

INVENTORY MATERIAL CONTROL WITH ECONOMIC ORDER QUANTITY (EOQ) METHOD ON PRODUCTION SHARING CONTRACT MALLACA STRAIT FIELD AREA

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Abstract: PT. XYZ is a business within the oil and gas industry. PT. XYZ conducts mineral and exploration activities in several parts of Indonesia, one of which is located in the Malacca area with a point of employment named EMP Mallaca Strait, SA. In this study, researchers used four chemical raw materials (EON Break DM 9268, EON Cor CI 7710, EON Solve SI 5710, and EON Solve 288) as research objects. The problem that occurs existing is PT. XYZ does not yet have a good raw material planning and control so that the cost of procurement and annual raw material inventory is high. This study used an method of Economic Order Quantity (EOQ), Re Order Point (ROP), Safety Stock and the comparison of Total Cost between the methods used by the company's method and after using the EOQ method. As well as providing suggestions for holding the value of safety stock and the value of the reorder point. The results of this study were obtained by using the EOQ method if applied by PT. XYZ, it resulted more optimal total cost, compared to the current method used by PT. XYZ.

Keywords: *inventory control, logistics, oil and gas industry, order quantity, raw material*

Introduction

In the mining industry in the 4.0 era, competition has grown. Oil companies conduct massive mining due to the need for high petroleum demand around the world.(Dallasega et al., 2022) Competition to achieve a competitive advantage is a problem that will be faced by companies. The mining sector is faced with a decline in profit margins due to falling commodity prices and triggering the increasing costs that are important in the mining industry.(Wang et al., 2018)

Chemicals are one of the raw materials needed to carry out drilling activities at oil refineries. The chemicals covered in this study are EON Break DM 9268, EON Cor CI 7710 (liquid), EON Scale SI 5710 and EON Solve 288. These four chemicals become the basic material in the process of mining oil refineries in wells managed by Production Sharing Contract (PSC) Malacca Strait Field Area.

Economic Order Quantity (EOQ) is the number of goods that can be purchased at a minimum cost of inventory or often called the optimal number of orders of materials.(Hasibuan et al., 2022).

Economic Order Quantity Method (EOQ Method) is a method of inventory control that aims to determine the optimum number of orders for goods or materials that are the most economical for each order.(Gu et al., 2018; Mahendrawathi et al., 2018) Meanwhile, Company Method can also determine the optimal frequency of the ethics of placing hardware orders so that the company can reduce the total costs that will arise.

This study aims to find out the right method and proper to be applied to the company in carrying out the inventory process Production Sharing Contract (PSC) Malacca Strait Field Area. The company can evaluate the reorder and the amount of safety supplies that should be provided. The company is also supposed to determine the optimum order frequency once the calculations have been completed.(Forslund & Mattsson, 2021; Timotius et al., 2022)



Figure 1. Field Area Mallaca Strait

Logistics is the integration of transportation procurement, inventory management and warehousing activities into the provision of cost-effective tools and capabilities to meet the needs of internal and external customers.(Dallasega et al., 2022; Randi & Meirini, 2021) Thus, logistics is the process or activity of moving goods from one place to another and the flow of information in it, from suppliers to *end-users* in an effective and efficient way, and at the minimum possible cost.(Ridwan et al., 2020).

The raw material is the entry of the processing process in the final product.(Hasibuan et al., 2022; Wang et al., 2018). How to differentiate, if the raw material is an aid material by conducting a search of the elements or materials in the finished product. How to procure raw materials may be obtained from natural sources, farmer, or purchase, for example, fibres are processed into wires. Raw materials are materialized goods such as tobacco, paper, plastic, or other materials obtained from natural sources or purchased from suppliers, or self-processed by the company for use by the company in

its own production process.(Lai et al., 2020; Mahendrawathi et al., 2018; Pardamean et al., 2021).

Inventory management is essential for planning and operating logistical systems. The objective of inventory management is to improve the effectiveness of inventory management services by minimizing costs while continuing to prioritize compliance with consumer needs.(Vikaliana et al., 2020). Inventory is defined as a model commonly used to solve problems related to efforts to control raw materials and finished products in a company's activities.(Suntoro, 2020). A distinctive feature of the inventory model is that its optimal solution is focused on guaranteeing inventory at as low a cost as low as. The purpose of inventory is inventory policy and maintaining this optimal level through inventory.(Randi & Meirini, 2021)

Method

This study is quantitative research conducted by calculations Economic Order Quantity Method (EOQ Method). The type of research data used in this study is secondary in the form of the number and frequency of orders and data sourced from the internet as supporting data. The EOQ method used in the study consists of:(Krueger et al., 2019; Senthilnathan, 2019; Suntoro, 2020)

Economic Order Quantity

Economic Order Quantity (EOQ) aims to determine the optimal amount and frequency of purchases. The optimal amount and frequency of purchases will be obtained optimal inventory control.

$$EOQ = \sqrt{\frac{2DS}{H}}$$

Order Frequency

The concept of EOQ has several similarities including the frequency of ordering (n) or the number of orders the company placed in one period.

$$n = \frac{D}{Q}$$

Total Inventory Cost

Data processing to generate Total Inventory Cost (TIC) by summing the cost of the message added with the cost of storage.

$$TIC = \left(\frac{D}{Q}\right)S + \left(\frac{Q}{2}\right)H$$

Re-order Point (ROP)

Definition of re-order point (ROP) is the right target time to reorder the necessary raw materials, so that the arrival of raw materials that have been ordered can come on time the inventory of raw materials above *the safety stock* equal to zero.

$$ROP = (LD \times AU) + SS$$

Safety Stock

Safety stock is the ability of a company to create conditions for inventory raw materials to always be safe or minimum fixed costs in the hope that it will never experience a shortage of inventory.

$$SS = (D \text{ Max} - \bar{D}) \times Lt$$

Discussion and Result

From the research that has been processed by researchers, it can be seen the comparison of chemical raw material inventory between company policies and policies after using EOQ Method.(Hersa Pratama et al., 2021). It

can be seen in terms of the optimal number of orders, frequency of orders, total inventory costs, safety supplies and ordering points.

EON Break DM 9268 Chemical

At this point, the inventory values on the EON Break DM 9268 chemical are compared. Comparison of these types of chemical materials based on the method carried out by the company's method and the Economic Order Quantity method (EOQ method).

Table 1. Comparison of EON Break DM 9268 Materials

Description	Company Method	EOQ Method
Order quantity	22.400 liters	8.990 liters
Order frequency	7 times	3 times
Safety supplies	-	613,64 liters
Rebooking points	-	1.472 liters
Total inventory costs	Rp. 155.309.466,00	Rp. 96.323.167,00

Based on Table 1. it can be seen the comparison of the value of chemical inventory EON Break DM 9268 between the company's methods with Economic Order Quantity (EOQ) Method. The quantity of orders according to the method used by the company as much as 22.400 liters with as many orders frequencies as 7 times, then if the calculation is done with the EOQ method generated order quantity only 8.990 liters with as much frequency as 3 times. Furthermore, when viewed from total costs with the company method of Rp. 155.309.466,00. Meanwhile, if you apply the EOQ method, the total costs incurred are Rp. 96.323.167,00.

Further calculations are carried out on re-order point (ROP) with a yield of as much as 613,64 liters. In addition, calculations are carried out on

re-order point (ROP), the resulting value is as much as 1.472 liters on chemicals EON Break DM 9268.

Based on the calculation results above, it can be explained that calculations on chemical materials EON Break DM 9268 by method EOQ will minimize the total cost per year incurred by the company.

EON Cor CI 7710

At this point, the inventory values on the EON Cor CI 7710 chemical are compared. Comparison of these types of chemical materials based on the method carried out by the company's method and the Economic Order Quantity (EOQ) method.

Table 2. Comparison of CI 7710 Cast EON Material

Description	Company Method	EOQ Method
Order quantity	25.600 liters	10.274 liters
Order frequency	8 times	3 times
Safety supplies	-	490,82 liters
Rebooking points	-	1.472 liters
Total inventory costs	Rp. 174.636.875,00	Rp. 96.324.451,00

Based on Table 2. it can be seen the comparison of inventory value and frequency of chemical materials EON Cor CI 7710 between the company's methods and Economic Order Quantity method (EOQ Method). The quantity of orders according to the method used by the company as much as 25.600 liters with as many orders frequencies as 8 times. Furthermore, if the calculation is carried out with the EOQ method, the order quantity is generated only 10.274 liters with as much frequency as 3 times. Total cost

with enterprise method by Rp. 174.636.875,00, whereas if applying the EOQ method, the total costs incurred are Rp. 96.324.451,00.

Furthermore, calculations are carried out on the safety inventory with results of 490,82 liters. Moreover, performed calculations on re-order point (ROP), the resulting value is as much as 1.472 liters on chemicals EON Cor CI 7710.

Based on the calculation results above, it can be explained that calculations on chemical materials EON Cor CI 7710 with the EOQ method will minimize the total cost per year incurred by the company.

EON Scale SI 5710

In this third stage, a comparison of inventory values on the chemical EON Scale SI 5710 is carried out. Comparison of these types of chemical materials based on the firm method and the Economic Order Quantity (EOQ) method.

Table 3. Comparison of EON Scale SI 5710 Materials

Description	Company Method	EOQ Method
Order quantity	25.600 liters	10.274 liters
Order frequency	6 times	3 times
Safety supplies	-	1.962 liters
Rebooking points	-	2.943,18 liters
Total inventory costs	Rp.135.976.875,00	Rp. 96.324.451,00

Based on Table 3., it can be seen the comparison of inventory value and frequency of chemical materials EON Scale SI 5710 between the company's method and Economic Order Quantity (EOQ) Method. The quantity of orders according to the method used by the company as much as

25.600 liters with as many orders frequencies as 6 times, then if the calculation is carried out with the EOQ method, the order quantity is generated only 10.274 liters with as much frequency as 3 times. Furthermore, when viewed from the total cost with the company method of Rp.135.976.875,00. Meanwhile, if you apply the EOQ method, the total costs incurred are Rp. 96.324.451,00.

Furthermore, calculations are carried out on the safety inventory with results of 1.962 liters. In addition, calculations are carried out on re-order point (ROP), the resulting value is as much as 2.943,18 liters on chemicals EON Scale SI 5710.

Based on the calculation results above, it can be explained that the calculation on the chemical material EON Scale SI 5710 with the EOQ method will minimize the total cost per year incurred by the company.

EON Solve 288

Next, the fourth stage is the comparison of inventory value and frequency on the chemical EON Solve 288. Comparison of these types of chemical materials using the business method and the Economic Order Quantity (EOQ) method.

Table 4. Comparison Costs of EON Solve 288 Material Inventory

Description	Company Method	EOQ Method
Order quantity	41.600 liters	16.696 liters
Order frequency	12 times	3 times
Safety supplies	-	1.349.64 liters
Rebooking points	-	2.944 liters
Total inventory costs	Rp. 250.603.614,00	Rp. 96.322.525,00

Based on Table 4., it can be seen the comparison of inventory value and frequency of chemical materials EON Solve 288 between the company's methods and Economic Order Quantity method (EOQ Method). The quantity of orders according to the method used by the company as much as 41.600 liters with as many order frequencies as 12 times. Computation with the EOQ method generated order quantity only 16.696 liters with as many frequencies as 3 times. Furthermore, when viewed from the total cost with the company method of Rp. 250.603.614,00, however, if you apply the EOQ method, the total costs incurred are Rp. 96.322.525,00.

Furthermore, calculations are carried out on the safety inventory with results of 1.349.64 liter. In addition, the calculations are carried out on the re-order point (ROP), the resulting value is as much as 2.944 liters on chemicals EON Solve 288.

Based on the calculation results above, it can be explained that the calculation on the EON Solve 288 chemical material using the EOQ method will minimize the total cost per year incurred by the company.

The EOQ method is a logistics control strategy that can be carried out by companies to optimize inventory and determine the time and frequency of orders.(Abidi et al., 2020; Forslund & Mattsson, 2021; Mahendrawathi et al., 2018; Notiasari et al., 2018). Re-order points are made to avoid the appearance of shortages of raw materials and excess raw materials.(Huang & Wu, 2020; Mahendrawathi et al., 2018)

Conclusion

Based on the description above, it can be concluded that if the company uses the EOQ Methode in the chemical procurement policy, the company will get a more optimal order quantity.

The researcher also suggested that the company determine the number of control points and security stocks for each purchase of equipment. This is to prevent the possibility of a shortage of raw materials or excess raw materials which have an impact on changes in status of materials that were originally from fast moving to slow moving. It is also recommended that the production process continues to run as it should without any obstacles, as well as maintain the possibility of delays in the raw materials ordered by the chemical materials ordered.

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