the need for plates from August 2024 to July 2025 has an average of 837 sheets with a total need of 10,041 sheets.

Table 10. Total inventory cost of Continuous Review (s,Q) System method

	Continuous Review (s,Q) System Method
Total Cost of Inventory	Rp 266.912.000

Source: Company Data

Based on the calculation, it can be seen the comparison of total inventory costs incurred using the Continuous Review (s, Q) System method in August 2023 to July 2024. The total inventory cost using the Continuous Review (s, Q) method is IDR 144,722,000. The Continuous Review (s, Q) System method provides a minimum total plate inventory cost with a service level of 99%. By using this method, the planning of ordering the number of plates per month. The period from August 2024 to July 2025 is 6,650 sheets with a reorder of 846 sheets, the total inventory cost from August 2024 to July 2025 is IDR 266,912,000 / year with a service level of 99%.

Potentially increasing order frequency can also affect a company's bargaining power, as suppliers may be less willing to offer discounts or favorable terms for smaller, more frequent orders. On the other hand, more predictable ordering patterns can benefit both parties by providing clearer demand forecasts, allowing suppliers to optimize their own production schedules. A company's ability to replenish inventory faster and more accurately can improve product availability, which in turn improves customer satisfaction. However, if a company's procurement strategy becomes too focused on minimizing inventory costs, it may risk a lack of focus on other customer service metrics, such as lead times or product quality. Therefore, companies must maximize all parts to reduce costs and lead times that will occur.

Conclusion

The conclusion of this study is that plate inventory control in August 2023 - July 2024 with a total inventory cost using the company method of IDR 292,324,000 and the Continuous Review (s,Q) System method of IDR 144,722,000 with cost savings of IDR 147,602,000 and a cost reduction percentage of 50.4%. After forecasting the plate needs for August 2023 - July 2024, plate inventory control was obtained with an order quantity of 6,560 sheets and a reorder point of 846 sheets with a total inventory cost of IDR 220,902,000. The research suggestion is that the company can consider the results of the study by controlling plate inventory by carrying out good planning that is adjusted to the needs pattern and for further research using a longer period of time for maximum results.

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