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Raw Material Inventory Control Using The Just-in-Time Method

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Abstract - The object of this study is an industry engaged in the production and marketing of tempeh, which is made from soybeans and yeast. However, in the tempeh production process, there is a problem in determining the amount of raw materials, as there is no proper control of raw material supplies. This is due to the lack of clarity regarding the monthly raw material requirements, leading to an inaccurate determination of the raw material inventory to be stocked and resulting in cost losses because the incoming raw material inventory exceeds the monthly raw material requirements. Data processing is conducted using the Just In Time method to determine the appropriate amount of raw material inventory and production. The Just In Time method results in more effective raw material inventory costs compared to the company's existing policies. Planning and controlling raw material inventory using the Just In Time method can save inventory costs by Rp.31,997,869 or 12.54%.

Keywords: Control, Supply; Just In Time

1. INTRODUCTION

Inventory control is an essential component of supply chain management, particularly in manufacturing industries where raw materials are fundamental to production continuity. Traditional inventory systems often maintain high levels of stock to buffer against uncertainty. However, this approach increases holding costs and ties up capital.

The Just-in-Time (JIT) inventory method offers an alternative strategy, aimed at receiving goods only as they are needed in the production process, thereby reducing inventory costs and increasing efficiency. This study aims to analyze the impact and effectiveness of JIT implementation in managing raw material inventories.

The company is an industry engaged in the production and marketing of tempeh made from soybeans and yeast. To meet customer demand and satisfaction, this business always strives to increase its production in a timely manner. However, in large-scale production, there are problems in determining the amount of raw materials, as there is no proper control of the raw material inventory used by the company. This is because there is no clarity regarding the monthly raw material requirements, leading to inaccuracies in the amount of raw materials to be stocked, resulting in excess raw materials, as well as overproduction, which can cause cost losses due to the amount of raw materials received and the production volume exceeding the monthly requirements.

Based on the problems faced, the company needs a solution to overcome the problems that have arisen. In connection with this, the author is interested in conducting research related to raw material inventory.

II. RESEARCH METHOD

The JIT system, popularized by Toyota in the 1970s, is a demand-pull approach to inventory management. According to Ohno, JIT is based on the principle of continuous improvement and waste reduction, where inventory is viewed as a form of waste.Numerous studies have emphasized the benefits of JIT in reducing lead times, enhancing quality, and increasing responsiveness. However, challenges such as supplier reliability, transportation delays, and lack of flexibility can hinder successful implementation.

This research uses a case study method involving a mid-sized manufacturing company in the electronics sector. Data were collected through interviews with supply chain managers, analysis of inventory records, and observation of material flow.Key performance indicators (KPIs) analyzed include inventory turnover ratio, average inventory levels, and production downtime due to raw material unavailability—before and after the implementation of JIT.

This type of research is quantitative research that uses two variables, namely independent (free) variables and dependent (bound) variables. This research uses the Just In Time method. The data collection technique in this study is through observation or interviews with MSME owners. In implementing the Just In Time method, there are several steps, namely:

1. Creating a raw material requirement plan
2. Creating a daily production plan and daily raw material requirements
3. Determining the number of supplier Kanbans
    a. Calculating the frequency of raw material deliveries
    b. Calculating the order cycle
    c. Calculating the order time

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4. Calculating the total JIT cost
   a. Determining the optimal amount of raw materials
   b. Calculating the cost of purchasing raw materials

III. RESULT AND DISCUSSION

3.1. Total Raw Material Inventory Costs

Total raw material inventory costs include raw material ordering costs and raw material purchase costs. The following are the raw material ordering costs, raw material purchase costs, and total raw material inventory costs:

A. Raw Material Ordering Costs

Raw material orders are placed with suppliers via telephone calls, so the ordering costs incurred from purchasing raw materials are telephone costs. The telephone cost per order is Rp.3,000, and the total raw material ordering cost for 2024 is Rp.156,000, with an average of Rp.13,000.

B. Raw material purchase costs

The raw material for tempeh is soybeans, with a price of Rp.15,000 per kilogram. The total raw material purchase cost for 2024 is Rp.255,000,000, with an average of Rp.21,250,000 per month.

C. Raw material inventory costs

Raw material inventory costs include ordering costs and purchase costs. The total raw material inventory costs for 2024 are Rp.255,156,000, with an average of Rp.21,263,000 per month.

3.2. Total Raw Material Inventory Costs Using the Just-in-Time Method

The total raw material inventory costs using the Just-in-Time method include raw material ordering costs and raw material purchasing costs. The following are the raw material ordering costs, raw material purchasing costs, and total raw material inventory costs:

A. Raw Material Ordering Costs Using the Just-in-Time Method

Raw material orders are placed by phone with suppliers, so the ordering costs incurred from purchasing raw materials are phone costs. The phone cost for each order is Rp.3,000, and the total raw material ordering costs for UD. Usaha Maju in 2024 are Rp.33,131 with an average of Rp 2,761

B. Raw Material Purchase Costs Using the Just-in-Time Method

The raw material for tempeh is soybeans, with a price of Rp.15,000 per kilogram. The total raw material purchase cost for 2024 is Rp.223,125,000, with an average of Rp.18,593,750.

C. Raw material inventory costs using the Just-In-Time method

Inventory costs are the expenses incurred by the company to purchase raw material inventory. In this case, raw material inventory costs using the Just-In-Time method include ordering costs and purchase costs. The total raw material inventory cost for 2024 is Rp.223,158,131 with an average of Rp.18,596,511.

3. Comparison of Current Soybean Raw Material Inventory Costs and the Just-in-Time Method

Comparison of soybean raw material inventory to meet tempe production needs and the implementation of the Just-in-Time system, where the comparison is made in terms of costs, so that the efficiency and effectiveness of the Just-in-Time system implementation on raw material inventory can be determined.
The comparison table of total raw material inventory costs between the current method and the Just-in-Time method is as follows:

Table 1. Comparison of Current Soybean Raw Material Inventory Costs and Just-in-Time Costs

Variable	At Present (Rp)	Just-in-Time	Difference	Percentage Difference (%)
Raw Material Order Costs	156.000	33.131	122.869	78,76%
Raw Material Purchase Costs	255.000.000	223.125.000	31.875.000	12,5%
Total Inventory Costs	255.156.000	223.158.131	31.997.869	12,54%

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The first comparison of total inventory costs is a comparison of the cost of ordering raw materials between the current method and the Just In Time method. The current cost of ordering raw materials is Rp.156,000, while the cost of ordering raw materials using the Just In Time method is Rp.33,131. The difference between the two methods is Rp.122,869 or 78.76%, with the Just In Time method being more advantageous than the current method.

Raw material orders are placed each time the company requires raw materials from suppliers, whereas with the Just In Time method, orders are placed once every month, making the Just In Time method more efficient for raw material ordering. Long-term contracts with suppliers in the Just In Time system are crucial for ensuring the smooth and reliable supply of raw materials whenever the company needs them. This allows the company to place a single raw material order to meet its daily needs each month, aligning with the Just In Time principle of eliminating waste.

The second comparison is the comparison of raw material purchase costs between the current system and the Just In Time system. The current raw material purchase cost is Rp.255,000,000, while the raw material purchase cost using the Just In Time system is Rp.223,125,000. The difference between the two methods is Rp.31,875,000 or 12.5%.

The implementation of the Just In Time system is better than the current system, with a difference of Rp.31,875,000 or 12.5%, making the purchase cost of raw materials using the Just In Time method more efficient. This is because purchases under the Just In Time system are based on raw material requirements set according to the production plan for the next 12 months. As a result, the quantity of raw materials purchased aligns with production needs, and the quantity of raw materials purchased no longer depends on the supply received by the company from suppliers.

Total inventory costs are the overall costs of inventory, which are the sum of raw material ordering costs and raw material purchasing costs. The current total inventory cost for soybean raw materials is Rp.255,156,000, and with the implementation of the Just In Time method, the total inventory cost for raw materials is Rp.223,158,131. The difference obtained from the calculations of the two methods is Rp.31,997,869 or 12.54%. The Just In Time method has reduced the total cost of cassava raw material inventory by Rp 31,997,869 or 12.54%. Overall, the implementation of the Just In Time system has reduced raw material inventory planning costs. The reduction in total costs is due to the transformation carried out by the Just In Time method, which transforms monthly raw material requirements into daily requirements.

IV. CONCLUSION

The Just-in-Time method provides an effective approach for controlling raw material inventories by reducing waste and enhancing operational efficiency. However, its success relies on several factors, including supplier reliability, robust logistics, and technological integration. Companies considering JIT must weigh the benefits of lower inventory costs against the risks of increased vulnerability to supply chain disruptions.

The analysis of the implementation of the Just In Time concept in raw material inventory can be summarized as follows:

1. Understanding the current planning and control of raw material inventory using the Just In Time method. When the Just In Time concept is applied, the company can reduce raw material purchase costs by Rp.31,875,000 more efficiently than before. This is because the production schedule has been established, and the average raw material requirement for the production plan in one month is known to be 1,349.33 kg per month.
2. The comparison of inventory costs based on the company's policy and the Just In Time method shows that the total inventory cost of soybean raw materials using the current method is Rp.255,156,000, while applying the Just In Time method results in a total inventory cost of Rp.223,158,131. The difference obtained from the calculations of the two methods is Rp.31,997,869 or 12.54%.

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