

# Optimization of Raw Material Inventory using Always Better Control (ABC) Analysis and Economic Order Quantity (EOQ) Method Approach in the Warehouse of a Bolt Manufacturing Factory in Indonesia

Amalia Khusnul Irfani<sup>1</sup>  
Industrial Engineering,  
Faculty of Engineering  
Pelita Bangsa University  
Cikarang, Indonesia

Supriyanto<sup>2</sup>  
Industrial Engineering,  
Faculty of Engineering  
Pelita Bangsa University  
Cikarang, Indonesia

Gigih Hapsak Pradipto<sup>3</sup>  
Industrial Engineering,  
Faculty of Engineering  
Pelita Bangsa University  
Cikarang, Indonesia

**Abstract:-** There is a problem in the raw material procurement process at the Contractor Company, such as running out and excess stock of raw materials, as well as difficulties in determining how many raw materials to order that meet the company's economic value. Running out of raw material stock results in delays in production activities, while excess raw material stock can fill warehouse capacity, thereby increasing storage costs. To overcome this problem, research was carried out using a quantitative descriptive method to determine the level of production cost efficiency and production effectiveness level in order to achieve optimization of raw material supplies using Always Better Control (ABC) Analysis and the Economic Order Quantity (EOQ) Method at Bolt Companies. ABC analysis plays a role in determining which raw materials have the highest level of demand and the EOQ method plays a role in determining the amount of raw materials to be ordered in order to meet the company's economic value. The research results show that the combination of ABC Analysis and EOQ Method can reduce ordering costs and raw material inventory. There are 4 items out of 10 raw material items that are included in Category A or the most prioritized category. From the results of calculations using the EOQ method, the Bolt Company can save total orders and raw material inventory (TIC) in the period January to December 2023 amounting to IDR 2,147,403,-.

**Keywords:-** Optimization of Raw Material Inventory, Always Better Control (ABC) Analysis, Economic Order Quantity (EOQ) Method.

## I. INTRODUCTION

To make a product, raw materials are needed which are processed into finished materials through the production process. Raw materials have a very important role in the company, because if there are no raw materials then production activities will not run. According to Sasongko et al (2016:224) inventory is goods available for resale in buying and selling transaction activities, or equipment needed for the production process. In business, inventory is generally considered a company asset that can generate income within a certain period of time. Meanwhile, the definition of raw material inventory according to Heizer and Render (2010) in research, raw material inventory is one of the company's most expensive assets, representing as much as 50 percent of all invested capital. On the other hand, a company can reduce costs by reducing inventory [1]. Therefore, proper inventory control is needed to achieve optimum raw material supplies.

As experienced by one of the bolt production companies in Cikarang, there were problems in the raw material procurement process, such as running out and excess stock of raw materials, as well as difficulties in determining how many raw materials to order that met the company's economic value. Running out of raw material stock results in delays in production activities, while excess raw material stock can fill warehouse capacity, thereby increasing storage costs. The company needs a solution to achieve the expected goals, such as having a credible value reference so that it can determine how many raw materials should be ordered and determine which raw materials have a high level of demand so that it can anticipate fluctuations in raw materials so that they must be prioritized first. To overcome this problem, an ABC analysis test will be carried out to find out which raw materials are most needed from highest to lowest and the EOQ (Economical Order Quantity) method to determine the amount of raw materials to be ordered at the lowest cost.

## II. LITERATURE STUDY

### A. Raw Material Inventory

Inventory is a resource that is temporarily idle waiting for further processing [1]. With inventory planning, companies can fulfill buyer orders quickly and precisely, and will not create excess inventory which can result in inefficient use of funds (Darmawan et al., 2015) in research by [8].

#### ➤ Various Types of Raw Material Supplies

The following will explain more about these types of supplies:

- *Raw Materials Inventory*

This is a raw material that has not yet entered the production process.

- *Work in process (WIP)*

These are raw materials that have undergone a production process but are still not perfect or have not yet become a finished product.

- *Maintenance Repair Operating (MRO)*

Maintenance Repair Operating or operational repair maintenance is a type of inventory that is needed in case there is machine damage during the production process that must be scheduled or anticipated.

- *Finished Goods Inventory*

Namely the finished product and ready to be sold or sent to customers [2].

#### ➤ Factors Affecting Raw Material Supplies

According to Suyadi Prawirosentono (2001:71) in research by [7] the factors that influence the amount of inventory are:

- *Estimating the use of raw materials is determining the amount of raw material inventory required which must be in accordance with needs for a certain period.*
- *Raw material prices are prices that can influence the amount of inventory that must be held.*
- *Inventory costs are ordering costs and warehouse material storage costs.*
- *Waiting time for orders (lead time) is the time period from when an order is placed until the order becomes stock in the warehouse.*

### B. Controlling Raw Material Inventory

Raw material inventory control is an activity to determine inventory levels, purchase times and the amount of inventory that must be provided (Herjanto 2015). Controlling raw material inventory aims to make inventory costs efficient, one way is to make appropriate purchases according to the production plan so that there are no shortages or excesses in raw material inventory (Renta et al 2013). According to Nasution (2008) Inventories are idle resources waiting for further processing. With inventory planning, companies can fulfill buyer orders quickly and

precisely, and will not create excess inventory which can result in inefficient use of funds [3].

### C. Analisis Always Better Control (ABC)

ABC analysis is an inventory control technique by paying attention to groups of goods according to the level of importance of each group of goods. According to Render and Heizer (2005:62) ABC analysis divides inventory into three groups based on annual volume in money. In ABC Analysis, goods are usually grouped into three classes, namely A, B, and C. Class A is a very important group of goods (the largest sales value), class B is a group of goods with medium sales value, and class C is a group goods with the smallest sales value [4]. Based on the Pareto principle, goods can be classified into 3 categories as follows:

#### ➤ Category A

These are inventories that have a high annual volume value in rupiah. Category A represents around 60% – 80% of inventory costs.

#### ➤ Category B

It is an inventory with a medium annual volume value in rupiah. Category B represents 25% – 35% of inventory costs.

#### ➤ Category C

This is inventory with a low annual rupiah volume value, which only represents around 5% – 15% of inventory costs [5].

### D. Economic Order Quantity (EOQ) Method

Economic Order Quantity (EOQ) is the quantity of purchase orders for replenishment that minimizes total inventory costs [5]. Meanwhile, according to [6] Economic Order Quantity (EOQ) is the number of units of goods that must be ordered every time an order is placed so that the costs associated with procuring inventory are minimal, or the most optimal number of purchasing units. The EOQ method not only determines the optimal order quantity but more importantly concerns the financial aspects of decisions about the order quantity [9]. The calculation of the Economic Order Quantity (EOQ) method according to [5] is as follows:

The formula for economic order quantity (EOQ) is:

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

Where:

EOQ : Economic quantity of goods per order.

D : Annual demand in units for inventory items.

S : Ordering costs for each order.

H : Storage costs per unit.

Next, by using the formula above you can find the number of orders (P) during a certain period, namely with the formula:

$$P = \frac{D}{EOQ}$$

Where:

- P : Frequency of orders per year.
- D : The number of requests in a certain period.
- EOQ : Economic quantity of goods per order.

The formula for determining the TIC value is:

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

Where:

- TIC : Total inventory cost.
- Q : average purchase of raw materials.
- D : Annual demand in units for inventory items.
- S : Ordering costs for each order.
- H : Storage costs per unit.

### III. RESEARCH METHODS

This type of research is quantitative descriptive research which can be used to collect, analyze and describe data related to raw material supplies to achieve optimal decision making goals. Quantitative descriptive research is research that only describes the content of a variable in the research, not intended to test a particular hypothesis. Thus it can be seen that quantitative descriptive research is research that describes, examines and explains a phenomenon with data (numbers) as is without the intention of testing a particular hypothesis [10]. In this research, a quantitative descriptive method was used to determine the level of production cost efficiency and production effectiveness level using Always Better Control (ABC) Analysis and the Economic Order Quantity (EOQ) Method at Bolt Companies.

The data collection methods used are primary data and secondary data. Primary data is information obtained from primary sources, namely information from sources [11]. The primary data in this research is information about current inventory management practices, the challenges faced, and the solutions needed to overcome these challenges. Meanwhile, secondary data is information obtained not directly from sources but from third parties [11]. Secondary data in this research is data in the form of Microsoft Excel or a database containing data regarding raw material supplies, where the secondary data source comes from the company's Enterprise Resource Planning (ERP) System, where in this system the author obtains raw material data entry, exit, Not

Good (NG), return of raw materials, stock taking of raw materials, etc.

### IV. RESULTS AND DISCUSSION

In this research, we only tested several types of tool raw materials for optimization using predetermined methods. The following is a calculation of the costs incurred by the company:

#### A. Storage Costs

Costs arising from storing raw material inventory in a storage room for a certain period of time. Storage costs borne by Bolt Company include:

##### ➤ Electricity Costs

Costs incurred by companies using electricity while raw materials are stored in the warehouse. Calculations are obtained from the use of 5 lamps in the warehouse with a power of 5 watts, a ½ PK AC with a power of 650 watts with a run time of 8 hours per day, and a special computer for Tools raw materials with a power of 120 watts with a run time of 8 hours per day multiplied by 25 working days. The calculation is as follows:

- Lamps = 5 lamps x 5 watts x 8 hours = 200 watts
- AC ½ PK = 650 watts x 8 hours = 5,200 watts
- Computer = 120 watts x 8 hours = 960 watts
- Total** = 6,360 watts = 6.36 kWh

Because the company has electricity tariff group B-2, it is charged IDR 1,444.70 per kWh. So, the calculation of electricity costs becomes:

- Electricity costs per day = 6.36 x IDR 1,444.70 = IDR 9,188,292 per day
- Electricity costs per month = 25 x IDR 9,188,292 = IDR 229,707.3 = IDR 230,000 per month
- Electricity costs per year = 12 x IDR 230,000 = IDR 2,760,000 per year

##### ➤ Labor Costs

Costs incurred by the company to provide wages to employees who work in the warehouse, who are tasked with maintaining and organizing goods, maintaining warehouse cleanliness, and inputting raw material data for tools into the company's ERP system. The following is the cost calculation for 1 warehouse worker with a monthly salary of IDR 4,800,000:

- Salary for 1 worker = 12 x IDR 4,800,000 = IDR 57,600,000 per year

So, the total storage costs incurred by the Bolt Company which includes electricity costs and labor costs are IDR 2,760,000 per year + IDR 57,600,000 per year = IDR 60,360,000 per year.

**B. Order Costs**

Costs incurred by the company to order raw materials from the Supplier. Ordering costs that must be incurred by the Bolt Company include:

➤ **Communication Costs**

Costs incurred by the company for the use of communication services in carrying out raw material buying and selling transactions. Communication can be via E-mail, WhatsApp, and Telephone via cellphone using the company WiFi network. The following is a breakdown of company WiFi costs within 1 year:

Table 1 Details of Bolt Company Wifi Costs in 2023

Month	Wifi Voucher Costs
January	IDR 50,000
February	IDR 50,000
March	IDR 50,000
April	IDR 50,000
May	IDR 50,000
June	IDR 50,000
July	IDR 50,000
August	IDR 50,000
September	IDR 50,000
October	IDR 50,000
November	IDR 50,000
December	IDR 50,000
<b>Total</b>	<b>IDR 600,000</b>

Source: Bolt Company (2023)

➤ **Administration Costs**

Costs incurred by the company as operational costs during the process of buying and selling raw materials with suppliers, which are indirect costs for the smooth running of business operations. The following are details of company administration costs within 1 year:

Table 2 Details of Bolt Company Administration Costs for 2023

Month	Administration Costs
January	IDR 50,000
February	IDR 20,000
March	IDR 35,000
April	IDR 28,000
May	IDR 25,000
June	IDR 12,000
July	IDR 16,000
August	IDR 24,000
September	IDR 22,000
October	IDR 15,000
November	IDR 32,000
December	IDR 31,000
<b>Total</b>	<b>IDR 310,000</b>

Source: Bolt Company (2023)

So, the total ordering costs incurred by the Bolt Company which includes communication costs and administration costs are IDR 600,000 per year + IDR 310,000 per year = IDR 910,000 per year.

**C. Ordering Costs Each Time Order (S)**

$$S = \frac{\text{Total order cost}}{\text{Frequency of orders}}$$

$$= \frac{\text{IDR } 910,000}{12}$$

$$= \text{IDR } 75,833.33 = \text{IDR } 76,000$$

**D. Storage Costs per Unit of Raw Material (H)**

$$H = \frac{\text{Total storage costs}}{\text{Total excess raw materials}}$$

$$= \frac{\text{IDR } 60,360,000}{13.700}$$

$$= \text{IDR } 4.405,84 = \text{IDR } 4.406$$

*E. Always Better Control (ABC) Analysis Calculations*

ABC analysis plays a role in determining the priority level of each raw material by grouping it into 3 categories, namely A, B, and C. The following is data on 10 types of tools along with prices/pcs, demand or needs within a year, along with the total price spent.

Table 3 Data on Raw Material Needs for Bolt Company Tools for the Period January 2023 – December 2023

No	Item	Price/Pcs	Demand	Total Price	Percentage	Cumulative	Category
1	CK YSM - 30 D1.80 MC 1	IDR 3,500	2,000	IDR 7,000,000			
2	CK YSM - 30 D1.80 MC 2	IDR 4,700	3,000	IDR 14,100,000			
3	CK YSM - 30 D1.80 MC 3	IDR 5,200	11,000	IDR 57,200,000			
4	HR HEX. K8 B 7.90	IDR 6,000	3,000	IDR 18,000,000			
5	HR HEX. K7 B 6.90	IDR 4,000	5,000	IDR 20,000,000			
6	HR ROUND PL.S-1K3004	IDR 2,600	10,000	IDR 26,000,000			
7	HR ROUND PL.S-1K3006	IDR 3,700	20,400	IDR 75,480,000			
8	HRMT 1125-A(M5 X 12)	IDR 4,200	12,500	IDR 52,500,000			
9	HR 104L-B S-1K6024	IDR 2,800	15,000	IDR 42,000,000			
10	HR64S-D TSAS 3X15 IDE	IDR 5,600	5,000	IDR 28,000,000			

Source: Bolt Company (2023)

The following is Table 4 which is the result of ABC analysis calculations with 10 types of Tools raw materials, where Category A has a cumulative value of  $\leq 70\%$ , Category B has a cumulative value of  $\geq 70\% \leq 95\%$ , and Category C has a cumulative value of  $\geq 95\%$ . Because ABC Analysis aims to find priority raw materials, in the subsequent EOQ Method calculation process it only focuses on Category A.

Table 4 Data Result of ABC Analysis of Bolt Company Tools Raw Materials for the Period January 2023 – December 2023

No	Item	Price/Pcs	Demand	Total Price	Percentage	% Cumulative	Category
1	HR ROUND PL.S-1K3006	IDR 3,700	20,400	IDR 75,480,000	22.18	22.18	A
2	CK YSM - 30 D1.80 MC 3	IDR 5,200	11,000	IDR 57,200,000	16.81	38.99	A
3	HRMT 1125-A(M5 X 12)	IDR 4,200	12,500	IDR 52,500,000	15.43	54.42	A
4	HR 104L-B S-1K6024	IDR 2,800	15,000	IDR 42,000,000	12.34	66.76	A
5	HR64S-D TSAS 3X15 IDE	IDR 5,600	5,000	IDR 28,000,000	8.23	74.99	B
6	HR ROUND PL.S-1K3004	IDR 2,600	10,000	IDR 26,000,000	7.64	82.63	B
7	HR HEX. K7 B 6.90	IDR 4,000	5,000	IDR 20,000,000	5.88	88.51	B
8	HR HEX. K8 B 7.90	IDR 6,000	3,000	IDR 18,000,000	5.29	93.80	B
9	CK YSM - 30 D1.80 MC 2	IDR 4,700	3,000	IDR 14,100,000	4.14	97.94	C
10	CK YSM - 30 D1.80 MC 1	IDR 3,500	2,000	IDR 7,000,000	2.06	100.00	C
	<b>Total</b>			<b>IDR 340,280,000</b>			

Based on the table above, the following is an example of calculations to determine Categories A, B and C using ABC Analysis:

Item = HR ROUND PL.S-1K3006

Demand = 20,400 Pcs

Price / Pcs = IDR 3,700

Total Price = IDR 75,480,000

$$\text{Percentage} = \frac{\text{Total Price}}{\text{Total All Price} \times 100} = \frac{\text{IDR } 75,480,000}{\text{IDR } 340,280,000 \times 100} = 22.18\%$$

After the percentage has been calculated, the next step is to sort the percentage values from largest to smallest, then determine categories A, B, and C. After that determine the Cumulative % value, with the first row formula having the same value as the percentage, then in the next row use formula previous Cumulative % + Percentage on calculated row.

*F. Calculation of the Economic Order Quantity (EOQ) Method*

The EOQ method plays a role in determining the company's economic value for each type of raw material so that inventory is as minimal as possible. The following is Table 5 which is data from the calculation results of the EOQ Method.



Table 5 Data from Calculation Results of the EOQ Method for Raw Materials for Bolt Company Tools for the Period January 2023 – December 2023

No	Item	Demand (D)	EOQ (Q*)	Frekuensi Banyaknya Pemesanan / Tahun (P)
1	HR ROUND PL.S-1K3006	20,400	839	24
2	CK YSM - 30 D1.80 MC 3	11,000	616	18
3	HR MT 1125-A (M5 X 12)	12,500	657	19
4	HR 104L-B S-1K6024	15,000	719	21

Based on the table above, the following is the EOQ Method calculation to obtain the EOQ value of raw materials and the frequency of ordering raw materials.

$$EOQ 1 = \sqrt{\frac{2SD}{H}} = \sqrt{\frac{2 \times 76,000 \times 20,400}{4,406}} = \sqrt{\frac{3,100,800,000}{4,406}} = \sqrt{703,767.589} = 838.90 = 839 \text{ pcs}$$

$$EOQ 2 = \sqrt{\frac{2SD}{H}} = \sqrt{\frac{2 \times 76,000 \times 11,000}{4,406}} = \sqrt{\frac{1,672,000,000}{4,406}} = \sqrt{379,482.52} = 616.02 = 616 \text{ pcs}$$

$$EOQ 3 = \sqrt{\frac{2SD}{H}} = \sqrt{\frac{2 \times 76,000 \times 12,500}{4,406}} = \sqrt{\frac{1,900,000,000}{4,406}} = \sqrt{431,230.14} = 656.68 = 657 \text{ pcs}$$

$$EOQ 4 = \sqrt{\frac{2SD}{H}} = \sqrt{\frac{2 \times 76,000 \times 15,000}{4,406}} = \sqrt{\frac{2,280,000,000}{4,406}} = \sqrt{517,476.17} = 719.35 = 719 \text{ pcs}$$

$$P 1 = \frac{D}{EOQ} = \frac{20,400}{839} = 24.31 = 24 \text{ times}$$

$$P 2 = \frac{D}{EOQ} = \frac{11,000}{616} = 17.86 = 18 \text{ times}$$

$$P 3 = \frac{D}{EOQ} = \frac{12,500}{657} = 19.02 = 19 \text{ times}$$

$$P 4 = \frac{D}{EOQ} = \frac{15,000}{719} = 20.86 = 21 \text{ times}$$

G. Calculation of Total Inventory Cost (TIC)

Total Inventory Cost (TIC) plays a role in finding the total value of ordering costs and total storage costs for raw materials per year. If the amount of raw material inventory stored in the warehouse increases, the storage costs will increase. Likewise, if the order frequency becomes greater, the ordering and storage costs will also increase.

Table 6 Data from Calculation Results of the EOQ Method for Raw Materials for Bolt Company Tools for the Period January 2023 – December 2023

No	Item	Demand (D)	BEFORE			AFTER		
			Average Order of Raw Materials (Q)	Frequency of Number of Orders / Year (P)	TIC	EOQ (Q*)	Frequency of Number of Orders / Year (P)	TIC
1	HR ROUND PL.S-1K3006	20,400	1,667	12	4,602,455	839	24	3,696,231
2	CK YSM - 30 D1.80 MC 3	11,000	833	12	2,838,700	616	18	2,714,191
3	HR MT 1125-A (M5 X 12)	12,500	1,250	12	3,513,750	657	19	2,893,338
4	HR 104L-B S-1K6024	15,000	1,333	12	3,665,750	719	21	3,169,492

Based on the table above, Demand (D) is obtained from the total demand for raw materials at the Bolt Company in the period January to December 2023. Average Orders for Raw Materials (Q) are obtained from dividing Demand (D) by the Frequency of Number of Orders per

Year (P). Then EOQ (Q\*) is obtained from the EOQ calculation. The following is a description of the Total Inventory Cost (TIC) calculation before and after using the EOQ Method:

➤ *Before Using the EOQ Method:*

$$\begin{aligned} \text{TIC 1} &= \left(\frac{D}{Q}S\right) + \left(\frac{Q}{2}H\right) \\ &= \left(\frac{20,400}{1,667}76,000\right) + \left(\frac{1,667}{2}4,406\right) \\ &= (930,053.98) + (3,672,401) \\ &= \text{IDR } 4,602,454.98 \\ &= \text{IDR } 4,602,455 \end{aligned}$$

$$\begin{aligned} \text{TIC 2} &= \left(\frac{D}{Q}S\right) + \left(\frac{Q}{2}H\right) \\ &= \left(\frac{11,000}{833}76,000\right) + \left(\frac{833}{2}4,406\right) \\ &= (1,003,601.44) + (1,835,099) \\ &= \text{IDR } 2,838,700.44 \\ &= \text{IDR } 2,838,700 \end{aligned}$$

$$\begin{aligned} \text{TIC 3} &= \left(\frac{D}{Q}S\right) + \left(\frac{Q}{2}H\right) \\ &= \left(\frac{12,500}{1,250}76,000\right) + \left(\frac{1,250}{2}4,406\right) \\ &= (760,000) + (2,753,750) \\ &= \text{IDR } 3,513,750 \end{aligned}$$

$$\begin{aligned} \text{TIC 4} &= \left(\frac{D}{Q}S\right) + \left(\frac{Q}{2}H\right) \\ &= \left(\frac{15,000}{1,250}76,000\right) + \left(\frac{1,250}{2}4,406\right) \\ &= (912,000) + (2,753,750) \\ &= \text{IDR } 3,665,750 \end{aligned}$$

➤ *After Using the EOQ Method:*

$$\begin{aligned} \text{TIC 1} &= \left(\frac{D}{Q}S\right) + \left(\frac{Q}{2}H\right) \\ &= \left(\frac{20,400}{839}76,000\right) + \left(\frac{839}{2}4,406\right) \\ &= (1,847,914.18) + (1,848,317) \\ &= \text{IDR } 3,696,231.18 \\ &= \text{IDR } 3,696,231 \end{aligned}$$

$$\begin{aligned} \text{TIC 2} &= \left(\frac{D}{Q}S\right) + \left(\frac{Q}{2}H\right) \\ &= \left(\frac{11,000}{616}76,000\right) + \left(\frac{616}{2}4,406\right) \\ &= (1,357,142.86) + (1,357,048) \\ &= \text{IDR } 2,714,190.86 \\ &= \text{IDR } 2,714,191 \end{aligned}$$

$$\begin{aligned} \text{TIC 3} &= \left(\frac{D}{Q}S\right) + \left(\frac{Q}{2}H\right) \\ &= \left(\frac{12,500}{657}76,000\right) + \left(\frac{657}{2}4,406\right) \\ &= (1,445,966.51) + (1,447,371) \\ &= \text{IDR } 2,893,337.51 \\ &= \text{IDR } 2,893,338 \end{aligned}$$

$$\begin{aligned} \text{TIC 4} &= \left(\frac{D}{Q}S\right) + \left(\frac{Q}{2}H\right) \\ &= \left(\frac{15,000}{719}76,000\right) + \left(\frac{719}{2}4,406\right) \\ &= (1,585,535.47) + (1,583,957) \\ &= \text{IDR } 3,169,492.47 \\ &= \text{IDR } 3,169,492 \end{aligned}$$

So, it can be concluded that the number of orders for raw materials and the frequency of orders before and after being calculated using the EOQ method have different values. The HR ROUND PLS-1K3006 item before calculating using the EOQ method has an order value of 1,667 pcs with an order frequency of 12 times in 1 year, so the Total Inventory Cost (TIC) incurred by the Bolt Company is IDR 4,602,455.-. Then, after carrying out calculations using the EOQ method, the number of orders for raw materials became 839 pcs with an order frequency of 24 times in 1 year, so that the Total Inventory Cost (TIC) incurred by the Bolt Company was IDR 3,696,231.-. So the Bolt Company can save inventory costs for the HR ROUND PLS-1K3006 item amounting to IDR 906,224 per year, as well as for other items.

## V. CONCLUSIONS

➤ *Based on the results of the research that has been carried out, it can be concluded that:*

- From the results of calculations using ABC Analysis, the cumulative value of 10 items of Tools raw materials is obtained which can be seen in **Table 7** below.

Table 7 Results of Cumulative Value Calculation in ABC Analysis

No	Item	% Kumulatif	Kategori
1	HR ROUND PL.S-1K3006	22,18	A
2	CK YSM - 30 D1.80 MC 3	38,99	A
3	HR MT 1125-A (M5 X 12)	54,42	A
4	HR 104L-B S-1K6024	66,76	A
5	HR64S-D TSAS 3X15 IDE	74,99	B
6	HR ROUND PL.S-1K3004	82,63	B
7	HR HEX. K7 B 6.90	88,51	B
8	HR HEX. K8 B 7.90	93,80	B
9	CK YSM - 30 D1.80 MC 2	97,94	C
10	CK YSM - 30 D1.80 MC 1	100,00	C

Based on the table above, items in sequence number 1 to 4 have a cumulative value  $\leq 70\%$ , so they are included in Category A. Meanwhile, items in sequence number 5 to 8 have a cumulative value  $\geq 70\% \leq 95\%$ , so they are included in Category B, and items in sequence number 9 and 10 have a cumulative score  $\geq 95\%$ , then they are included in Category C.

- From the results of calculations using the EOQ Method for Category A, differences in Total Inventory Cost (TIC) have been found before and after using the EOQ calculation for each item, which can be seen in **Table 8** below.

Table 8 Differences in Total Inventory Cost (TIC) Before and After EOQ Calculation

No	Item	TIC Before EOQ	TIC After EOQ	Difference
1	HR ROUND PL.S-1K3006	IDR 4.602.455	IDR 3.696.231	IDR 906.224
2	CK YSM - 30 D1.80 MC 3	IDR 2.838.700	IDR 2.714.191	IDR 124.509
3	HR MT 1125-A (M5 X 12)	IDR 3.513.750	IDR 2.893.338	IDR 620.412
4	HR 104L-B S-1K6024	IDR 3.665.750	IDR 3.169.492	IDR 496.258
<b>Total</b>				<b>IDR 2.147.403</b>

Based on the table above, the Bolt Company can save total ordering costs and total storage costs of IDR 2,147,403 per year based on item calculations that have been determined for the period January to December 2023.

- Optimizing raw material inventory in the warehouse can be done by combining the Always Better Control (ABC) Analysis Method with the Economic Order Quantity (EOQ) Method. The first step is to calculate the ABC Analysis to find category A raw materials which are the raw materials with the highest priority, then calculate the EOQ value for each raw material. The EOQ value helps in determining the quantity of raw material orders that are more economical. So the company gets the benefit of reducing total inventory costs including ordering and storage costs, as well as minimizing shortages of raw material stock in the warehouse.

### SUGGESTIONS

- *Based on the results of the research that has been carried out, there are several suggestions that the author puts forward, namely as follows:*
  - Companies should review their raw material inventory policies based on research results using Always Better Control (ABC) Analysis and the Economic Order Quantity (EOQ) Method. Where the company can save total ordering costs and total storage costs of IDR 2,147,403,-, which is a total cost savings of 14.69% of the costs previously incurred.
  - By using the Economic Order Quantity (EOQ) method, the company can optimize the total inventory of Category A raw materials in the warehouse from 61,000 pcs to 2,831 pcs each time the order is reordered with a predetermined order frequency, thereby saving costs and storage space.
  - Companies should improve the raw material inventory system in the Enterprise Resource Planning (ERP) system used, which includes raw material order lead times, starting from calculating demand for raw materials, purchasing raw materials, to storing raw materials again so that they can support the Analysis function Always Better Control (ABC) and the Economic Order Quantity (EOQ) method run automatically, so you can make decisions quickly and precisely with better data accuracy.



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