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Inventory Control of Tellus 68 Oil and Tellus 46 By Using Economic Order Quantity Method (Case Study at Pama Persada Nusantara, Kpcs Sangatta District, East Borneo)

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Abstract: Inventory is a companies asset that has an important role in business operations, so companies need to proactive management, which means companies should be able to anticipate the circumstances and challenges that exist in inventory management to achieve the ultimate goal, namely to minimize the total costs to be incurred by the company for handling inventory. Research conducted at Pama Persada Nusantara District KPCS aims to find out the amount of economical supply procurement in the effort to meet the procurement of Tellus 68 and Tellus 46 oil supplies to support the company's operational activities continuously. The analysis method used is EOQ (Economic Order Quantity), the total cost of inventory obtained from EOQ for Tellus 68 oil is Rp. 3.435.607.950 and Tellus Oli 46 is Rp. 8.424.243.631. The cost of the company for Tellus 68 Oil is Rp. 3.542.953.830 and Tellus 46 Oil is Rp. 9.065.390.370 so that the cost efficiency comparison between company policy and EOQ is Rp. 748.492.619. The results of this study showed that the most economical inventory by comparing the amount of ordering time, the number of purchases, the cost of ordering, storage costs, and the minimum total inventory cost of the company.

Keywords: Economic Order Quantity, Oil, Reorder Point, Safety Stock

1. Introduction

Every company is required to work harder in facing competition in the business world due to the increasingly rapid development economy. Currently, the development of the industrial world is more advanced. This encourages companies to optimize their production planning and control systems. Competitive selling prices are generated from a planning system that helps companies manage production activities, reduce production costs, and make product results effective [1]. The cost of raw material inventory is one of the things that affect the cost of production activities. In the production activities and streamline inventory activities, inventory planning has an important role. If there is a shortage of raw materials, production activities will be disrupted. Conversely, if there is an excess of raw materials, the storage costs will increase [1]. The lack of supply of raw materials will make the company's production activities run poorly, therefore, inventory problems are an important issue for companies, especially manufacturing companies. Inventories can incur large costs (such as labor costs, administration, Expedition, Electricity, and Tax). That's why the inventory must be done with the right method so that the company can avoid losses - losses that should not occur.

Inventory control is important for companies to know the right number of order frequencies to minimize inventory costs [2]. Planning does not always run smoothly, this causes the production process to be interrupted and the company cannot produce on time. Meanwhile, if the company fulfills excessive raw materials it will cause excessive inventory costs. So to make purchases (purchasing) raw materials needed inventory control by knowing the right number of

ordering frequencies to minimize inventory costs so as not to interfere with the smooth production process [2].

One important aspect of inventory held by companies in the warehouse. Savings in operational costs, in this case, storage costs and costs *material handling, are* based on the good layout in the warehouse area. Arrangement of goods properly, vertically or horizontally, the warehouse capacity can be maximized. Warehouse management requires construction and a good control system [3]. The Economic Order Quantity (EOQ) method can be used to minimize inventory costs. EOQ value is the amount or volume of the most economical purchase or order of goods to be made at each time of purchase or order. The EOQ method strives to achieve the minimum inventory levels, with low storage costs and good quality production [4].

PT. Pama Persada Nusantara, KPCS District, is one of the companies engaged in the mining industry especially coal mining. In this company, there is a *Warehouse* that functions as a provider of goods as a need for a *breakdown* in operational vehicles such as *dump trucks* and heavy equipment such as *excavators, bulldozers,* or all *heavy equipment* owned by PT. Pama Persada Nusantara, KPCS District, for this reason, the importance of the warehouse function in the company environment. Controlling inventory or *inventory management* is right is not easy. Costs incurred will be large if the inventory is increasingly large. This is due to the greater storage of goods and allows the risk of damaged goods becoming greater. However, if the amount of inventory is too small, there will be a risk to the production process which results in suboptimal production, so that profit delays can even cause loss of customers. The process of procurement of inventory cannot be carried out quickly, because in the procurement of goods inventory must go through the ordering process and the waiting period for the arrival of the goods.

The method used by the company does not have the right calculation so the company experiences high costs. This is certainly very influential on goods or *parts* whose value in money and needs per year are high. it would require management of *stock* of goods, in this case, is oil in the PT. Pama Persada Nusantara, KPCS District, which has had problems in *overstock* or out of *stock*. The problem also has to do with the arrangement of the layout of the warehouse that has not been organized and maximized, such as labeling, providing *barcodes*, classification according to the storage, and others. From the inventory problem, the Economic Order Quantity method is expected to provide a solution to the problem. Following the purpose of this study is to determine the most important stock of goods in priority inventory based on the value of money and needs per year and get the amount of inventory, in this case, safe oil using the EOQ (method *Economic Order Quantity*) so that oil needs during the process operational for a year are fulfilled and as needed.

a) Inventory Control

Physical inventory in a company will involve a very large investment in current assets, because inventory control is a managerial function that is very important for companies, especially in manufacturing companies [5].

b) Oli

Oli is an oil that is used as a lubricant. Oil has many variants, depending on its use as a lubricant in the engine and components that need the right oil to increase or preserve the *lifetime of the* engine or its components. The type of oil is divided into two, namely oil *Engine* and Hydraulic Oil, which will be discussed in this study is Hydraulic Oil.

c) ABC Analysis

This is a method of classifying several items based on the use of the annual money volume value from the highest to the lowest. ABC Analysis Method divides 3 (three) groups of items of goods into class A for goods with high use of the annual volume of money, class B for goods with use of a medium annual volume value, and class C for goods with use of a low annual money volume value [6].

d) Economic Order Quantity (EOQ)

The EOQ model is used to identify fixed order sizes that will minimize the total amount of annual inventory costs for storing and ordering inventory items. The total annual costs associated with storing and ordering inventory when Q units are ordered each time is shown in equation (1) [7]:

$$TC = \left(\frac{Q^*}{2}\right) H + \left(\frac{D}{Q^*}\right) S \quad (1)$$

Where:

TC = Total Cost (total)

Q* = Quantity order (unit)

H = Storage cost per unit

D = Demand (unit / year)

S = Order cost

As for the calculation of the optimal order amount shown in equation (2):

$$Q^* = \sqrt{\frac{2SD}{H}} \quad (2)$$

e) Reorder points and Safety Stock

Reorder Point (ROP) is the time when the company makes an order back from inventory items used in the production process, so that when the ordered items arrive on time by the capacity in the warehouse. Item items ordered back by the company arrive when the value of inventory items is above *safety stock* or equal to zero. This is done so that the inventory in the warehouse matches the *safety stock* (safety stock) [8].

Safety stock is an inventory that reserves some items of goods as a safety from the company's production activities. Safety stock is needed in production activities, especially in the manufacturing industry, because in reality the amount of raw material needed for the production process is often not always exactly as planned. The determination of *safety stock* can be calculated by perdurance (3).

$$\text{Safety Stock} = \text{PM-AUx L} \quad (3)$$

Where:

PM = Maximum Use of

AU = Needs Average
L = Lead time
For reorder point calculations you can use equation (4) [9]:

$$ROP = dx\ L + SS \quad (4)$$

Where:
ROP = Reorder Point
d = Requirement level
L = Lead Time
SS = Safety Stock

2. Methods

This research is an intensive study, using company historical data for the inventory. As for the case discussed the technique of procurement or purchase of oil supplies in the warehouse of PT. Pama Persada Nusantara KPCS District which aims to reduce the total cost of saving or total inventory cost, the reorder point for purchasing spare parts as well as safety stock the optimal when using the method Economic Order Quantity where oil items that are examined and analyzed consist of both items that are always excess stock from the use of Oli Tellus 68 and Oli Tellus 46. The flow chart of this study is shown in Figure 1. The observation made is direct observation of oil management in the warehouse division. Also, interviews were conducted with employees in the warehouse division. The data used are data obtained from the procurement of parts items Spare namely Tellus 68 oil and Tellus 46 oil in the period January - December 2019. These data include the type of oil and the amount of oil used, the amount of oil ordered, the oil storage fee, and the booking fee oil in the period of January - December 2019.

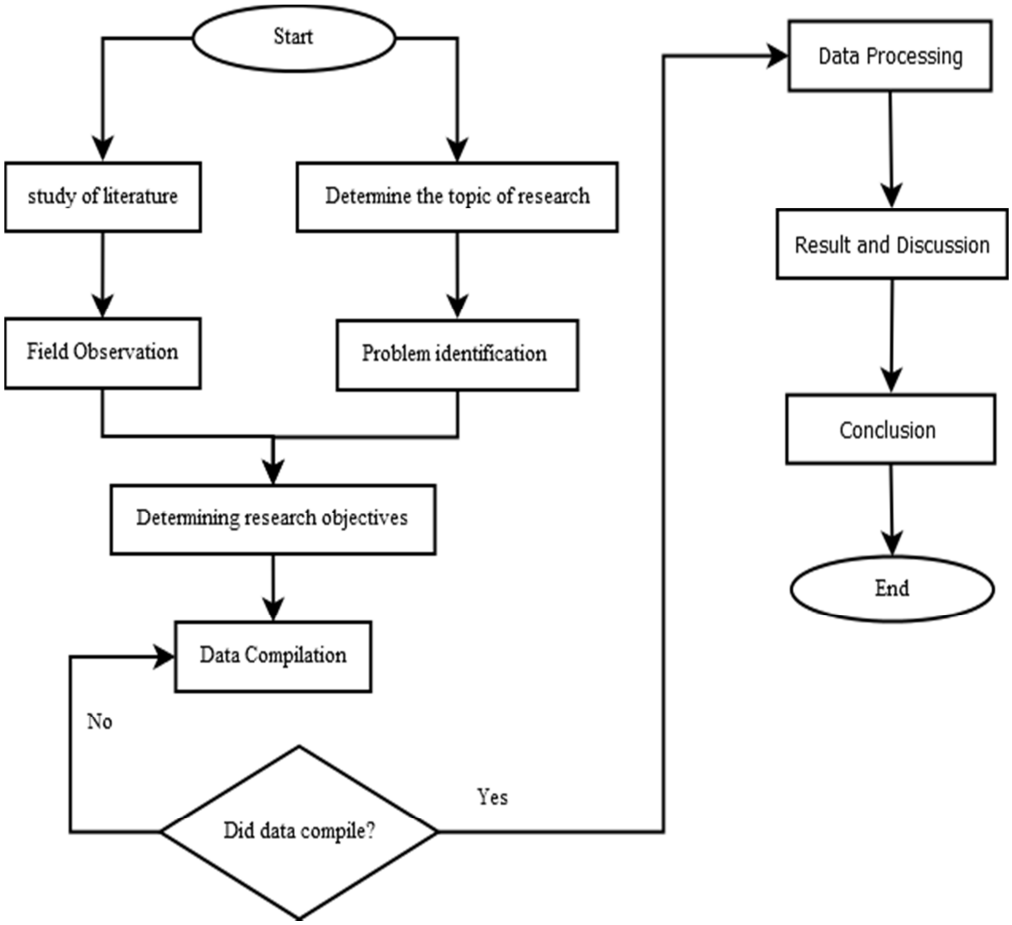

Figure 1. *Research Flow Chart.*

3. Results and Discussion

PT. Pama Persada Nusantara KPCS District, there are several types of oil used for the company's operational needs, in this case, it will be classified to find out which oil is the highest consumption and high cost so that the company knows what kind of oil should be repaired for its ordering system. As for the classification of these types of oil by using classes A, B, and C, where for class A is the oil category with the most use at a high cost per unit, for class B for the oil category with moderate use and the cost per unit used medium, class C for the category of low or low oil usage with a low cost per unit. The results of ABC analysis classification are based on the calculation of the amount of oil usage in PT. The PPCS of the KPCS District for one year from January to December 2018 is shown in Table 1.

Table 1. *Classification of the type of oil is based on annual usage.*

No	Type Oil	Cost per Year (USD)	Percentage of	Class
1	Tellus 46	7,802,420,808	38.49	A
2	Tellus 68	3,035,855,560	14.96	A
3	Donax TX	1,808,805,712	8.92	B
4	Omala 220	1,456,012,544	7.18	B
6	SAE 10	1,405,004,224	6.93	B
7	SAE 30	1392787569	6.87	B
8	SAE 15W - 40	1387690512	6.85	B
9	Donax TC	1105334388	5.45	C
10	SAE 30 Transilk HD	638,741,712	3.15	C
11	SAE 85W - 140	236,937,960	1.17	C

From Table 1 the trends highest oil usage and are classified by Code A namely on Tellus 68 and Tellus 46 oils, with a percentage usage, are 53.47% of all total oil usage in the 2018 period and affect the cost overall of oil use. From these data, Tellus 68 and Tellus 46 oils must be calculated so that the company does not suffer losses. The overall classification of oil use is shown in Figure 2.

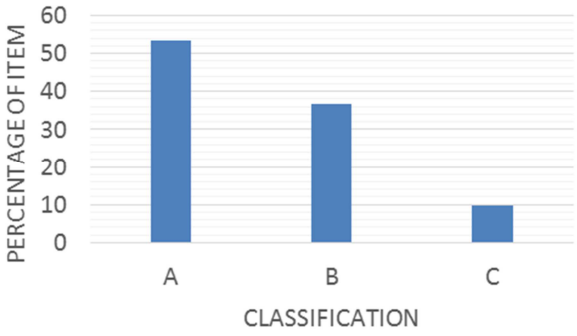

Figure 2. *Percentage of oil use based on classifications A, B, and C.*

Based on the calculation of the effect on the availability of the two oil items, Oil Tellus 46 and Tellus 68 are quite affected because both oil items are fast moving or goods with a large enough consumption movement in the movement of warehouse items. If the unavailability of these two items can hamper the maintenance process of mining operational equipment. Where if obstructed will cause harm to the company. Data on Tellus 68 and Tellus 46 oil procurement for a year are shown in Table 2.

Table 2. *Procurement Data Oil Tellus 68 and Tellus 46.*

No.	Month	Tellus Oil 68 (L)	Tellus Oil 46 (M)
1	January	0	0
2	February	0	0
3	March	4,000	0
4	April	18,000	30,000
5	May	22,000	50,000
6	Jun	28,800	43,000
7	Jul	7,000	40,000
8	August	16,000	50,000
9	September	21,000	27,000
10	October	16,000	82,000
11	November	9,000	21,000
12	December	20,000	71,000
Total Procurement / Year		161,800	414,000
Procurement Frequency / Year		10	9

Based on data from storage costs (H) of Rp 6,312 per unit for Tellus 68 oil and Rp. 2,700 per unit for Tellus 46 oil and an orderly fee (S) of Rp 2,600,000 per order, the economic order for Tellus 68 and Tellus 46 oil using equation (2), namely:

a. EOQ calculation for Tellus 68 oil

Q * =2x161.800x2.600.0006312

Q * = 11 545 L

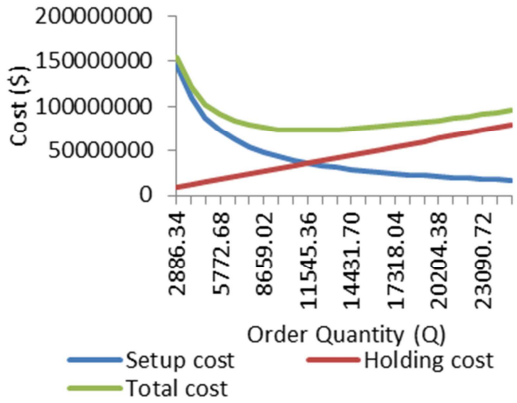

Figure 3. *Graph of Economic Order Quantity for Tellus oil 68.*

b. EOQ calculation for Tellus oil 46

Q * =2x414,000x2,600,0002,700

Q * = 28,237 L

For the calculation of order frequency for a year can be calculated using equation (5) [7]:

$$\text{Order cycle} = DQ^* \quad (5)$$

a. Calculation of Order cycle for Tellus oil 68

Order cycle = 161, 80011, 545= 14 times

b. Cycle Counting orders for oil Tellus 46

Cycle booking = 414 00028 237= 14 times

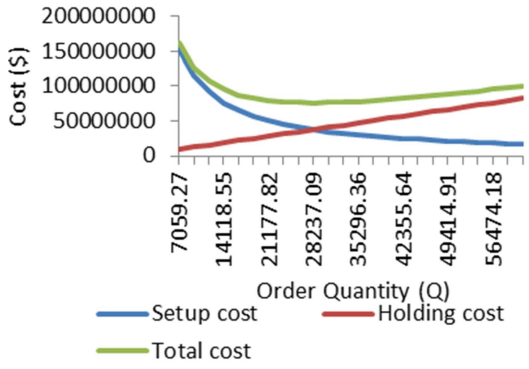

Figure 4. *Chart of Economic Order Quantity for Tellus oil 46.*

Inventories safety (safety stock) is necessary in a company especially manufacturing companies, because it serves to protect or maintain the possibility of a shortage of raw materials, so that facilitate the activities of production [10].

a. Safety stock and Reorder point for Tellus Oil items 68

PM = 28,800 L / month

= 28,800 L / 30

= 960 L / day
AU = 160,855 / 365
= 440.7 L / day
L = 7 Days
d = 160,855 / 365
= 440, 7 L / day

Then the value of Safety stock and ROP:
SS = (960 - 440.7) X 7
= 3,635.1 L
ROP = (440.7 X 7) + 3,635.1 L
= 6,720 L

b. Safety Stock and Reorder Points for Oli Tellus 46
PM = 81,150 / month
= 81,150 / 30
= 2,705 L / day
AU = 413,439 / 365
= 1,132.7 L / day
L = 7 Days
d = 413,439 / year
= 413,439 / 365
= 1,132.7 L / day

Then, the value of Safety stock and ROP:
SS = (2,705 - 1,132.7) x 7
= 11,006.1 L
ROP = (1,132,7 x 7) + 11,006 L
= 18,935 L

Based on the calculations, the results of the comparison between company calculations and calculations using the EOQ method are shown in Table 3.

Table 3. *Comparison of EOQ methods and company versions.*

No	Description	Economic Order Quantity		Company Policy	
		Tellus Oil 68 Tellus	Oil 46 Tellus	Oil 68 Tellus	Oil 46
1	Quantity Order (Liter)	11,545	28,237	16,180	46,000
2	Order Frequency (Times)	14	14	10	9
3	Safety Stock (Liter)	3,635,1	11,006	-	-
4	ReorderPoint (Liter)	6,720	18,935	-	-
5	Total Cost Inventory	Rp. 72,874,304	Rp. 116,569,608	Rp. 77,064,080	Rp. 168,576,000

4. Conclusion

Some conclusions obtained when using the calculation are *Economic Order Quantity* (EOQ) that the company is more profitable and can save costs. For the procurement of Oli Tellus 68, the company can save up to 5%, while for the procurement of Oli Tellus 46, the company can save costs up to 31%. The total cost efficiency between company policies with the calculation of the EOQ method is Rp. 56,196,168 per year. by saving the cost of ordering raw materials, the company can save other costs such as storage costs, taxes, warehouse rental fees, employee salaries, and maintenance costs. the application of economic order quantity to order goods items with fast movements can provide operational cost savings to the company, so the company will get greater profits.

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