

ANALISIS PENGENDALIAN PERSEDIAAN BATU TRASS DENGAN METODE EOQ DAN JIT

ANALYSIS OF TRASS STONE INVENTORY CONTROL WITH EOQ AND JIT METHODS

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ABSTRACT

PT ABC is a company engaged in the cement manufacturing industry. In making cement at PT ABC, one of the raw materials used is Trass Stone. PT ABC in carrying out its production process from raw materials to finished goods experiences problems in the supply of raw materials which are sometimes excess or deficient. From these problems it is necessary to analyze the control of trass stone inventory using the Economic Order Quantity (EOQ) and Just In Time (JIT) approaches to control the optimal and efficient trass stone inventory, because it can calculate the amount of inventory, safety stock, and total inventory costs. The results showed that using the Economic Order Quantity (EOQ) and Just In Time (JIT) methods is more optimal and efficient than company policy. It can be seen from the total inventory cost of trass stone using company policy of Rp. 22,442,213, the total cost of trass stone inventory using the EOQ method is Rp. 10,269,996, while the total cost of trass stone inventory using the JIT method is Rp. 7,480,737.

Keywords: Inventory, Cost, Economic Order Quantity, Just in Time, Trass Stone.

ABSTRAK

PT ABC merupakan perusahaan yang bergerak di bidang industri pembuatan semen. Dalam pembuatan semen di PT ABC, salah satu bahan baku yang digunakan adalah Batu Trass. PT ABC dalam melakukan proses produksinya dari bahan baku hingga menjadi barang jadi mengalami permasalahan dalam persediaan bahan baku yang terkadang mengalami kelebihan atau kekurangan. Dari permasalahan tersebut perlu dilakukan analisis pengendalian persediaan batu trass dengan menggunakan pendekatan Economic Order Quantity (EOQ) dan Just In Time (JIT) untuk mengendalikan persediaan batu trass yang optimal dan efisien, karena dapat menghitung jumlah persediaan, persediaan pengaman, dan total biaya persediaan. Hasil penelitian menunjukkan bahwa dengan menggunakan metode Economic Order Quantity (EOQ) dan Just In Time (JIT) lebih optimal dan efisien dibandingkan dengan kebijakan perusahaan. Hal ini dapat dilihat dari total biaya persediaan batu trass dengan menggunakan kebijakan perusahaan sebesar Rp. 22.442.213, total biaya persediaan batu trass dengan menggunakan metode EOQ sebesar Rp. 10.269.996, sedangkan total biaya persediaan batu trass dengan menggunakan metode JIT sebesar Rp. 7,480,737.

Kata Kunci: Persediaan, Biaya, Economic Order Quantity, Just In Time, Batu Trass.

INTRODUCTION

In an industry, many factors support the success of business processes. Receiving materials (receiving), production planning, warehousing, and product delivery (shipping) are key things that are very vital in industrial business processes (Alfian, A., & Pratama, S, 2022). The many industries currently developing in Indonesia must be supported by good and disciplined management, in order to be able to survive in the competitive world of industry. One way is to control inventory. Inventory control is a

very important managerial function, because inventory involves the largest rupiah investment in current assets. Apart from that, if the inventory in the warehouse is excessive, it will cause the risk of loss and damage to goods to be greater (Mayasari, D., 2021). One of the problems often faced by companies, especially large processing companies, is regarding the proper processing of raw material supplies. Because inventory is an asset (Wahid, A., & Munir, M, 2020). Raw material inventory is an important component in the production process in a

company and has a significant influence on the smooth running of the production process (Larasati, AD, Retnowati, N., Abdurahman, A., & Mayasari, F, 2021

The method used to minimize total inventory costs by calculating storage costs and ordering costs is the definition of the Economic Order Quantity (EOQ) method (Firmansyah, F. A, 2023). The EOQ technique can be used to help determine efficient inventory. This EOQ model not only determines the optimal order quantity. In the industrial world, we often hear about inventory methods to minimize total costs. One of the most well-known inventory management methods is the Economic Order Quantity method or what can be called (EOQ Karamoy, H., & Tirayoh, V., 2024). By using the EOQ method, safety stock, maximum inventory and optimal reorder points can also be calculated for the company so as to avoid shortages or excess inventory (Hidayat, K., Efendi, J., & Faridz, R., 2020). Just In Time (JIT) is a production system designed to ensure quality, reduce costs and achieve delivery times as efficiently as possible by eliminating all waste in the process of delivering goods so that the company is able to deliver its products (both goods and services) according to consumer wishes precisely. time.

PT ABC is a company engaged in the cement manufacturing industry. With various types of products, namely 50 kg and 40 kg PCC cement, 50 kg and 40 kg PPC cement. In this research the author found problems that existed at PT ABC, namely in carrying out the production process from raw materials to finished goods. PT ABC sometimes experienced problems in the supply of raw materials, especially tras stone, which were not available in the required quantities, so this had an undesirable impact.

RESEARCH METHODS

Data collection

Data collection was carried out by observation and interviews with related

sources. The data used in this research is quantitative data. Quantitative data is data in the form of numbers. To control trass stone inventory using the EOQ and JIT methods, namely by taking historical data on ordering and usage of trasstone, ordering costs and holding costs.

The following data on trass stone orders at PT ABC is shown in Table 1.

Table 1. Trass stone ordering data

Month	Orders/Kg
June	47,323
July	34,319
August	38,746
September	36,108
October	29,102
November	36,591
December	44,273
January	46,250
February	51,374
March	52,299
April	50,933
May	47,290
Order Total	514,608
Average Orders	42,884

(Source: PT ABC)

The following data on the use of trass stone at PT ABC is shown in Table 2.

Table 2. Trass Stone Usage Data

Month	Usage/Kg
June	37,776
July	31,256
August	39,720
September	44,733
October	22,278
November	28,449
December	39,141
January	38,873
February	41,388
March	42,837
April	39,919
May	35,827
Total Usage	442,197
Average Usage	36,589

(Source: PT ABC)

The following are details of PT ABC's costs for storing trass stones, including warehouse maintenance costs, water costs and electricity costs which are shown in Table 3.

Table 3. Trass Stone Storage Costs

Fee Type	Amount/Year
Warehouse Maintenance Costs	14,000,000
Electricity cost	1,750,000
Total	Rp. 15,750,000

(Source: PT ABC)

The following are details of PT ABC's costs for ordering trass stone, including telephone costs, transportation costs and document costs, which are shown in Table 4.

Table 4. Trass Stone Ordering Costs

Fee Type	Amount/Year
Telephone Costs	150,000
Transportation costs	80,000,000
Document Fees	1,500,000
Total	Rp. 81,650,000

(Source: PT ABC)

Data processing

EOQ Method:

Calculation of average trass stone orders

$$Q^* = \frac{\sqrt{2DS}}{H}$$

Information:

D = total raw material requirements per year

S = ordering cost per message

H = storage cost per unit

Calculation of the frequency of ordering trass stones

$$F = \frac{D}{Q^*}$$

TIC uses the EOQ method

$$TIC = \sqrt{2xDxSxH} \tag{3}$$

Company policy = ((Average usage) x H) + (S x (lead time))

Safety stock calculation

Safety Stock = (maximum usage – average usage) x lead time

Determine the reorder point (Reorder Point)

$$d = D / t \tag{6}$$

ROP = dx L

JIT Method:

Calculate the optimal order quantity

$$Q_n = Q^* \cdot \sqrt{n}$$

Information:

Q_n = order quantity

n = number of deliveries per order

Q* = optimal order quantity from EOQ

Calculating order frequency

$$= \frac{Q}{Q_n}$$

Calculate total inventory costs

$$TJIT = \frac{1}{\sqrt{n}} (T)$$

RESULTS AND DISCUSSION

BatuTrass inventory control analysis using the EOQ method

1. Average calculation of trass stone orders:

A. Total need for trass stone (D): 442,197 kg/year

B. Ordering fee (S): IDR 3,350,000/order

C. Storage costs (H): Rp. 35.6/kg

1. Calculation:

$$Q^* = \frac{\sqrt{2DS}}{H} = \frac{\sqrt{2(442.197)(3.350.000)}}{35,6} = 48,349 \text{ kg}$$

So the economical number of orders for raw materials using the EOQ method is 48,349 kg

2. Frequency of ordering trass stones

$$F = \frac{D}{Q^*}$$

$$= \frac{442.197}{48.349} = 9.14 = 9 \text{ times messages}$$

So the frequency of ordering trass stones using the EOQ method is 9 orders.

3. Total Inventory Cost (TIC) EOQ method

$$TIC = \sqrt{2xDxSxH} \tag{3} = \sqrt{2x442.197x3.350.000x35,6} = \text{IDR } 10,269,996/\text{year}$$

So the total cost of trass stone inventory using the EOQ method is IDR 10,269,996/year.

4. Safety stock calculation

$$\text{Safety stock} = (\text{maximum usage} - \text{average usage}) \times \text{lead time} = 44,733 - 36,589 \times 2 = 8,144 \times 2 = 16,288 \text{ kg}$$

So based on the safety stock calculation using the EOQ method, it shows that safety stock must always be

available at PT ABC for Batu Trass as much as 16,288 kg.

5. Determine the reorder point (Reorder Point)

$$\begin{aligned} d &= D / t \\ &(6) \\ &= 442.197 \text{ kg} / 300 \\ &= 1,474 \text{ kg} \end{aligned}$$

So the reorder point (ROP) is as follows:

$$\begin{aligned} \text{ROP} &= dx L \\ &= 1,4733.99 \times 2 \\ &= 2,948 \text{ kg} \end{aligned}$$

So PT ABC must reorder Batu Trass if it reaches the quantity level of 2,948 kg. The reorder point is made to avoid excess or shortage of raw materials.

Analysis of Batu Trass inventory control with company policy

Total Inventory Cost (TIC) company policy
 $\text{TIC} = ((\text{Average usage}) \times H) + (S \times (\text{lead time}))$ Assumed Lead Time = 2 Days4)

$$\begin{aligned} &= ((442,197) \times 35.6) + (3,350,000 \times (2)) \\ &= 15,742,213 + 6,700,000 \\ &= \text{IDR } 22,442,213/\text{year} \end{aligned}$$

So the total cost of Batu Trass inventory charged is IDR 22,442,213/year

Analysis of Batu Trass inventory control using the JIT method

1. Calculation of optimal trass stone ordering

A. Calculation of the optimal quantity per delivery per order:

Total demand for trass stone (Q): 442,197 kg/year

Average order of trass stone (a): 42,884 kg

Calculation:

$$\begin{aligned} &= \frac{Q}{2a} \\ &= 9.4 = 9 \text{ times} \frac{442.197}{2 \times 42.884} \end{aligned}$$

So the optimal number of deliveries per trass stone order from this calculation is 9 times.

B. Calculation of the optimal quantity of trass stone orders:

Optimal number of deliveries per trass stone order (n): 9 times

Optimum trass stone ordering quantity

EOQ: 48,349 kg

Calculation:

$$\begin{aligned} Q_n &= Q * \sqrt{n} \\ &= 48.349 \sqrt{9} \\ &= 145,047 \text{ kg} \end{aligned}$$

So the optimal quantity to order trass stone from this calculation is 145,047 kg.

C. Calculation of order quantity per delivery:

Optimal trass stone ordering quantity

(Qn): 145,047 kg

Optimal number of deliveries per trass stone order (n): 9 times

Calculation:

$$\begin{aligned} Q &= \frac{Q_n}{n} \\ &= \frac{145,047}{9} \\ &= 16,116 \text{ kg} \end{aligned}$$

So the optimal quantity of trass stone orders per delivery is from This calculation is 16,116 kg.

2. Frequency of ordering trass stones:

Total demand for trass stone (Q): 442,197 kg

Optimal trass stone ordering quantity (Qn): 145,047

Calculation:

$$\begin{aligned} &= \frac{Q}{Q_n} \\ &= \frac{442.197}{145.047} \\ &= 3.04 = 3 \text{ times} \end{aligned}$$

So the frequency of ordering trass stones using the JIT method is 3 times

3. Trass stone supply costs:

Total cost of trass stone supplies (T):

91,648,346

Optimal number of deliveries per purchase (n): 9 times

Calculation:

$$\begin{aligned} \text{TJIT} &= \frac{1}{\sqrt{n}} (T) \\ &= \frac{1}{\sqrt{9}} 22,442,213 \\ &= \text{IDR } 7,480,737 \end{aligned}$$

So the total inventory cost for tras stone using the JIT method is IDR 7,480,737

From the calculations that have been carried out, it can be seen which method is more efficient in inventorying wood raw material products. The following is a comparison of the provision of tras stone and inventory costs between PT ABC's policies with the EOQ and JIT methods:

Table 5. Comparison Of Company Policies with The EOQ And JIT Methods

Information	Company policy	EOQ method	JIT method
Average order in one order	19,225 kg	48,349 kg	349,800 kg
Frequency of orders	23 times	9 times	3 times
Safety stock	-	16,288 kg	-
Reorder point (reorder point)	-	2,948 kg	-
Total inventory costs	Rp. 22,442,213	Rp. 10,269,996	Rp. 7,480,737

(Source: Processed data)

CONCLUSION

Based on the results of research using the Economic Order Quantity (EOQ) and Just In Time (JIT) methods, it was concluded that the Economic Order Quantity (EOQ) and Just In Time (JIT) methods were more optimal and efficient than company policy. It can be seen from the total inventory cost of trass stone using company policy of IDR 22,442,213, the total inventory cost of trass stone using the EOQ method is IDR 10,269,996, while the total inventory cost of trass stone using the JIT method is IDR 7,480,737. Therefore, the EOQ method is highly recommended to be applied to companies, because the EOQ method shows inventory costs are smaller than company policy with a difference of IDR 12,172,217, average ordering 48,349 kg, ordering frequency 9 times, safety stock 16,288 kg, and reorder point 2,948 kg.

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