Type of Contribution:
Research Paper
Review Paper
Case Study

ENERGY: JURNAL ILMIAH ILMU-ILMU TEKNIK
Vol. 16, No. 1 (2026) pp 178-194
DOI: 10.51747/energy.v16i1.16112

E-ISSN: 2962-2565

This article contributes to:

SUSTAINABLE DEVELOPMENT GOALS
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

Optimizing Toluene Inventory Control Using Economic Order Quantity

Muhammad Nabil Arijuddin[1*], **Siti Rahayu**[1], **Andini Putri Riandani**[1]

[1] Department of Industrial Engineering, Faculty of Engineering, Universitas Pelita Bangsa, Bekasi 17530, **Indonesia**

*mnabilarijuddin321@gmail.com

Abstract

Raw material inventory control plays an important role in maintaining production continuity and reducing inventory costs. CV. AK INDOPRIMA, a thinner manufacturing company, still determines the quantity and timing of Toluene raw material orders based on estimation. This condition causes inventory fluctuations, including overstock in several periods and shortage risk in other periods. This study aims to analyze the company's current inventory control system and determine an optimal inventory policy using the Economic Order Quantity (EOQ) method, supported by Safety Stock, Reorder Point (ROP), and Total Inventory Cost (TIC) calculations. This study used a quantitative descriptive method. Data were collected through observation, interviews, and company documentation for the January to December 2025 period. The results showed that the annual demand for Toluene was 183,600 liters. The EOQ calculation produced an optimal order quantity of 5,777.70 liters per order, with an ordering frequency of 32 times per year or every 9 days. The Safety Stock was 2,799 liters, while the Reorder Point was 5,859 liters. The Total Inventory Cost based on the EOQ policy was IDR 63,554,796 per year. These results indicate that the integrated EOQ-based policy can provide a more structured inventory control system by determining order quantity, safety inventory, reorder timing, and annual inventory cost. From a managerial perspective, the proposed policy can help managers reduce subjective purchasing decisions, establish a measurable ordering schedule, prevent excessive stock accumulation, reduce shortage risk, and maintain the availability of Toluene raw material to support production continuity at CV. AK INDOPRIMA.

Keywords: Inventory Control, Economic Order Quantity, Safety Stock, Reorder Point, Total Inventory Cost

Article Info
Submitted: 2026-05-19
Revised: 2026-06-21
Accepted: 2026-06-27
Published: 2026-06-29

Publisher
Universitas Panca Marga

1. Introduction

Raw material inventory control is essential in manufacturing because it affects production continuity, working capital, and operating cost. Poor inventory control can cause excessive inventory or insufficient inventory. Excessive inventory increases holding costs and capital accumulation, while insufficient inventory increases the risk of stockout and production delays [1], [2]. In chemical manufacturing, this issue becomes more critical because raw materials must be available in the right quantity and at the right time to maintain production stability.

CV. AK INDOPRIMA is a thinner manufacturing company that uses Toluene, Methanol, Ethanol, Acetone, and other supporting materials. Toluene is one of the main raw materials because it functions as a primary solvent in thinner production. Based on company observations, Toluene ordering is still based on experience and estimation, without structured calculations of optimal order quantity, safety inventory, and reorder timing. As a result, inventory fluctuations occurred during January to December 2025. Overstock occurred in February, August, and December, while shortage risk occurred in May and October. This condition shows that the current inventory control system has not provided a stable basis for ordering decisions.

The inventory problem at CV. AK INDOPRIMA can be conceptually understood as a consequence of estimation-based ordering decisions. When order quantities and ordering times are determined without systematic calculations, inventory levels tend to fluctuate and become difficult to control. Such fluctuations may lead to overstock when purchased quantities exceed actual production requirements, or shortage risk when available inventory is insufficient to meet demand. Overstock conditions increase holding costs and tie up company capital in inventory, whereas shortage risks can result in stockouts, production interruptions, and reduced operational efficiency [1], [2]. Therefore, a structured inventory control approach is required to support more accurate and efficient inventory decision-making. By applying quantitative inventory management methods, the company can determine optimal order quantities, establish adequate safety inventory levels, identify appropriate reorder timing, and evaluate inventory-related costs more systematically.

Several studies have used inventory control methods to solve similar problems. Economic Order Quantity (EOQ) determines the most economical order quantity by balancing ordering costs and holding costs [3]. Safety Stock and Reorder Point (ROP) reduce stockout risk caused by demand fluctuation and lead time uncertainty [4]. Total Inventory Cost (TIC) evaluates inventory policy efficiency by calculating total ordering and holding costs [5]. Previous studies found that EOQ, Safety Stock, and ROP improve ordering efficiency and prevent raw material shortages [6]-[8]. Other studies showed that EOQ can reduce inventory costs and determine economical purchasing quantities [9], [10]. The integration of EOQ, Safety Stock, ROP, and TIC also provides a stronger basis for evaluating inventory efficiency [11], [12].

However, previous studies still differ in method integration, cost evaluation depth, and research object characteristics. Some studies focused only on EOQ or EOQ and ROP without integrating Safety Stock and TIC [9], [10]. Other studies used Safety Stock and ROP but did not provide detailed TIC evaluation [6]-[8]. Although one study included TIC, the operational context differed from the Toluene inventory problem at CV. AK INDOPRIMA [3]. Therefore, an integrated analysis is needed to determine optimal order quantity, safety inventory, reorder point, and annual inventory cost based on the company's actual inventory data.

This study applies an integrated inventory control approach using EOQ, Safety Stock, ROP, and TIC for Toluene raw material at CV. AK INDOPRIMA. This study aims to analyze the current inventory control system, determine the optimal order quantity, calculate Safety Stock and ROP, and evaluate Total Inventory Cost. The results are expected to provide a structured inventory policy that supports production continuity and improves inventory cost efficiency.

2. Methods

2.1 Research Design

This This study used a quantitative method with a descriptive comparative approach. The quantitative approach was used because this study analyzed numerical inventory data, including raw material demand, ordering cost, holding cost, lead time, and current inventory policy. The descriptive approach was used to describe the actual inventory control system applied by CV. AK INDOPRIMA. The comparative approach was used to compare the company's current inventory policy with the proposed inventory policy based on Economic Order Quantity (EOQ), Safety Stock, Reorder Point (ROP), and Total Inventory Cost (TIC).

This study did not develop a new mathematical model. It applied established inventory control models in an integrated framework to solve the Toluene raw material inventory problem at CV. AK INDOPRIMA. EOQ was used to determine the optimal order quantity [3]. Safety Stock and ROP were used to reduce shortage risk caused by demand fluctuation and lead time [4]. TIC was used to evaluate the annual inventory cost based on ordering cost and holding cost [5].

2.2 Research Object and Scope

The object of this study was the inventory control system of Toluene raw material at CV. AK INDOPRIMA, a thinner manufacturing company located in

Bekasi, Indonesia. Toluene was selected because it is one of the main raw materials used as a primary solvent in thinner production and has continuous demand in each production period.

This study focused only on raw material inventory and did not analyze finished goods or work-in-process inventory. The study used company inventory data for the January to December 2025 period. The analysis was limited to annual demand, ordering cost, holding cost, lead time, current ordering frequency, and the existing inventory policy applied by the company.

2.3 Data Collection

The data used in this study consisted of primary and secondary data. Primary data were obtained through direct observation and interviews with personnel involved in inventory management and purchasing activities at CV. AK INDOPRIMA. Observation was conducted to understand the actual inventory control process, including how the company determines order quantity, order timing, and stock availability. Interviews were conducted to obtain supporting information related to ordering procedures, lead time, inventory problems, and cost components involved in the procurement and storage of Toluene raw material.

Secondary data were collected from company documents related to inventory activities during the January to December 2025 period. These documents included monthly Toluene demand, ordering cost, holding cost, lead time, current ordering frequency, and the company's existing inventory policy. The combination of observation, interview, and documentation was used to ensure that the inventory analysis reflected the actual operational condition of the company and was supported by quantitative company records.

2.4 Research Procedure

The research procedure was arranged systematically to show how the inventory control problem was solved. The procedure began with initial observation to identify the actual inventory condition at CV. AK INDOPRIMA. The next stage was problem identification, followed by field study, literature review, problem formulation, research objective formulation, data collection, data processing, comparison between current and proposed inventory policies, and formulation of the proposed inventory control recommendation.

The data processing stage was carried out through a structured sequence. The input data consisted of annual demand, ordering cost, holding cost, lead time, service level, and demand standard deviation. These data were processed through EOQ, ordering frequency, ordering interval, Safety Stock, ROP, and TIC calculations. The outputs of this stage were EOQ, ordering frequency, ordering interval, Safety Stock, Reorder Point, and Total Inventory Cost. The results were then compared with the company's current inventory policy to formulate the proposed inventory control recommendation. The research flowchart of the EOQ-based inventory control analysis is presented in Figure 1.

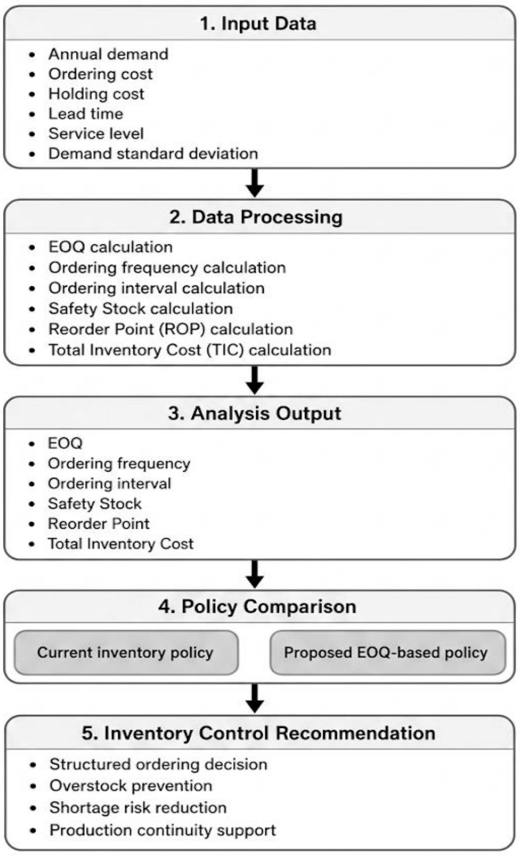

Figure 1. Research Flowchart of EOQ-Based Inventory Control Analysis

Figure 1 shows the flow of inventory control analysis from input data to inventory control recommendation. Annual demand, ordering cost, and holding cost were used to calculate EOQ, ordering frequency, ordering interval, and TIC. Lead time, service level, and demand standard deviation were used to calculate Safety Stock and ROP. The calculation results were then used to compare the current policy with the proposed EOQ-based policy.

2.5 Data Analysis Method

Based on the research flowchart in Figure 1, the data analysis was carried out in several stages. First, monthly Toluene demand from January to December 2025 was summed to obtain annual demand. Second, ordering cost, holding cost, lead time, and current inventory policy were identified as input parameters. Third, EOQ was calculated to determine the optimal order quantity. Fourth, ordering frequency and ordering interval were calculated to determine the proposed ordering schedule. Fifth, Safety Stock was calculated to determine the minimum safety inventory. Sixth, ROP was calculated to determine the reorder level. Seventh, TIC was calculated to evaluate the annual inventory cost. Finally, the current inventory policy and the proposed inventory policy were compared to formulate inventory control recommendations.

EOQ was used to determine the most economical order quantity by balancing ordering cost and holding cost [3]. The EOQ equation is shown in Equation (1).

$$EOQ = \sqrt{\frac{2DS}{H}} \qquad (1)$$

Where (D) is annual demand (L/year), (S) is ordering cost per order (IDR/order), and (H) is holding cost per liter per year (IDR/L/year). The annual ordering frequency was calculated using Equation (2).

$$F = \frac{D}{EOQ} \qquad (2)$$

Where (F) is ordering frequency in one year and (EOQ) is the optimal order quantity.

The ordering interval was calculated using Equation (3).

$$\boldsymbol{T = \frac{N}{F}} \qquad (3)$$

Where (T) is the ordering interval in days, (N) is the number of working days in one year, and (F) is the annual ordering frequency. Safety Stock was used to provide safety inventory against demand fluctuation during lead time [4]. The Safety Stock equation is shown in Equation (4).

$$SS = (U_{max} - AU) \times LT \qquad (4)$$

Where (SS) is Safety Stock (L), (Z) is the service level factor, (\sigma_d) is the standard deviation of demand, and (L) is lead time in days. ROP was used to determine the inventory level at which the company must place a new order [4]. The ROP equation is shown in Equation (5).

$$\boldsymbol{ROP = (d \times LT) + SS} \qquad (5)$$

Where (ROP) is reorder point (L), (d) is average daily demand (L/day), (L) is lead time in days, and (SS) is Safety Stock (L). TIC was used to evaluate the total annual inventory cost based on ordering cost and holding cost [5]. The TIC equation is shown in Equation (6).

$$TIC = \left(\frac{D}{S}\right) S + \left(\frac{Q}{2}\right) H \qquad (6)$$

Where (TIC) is total inventory cost (IDR/year), (D) is annual demand (L/year), (Q) is order quantity (L), (S) is ordering cost per order (IDR/order), and (H) is holding cost per liter per year (IDR/L/year). In the proposed inventory policy, (Q) was represented by the EOQ value.

3.Results and Discussion

3.1 Current Toluene Inventory Condition

The analysis began by identifying the current inventory condition of Toluene raw material at CV. AK INDOPRIMA. This stage was used to determine whether the company's current ordering policy had maintained inventory stability or still caused overstock and shortage risk. The monthly inventory condition from January to December 2025 is presented in **Tabel 1**. To provide a clearer visual interpretation of the monthly inventory movement, the trends of demand, order quantity, and final stock are presented in **Figure 2**.

Tabel 1. Toluene Inventory Data from January to December 2025

Month	Initial Stock (L)	Order Quantity (L)	Demand (L)	Final Stock (L)	Condition
January	2,500	14,000	13,900	2,600	Stable
February	2,600	16,000	15,300	3,300	Overstock
March	3,300	14,000	14,800	2,500	Stable
April	2,500	15,000	14,700	2,800	Stable
May	2,800	14,000	16,300	500	Shortage risk
June	500	17,000	15,000	2,500	Stable
July	2,500	15,000	15,700	1,800	Stable
August	1,800	17,700	16,100	3,400	Overstock
September	3,400	14,000	15,200	2,200	Stable
October	2,200	15,000	16,500	700	Shortage risk
November	700	17,000	15,200	2,500	Stable
December	2,500	16,000	14,900	3,600	Overstock

Source: Processed company data, 2026.

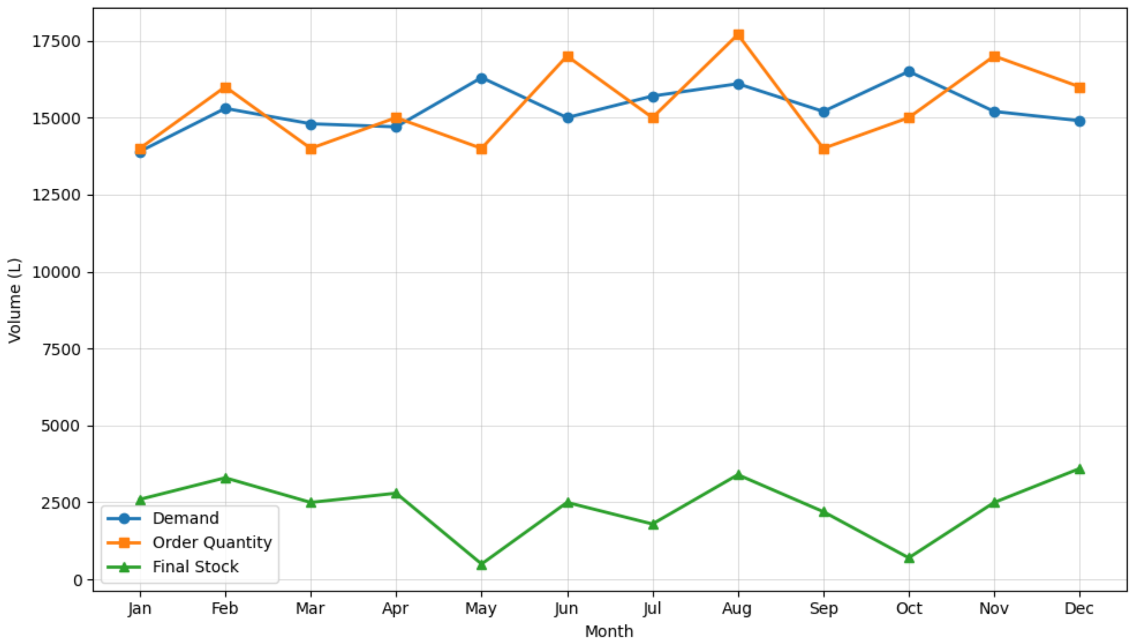

Figure 2. Monthly Toluene Demand, Order Quantity, and Final Stock Trends

As shown in **Tabel 1** and **Figure 2**, Toluene inventory fluctuated during the observation period. Overstock occurred in February, August, and December, with final stock levels of 3,300 L, 3,400 L, and 3,600 L. In contrast, shortage risk occurred in May and October, with final stock levels of only 500 L and 700 L. This pattern indicates that the company's current estimation-based ordering policy has not fully stabilized inventory levels.

The fluctuation confirms the main inventory control problem faced by the company. Excessive inventory can increase holding cost and capital accumulation, while insufficient inventory can increase the risk of stockout and production disruption [1], [2]. Therefore, the company needs a more structured inventory control approach to determine order quantity, safety inventory, and reorder timing.

3.2 Inventory Cost and Lead Time Parameters

After identifying the inventory condition, the next stage was determining the input parameters for EOQ, Safety Stock, ROP, and TIC calculations. These parameters were obtained from company records and interview results. The parameters used in this study are presented in **Tabel 2**.

Tabel 2. Inventory Control Parameters for Toluene Raw Material

Parameter	Symbol	Value	Unit
Annual demand	D	183,600	L/year
Average monthly demand	-	15,300	L/month
Average daily demand	d	612	L/day
Ordering cost per order	S	1,000,000	IDR/order
Toluene purchase price	-	55,000	IDR/L
Holding cost percentage	-	20	%/year
Holding cost per unit	H	11,000	IDR/L/year
Lead time	L	5	days
Working days per month	-	25	days
Service level	-	95	%
Service level factor	Z	1.645	-
Standard deviation of demand	σd	760.12	L

Source: Processed company data, 2026.

Tabel 2 shows the main parameters used in the inventory control calculation. The annual demand for Toluene was 183,600 L/year, with an average monthly demand of 15,300 L/month. The company used 25 working days per month, so the total working days in one year were 300 days. Based on this condition, the average daily demand was calculated as follows.

$$D = 13{,}900 + 15{,}300 + 14{,}800 + 14{,}700 + 16{,}300 + 15{,}000 + 15{,}700 + 16{,}100 + 15{,}200 + 16{,}500$$
$$D = 183{,}600 \text{ L/year}$$
$$d = \frac{D}{N}$$
$$d = \frac{183{,}600}{300}$$

The holding cost per unit was calculated based on 20% of the Toluene purchase price. The purchase price of Toluene was IDR 55,000/L. Therefore, the annual holding cost per liter was calculated as follows.

$$H = 20\% \times 55{,}000$$
$$H = 11{,}000 \text{ IDR/L/year}$$

These parameters were used as the basis for the next calculations. Annual demand, ordering cost, and holding cost were used to calculate EOQ [3]. Average daily demand, lead time, service level factor, and standard deviation of demand were used to calculate Safety Stock and ROP [4]. Ordering cost and holding cost were also used to calculate TIC as an indicator of annual inventory cost [5].

3.3 Economic Order Quantity Result

The EOQ calculation was conducted to determine the optimal order quantity of Toluene raw material. This calculation used three main parameters, namely annual demand, ordering cost per order, and holding cost per liter per year. Based on Table 2, the annual demand was 183,600 L/year, the ordering cost was IDR 1,000,000/order, and the holding cost was IDR 11,000/L/year. The EOQ calculation was carried out using Equation (1) as follows.

$$EOQ = \sqrt{\frac{2(183.600)(1.000.000)}{11.000}}$$

$$EOQ = \sqrt{\frac{367.200.000.000}{11.000}}$$

$$EOQ = \sqrt{33.381.818{,}18}$$
$$EOQ = 5.777{,}70 \text{ liter}$$

After the EOQ value was obtained, the ordering frequency was calculated by dividing annual demand by the EOQ value.

$$F = \frac{183.600}{5.777{,}70}$$
$$F = 31{,}77 \approx 32 \text{ times orders/year}$$

The ordering interval was then calculated using 300 working days per year.

$$T = \frac{300}{32}$$
$$T = 9{,}37 \approx 9 \text{ Day}$$

The results of the EOQ calculation, ordering frequency, and ordering interval are presented in **Tabel 3**.

Tabel 3. EOQ Calculation Result

No.	Description	Result	Unit
1	Economic Order Quantity	5,777.70	L/order
2	Ordering frequency	32	times/year
3	Ordering interval	9	days

Source: Processed company data, 2026.

Tabel 3 shows that the optimal order quantity was 5,777.70 L/order. Based on this order quantity, the company needs to place orders 32 times per year, with an order interval of approximately 9 days. This result provides a fixed and measurable ordering pattern compared with the current policy, which still relies on estimation. To provide a clearer comparison between the company's current ordering practice and the proposed EOQ policy, the average current order quantity and the EOQ result are presented in **Figure 3**.

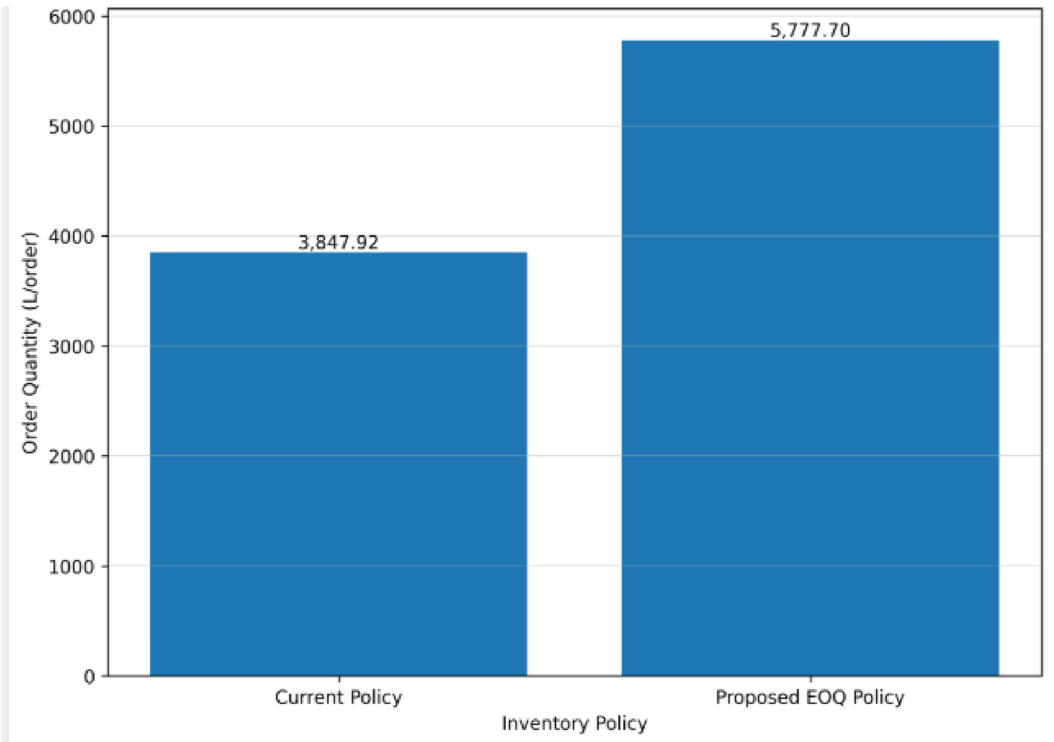

Figure 3. Monthly Toluene Demand, Order Quantity, and Final Stock Trends

As shown in **Figure 3**, the proposed EOQ value of 5,777.70 L/order is higher than the company's current average order quantity of 3,847.92 L/order. The current average order quantity was obtained by dividing the total annual ordered volume of 184,700 L by the current ordering frequency of 48 times/year. This result indicates that the company currently places orders in relatively smaller quantities but more frequently, whereas the EOQ approach recommends a larger and more economical order quantity.

The EOQ result strengthens the role of quantitative inventory control in determining economical order quantity. EOQ helps companies balance ordering cost and holding cost so that inventory decisions become more efficient [3]. This finding is in line with previous studies which found that EOQ can determine a more economical purchasing quantity and reduce inefficient inventory practices [9], [10], [11].

3.4 Economic Order Quantity Result

EOQ determines the optimal order quantity, but it does not directly determine the minimum safety inventory and reorder timing. Therefore, Safety Stock and Reorder Point (ROP) were calculated to reduce shortage risk during lead time. Safety Stock was used to determine the minimum inventory that should be maintained by the company, while ROP was used to determine when the company should place a new order. The calculation results of Safety Stock and ROP are presented in **Tabel 4**.

The Safety Stock calculation used a service level of 95%, a service level factor of 1.65, a standard deviation of demand of 760.12 L, and a lead time of 5 days. Using Equation (4), the Safety Stock was calculated as follows.

$$SS = 1{,}65 \times 760{,}12 \times \sqrt{5}$$
$$SS = 1{,}65 \times 760{,}12 \times 2{,}23$$
$$SS = 2.798{,}64 \text{ liter}$$
$$SS \approx 2.799 \text{ liter}$$

After the Safety Stock value was obtained, the ROP was calculated using average daily demand, lead time, and Safety Stock. The average daily demand was 612 L/day and the lead time was 5 days. Using Equation (5), the ROP was calculated as follows.

$$ROP = (612 \times 5) + 2.799$$
$$ROP = 3.060 + 2.799$$
$$ROP = 5.859 \text{ liter}$$

Tabel 4 shows that CV. AK INDOPRIMA needs to maintain Safety Stock of 2,799 L. This value represents the minimum safety inventory that should be available to anticipate demand fluctuation and possible delivery delay during lead time. The ROP value was 5,859 L, which means that the company should place a new Toluene order when the available inventory reaches 5,859 L.

These results answer the shortage risk found in the current inventory condition. In May and October, the final stocks were only 500 L and 700 L. Both values were far below the required Safety Stock of 2,799 L. This condition shows that the company did not have a clear minimum inventory limit in its current policy. Safety Stock provides a buffer against demand fluctuation, while ROP provides a clear reorder signal before inventory reaches a critical level [4].

Tabel 4. Safety Stock and Reorder Point Results

No.	Description	Result	Unit
1	Service level	95	%
2	Service level factor	1.645	-
3	Standard deviation of demand	760.12	L
4	Lead time	5	days
5	Safety Stock	2,799	L
6	Average demand during lead time	3,060	L
7	Reorder Point	5,859	L

Source: Processed company data, 2026.

The integration of Safety Stock and ROP strengthens the EOQ result because the company does not only know how much material should be ordered, but also when the order should be placed. This finding supports previous studies which showed that combining EOQ, Safety Stock, and ROP can reduce stockout risk and maintain production continuity [6], [7], [8], [12]. In the context of CV. AK INDOPRIMA, the proposed ROP can help reduce subjective ordering decisions and prevent the recurrence of shortage risk during high-demand periods.

3.5 Total Inventory Cost Result

After obtaining the EOQ value, Total Inventory Cost (TIC) was calculated to evaluate the annual inventory cost of the proposed policy. TIC consisted of ordering cost and holding cost. The calculation was carried out as follows.

$$\text{Ordering Cost} = \frac{183{,}600}{5{,}777.70} \times 1{,}000{,}000 = 31{,}777{,}446\ \text{IDR/year}$$

$$\text{Holding Cost} = \frac{5{,}777.70}{2} \times 11{,}000 = 31{,}777{,}350\ \text{IDR/year}$$

$$\text{TIC} = 31{,}777{,}446 + 31{,}777{,}350 = 63{,}554{,}796\ \text{IDR/year}$$

The TIC calculation result is presented in **Tabel 5**.

Tabel 5 Total Inventory Cost result

No.	Cost Component	Result
1	Ordering cost	IDR 31,777,446
2	Holding cost	IDR 31,777,350
3	Total Inventory Cost	IDR 63,554,796

Source: Processed company data, 2026.

Tabel 5 shows that the annual inventory cost based on the EOQ policy was IDR 63,554,796. The ordering cost was IDR 31,777,446, while the holding cost was IDR 31,777,350. The small difference between both cost components indicates that the EOQ policy produced a balanced cost structure.

This balance is consistent with the EOQ concept, where the optimal order quantity occurs when ordering cost and holding cost are relatively balanced [3]. TIC also becomes an important indicator because it measures the cost consequence of an inventory policy in one period [5]. This finding supports previous research which used TIC to evaluate the efficiency of EOQ-based inventory policy [11].

3.6 Comparison Between Current and Proposed Inventory Policies

The final stage of the analysis was comparing the current inventory policy with the proposed EOQ-based policy. This comparison was used to show the managerial difference between estimation-based ordering and calculation-based ordering. The comparison is presented in **Tabel 6**.

Tabel 6 Comparison Between Current and Proposed Inventory Policies

No.	Component	Current Policy	Proposed Policy
1	Ordering basis	Experience and estimation	EOQ, Safety Stock, ROP, and TIC calculation
2	Ordered volume	14,000 to 17,700 L/month	5,777.70 L/order
3	Ordering frequency	48 times/year	32 times/year
4	Ordering interval	No fixed schedule	Every 9 days
5	Safety Stock	Not applied	2,799 L
6	Reorder Point	Not applied	5,859 L
7	Inventory condition	Overstock and shortage risk still occurred	More controlled inventory
8	Total inventory cost	Not specifically calculated	IDR 63,554,796/year

Source: Processed company data, 2026.

To strengthen the comparison, **Table 7** summarizes the main differences between the current policy and the proposed EOQ-based policy in terms of ordering frequency, annual inventory cost, stock control basis, and inventory stability.

Tabel 7 Summary Comparison of Current and Proposed Inventory Policies

Aspect	Current Policy	Proposed EOQ-Based Policy
Ordering Frequency	48 times/year	32 times/year
Annual Inventory Cost	Estimated TIC: IDR 68,877,673/year	TIC: IDR 63,554,796/year
Stock Control Basis	No Safety Stock and ROP	Safety Stock: 2,799 L; ROP: 5,859 L
Inventory Stability	5 unstable months; overstock in Feb, Aug, Dec, shortage risk in May, Oct	Controlled using EOQ, Safety Stock, and ROP

As shown in **Table 6** and **Table 7**, the proposed policy provides a more structured inventory control system than the current policy. The current policy is based on experience and estimation, with an ordering frequency of 48 times/year and no specific Safety Stock or ROP. In contrast, the proposed EOQ-based policy reduces the ordering frequency to 32 times/year, applies Safety Stock of 2,799 L, sets the ROP at 5,859 L, and produces a TIC of IDR 63,554,796/year. The estimated TIC of the current policy was calculated using the current average order quantity and the same cost parameters, resulting in IDR 68,877,673/year.

The comparison shows that EOQ, Safety Stock, ROP, and TIC have complementary roles. EOQ controls order quantity, Safety Stock controls shortage risk, ROP controls reorder timing, and TIC evaluates inventory cost [3], [5]. This integrated approach is stronger than using EOQ alone because the company does not only know how much to order, but also when to order and how much inventory cost must be prepared. This result is consistent with studies that recommend combining EOQ with Safety Stock, ROP, and TIC to improve inventory control performance [7], [11], [12].

3.7 Proposed Inventory Control Policy

Based on the analysis, CV. AK INDOPRIMA should apply a structured inventory control policy for Toluene raw material. The company should order Toluene in the amount of 5,777.70 L for each order, with an ordering frequency of 32 times per year and an ordering interval of approximately 9 days. The company should also maintain Safety Stock of 2,799 L to anticipate demand fluctuation and place a new order when inventory reaches the Reorder Point of 5,859 L.

The proposed policy provides a clearer inventory control mechanism than the current estimation-based policy. EOQ determines the optimal order quantity, Safety Stock protects the company from shortage risk, ROP determines the reorder timing, and TIC evaluates the annual inventory cost [3], [5]. By applying these calculations, the company can reduce subjective ordering decisions and improve inventory planning. This approach is also in line with previous studies which show that the integration of EOQ, Safety Stock, ROP, and TIC can improve inventory control performance and support production continuity [7], [11], [12].

Therefore, the proposed inventory control policy can be used as a practical basis for managing Toluene raw material at CV. AK INDOPRIMA. The policy helps the company maintain raw material availability, prevent excessive inventory, reduce shortage risk, and control annual inventory cost more systematically. Data utama bagian ini sinkron dengan hasil skripsi kamu yang memuat EOQ 5,777.70 L, Safety Stock 2,799 L, ROP 5,859 L, dan TIC IDR 63,554,796.

4. Conclusion

This study shows that the current Toluene inventory control system at CV. AK INDOPRIMA still relies on experience and estimation, which caused inventory fluctuations during the January to December 2025 period. Overstock occurred in February, August, and December, while shortage risk occurred in May and October. Based on the EOQ calculation, the optimal order quantity for Toluene raw material was 5,777.70 L/order, with an ordering frequency of 32 times/year and an ordering interval of approximately 9 days. The Safety Stock calculation produced a minimum safety inventory of 2,799 L, while the Reorder Point was 5,859 L. The Total Inventory Cost based on the proposed EOQ policy was IDR 63,554,796/year.

These results indicate that the integration of EOQ, Safety Stock, ROP, and TIC can provide a more structured inventory control policy by determining how much material should be ordered, when the order should be placed, how much safety inventory should be maintained, and how much annual inventory cost should be prepared. From an implementation perspective, the proposed policy is ready to be applied if the company strengthens daily stock recording, follows the reorder signal consistently, and improves coordination between warehouse, purchasing, and production units. However, several operational challenges may occur, such as supplier lead time variation, changes in monthly demand, storage capacity limitations, and purchasing discipline. Therefore, the EOQ-based policy should be reviewed periodically to ensure that the order quantity, Safety Stock, and ROP remain suitable for actual operational conditions.

Therefore, the proposed policy can help CV. AK INDOPRIMA reduce subjective ordering decisions, prevent excessive inventory, reduce shortage risk, and support production continuity. Future studies may develop the analysis by adding demand forecasting, supplier performance evaluation, or inventory simulation to improve the adaptability of the inventory control policy.

Acknowledgement

The author would like to express sincere gratitude to the Department of Industrial Engineering, Faculty of Engineering, Universitas Pelita Bangsa, for academic support during this research. The author also thanks CV. AK INDOPRIMA for providing the data and information required to complete this study. Appreciation is also given to all parties who supported the preparation of this article.

Authors' Declaration

Authors' contributions and responsibilities - The authors made substantial contributions to the conception and design of the study. The authors took responsibility for data analysis, interpretation, and discussion of results. The authors read and approved the final manuscript.

Funding - No funding information from the authors.

Availability of data and materials - All data is available from the authors.

Competing interests - The authors declare no competing interest.

Additional information - No additional information from the authors.

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