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# Inventory Management of Imported Raw Materials Based on Continuous Review Policy Using EOQ, POQ, and Min-Max Stock Methods: A Case Study: PT XYZ

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***Abstract:*** *Inventory management is a critical factor in ensuring the efficiency of supply chain operations, particularly in the Fast-Moving Consumer Goods (FMCG) industry, where demand fluctuations and lead time uncertainties pose significant challenges. This study examines the effectiveness of Economic Order Quantity (EOQ), Periodic Order Quantity (POQ), and Min-Max Stock methods within a continuous review policy framework to optimize raw material inventory management at PT Torabika Eka Semesta. The primary objective is to minimize total inventory costs while maintaining adequate stock levels to prevent shortages and overstocking. A case study approach was employed, utilizing historical inventory data and structured interviews with supply chain managers. The study analyzed safety stock levels, reorder points, inventory turnover, and total inventory costs across the three inventory control models. Statistical methods, including sensitivity analysis, were applied to assess the impact of demand variability on inventory performance. The results indicate that POQ offers the most cost-effective approach for handling fluctuating demand, as it aligns order cycles with consumption patterns, reducing holding and shortage costs. EOQ minimizes total inventory costs under stable demand conditions but struggles with demand unpredictability. The Min-Max Stock method provides a balance between availability and cost efficiency, yet incurs higher holding costs due to pre-set stock limits. Additionally, the integration of Standard Operating Procedures (SOPs) was found to enhance inventory responsiveness and minimize procurement inefficiencies. This study contributes to the existing body of knowledge by providing empirical insights into inventory control optimization for FMCG companies managing imported raw materials. The findings underscore the importance of selecting appropriate inventory control methods based on demand characteristics and supply chain constraints. Future research should explore the integration of predictive analytics and machine learning models to further enhance inventory forecasting accuracy.*

**Keywords: Inventory Management, EOQ, POQ, Min-Max Stock, Continuous Review Policy, Supply Chain Optimization, FMCG Industry**

## 1. INTRODUCTION

Inventory management plays a crucial role in the operational efficiency of Fast-Moving Consumer Goods (FMCG) companies, particularly those relying on imported raw materials. The complexity of supply chain operations, fluctuating consumer demand, and lead time uncertainties pose significant challenges in maintaining optimal inventory levels. Inaccurate demand forecasting and inadequate inventory control mechanisms often result in either overstocking or stockouts, both of which have severe financial and operational consequences [1]. Effective inventory management is essential to balance cost efficiency while ensuring the availability of raw materials to support continuous production cycles.

In the FMCG industry, managing imported raw materials requires robust inventory control strategies due to longer lead times, variations in supplier reliability, and unpredictable market demand. Studies have shown that demand fluctuations significantly impact supply chain performance, leading to inefficiencies in production planning and increased costs [2]. Without a well-structured inventory control system, companies risk disruptions in manufacturing processes, which can compromise their ability to meet market demand and maintain competitive advantage.

A common approach adopted by FMCG companies to manage inventory is the use of Enterprise Resource Planning (ERP) systems such as System Application and Product in Data Processing (SAP). However, traditional ERP implementations often focus on data collection and storage rather than providing automated solutions for Material Requirement Planning (MRP) and demand forecasting [1]. The reliance on manual calculations in inventory management creates inefficiencies, increasing the risk of stock imbalances and order fulfillment delays. The absence of automated forecasting mechanisms limits the effectiveness of decision-making processes, making it difficult to respond to demand variations in a timely and cost-efficient manner.

To address these issues, several inventory control methods have been proposed, including Economic Order Quantity (EOQ), Periodic Order Quantity (POQ), and Min-Max Stock. These methods provide systematic approaches to determining order quantities, replenishment frequencies, and safety stock levels to optimize inventory costs [1,3]. EOQ minimizes total inventory costs by balancing ordering and holding costs, while POQ determines economic ordering intervals based on demand cycles. Min-Max Stock, on the other hand, sets upper and lower stock limits to mitigate risks associated with overstocking and stockouts [4]. Implementing these strategies enables companies to make data-driven decisions that enhance supply chain efficiency and cost-effectiveness.

Among the most widely adopted inventory control strategies in manufacturing is the Continuous Review Policy. This policy ensures that inventory levels are monitored in real time, triggering replenishment orders when stock reaches the predetermined reorder point [3,5]. Studies have highlighted the benefits of continuous review policies in reducing lead times and improving responsiveness to demand fluctuations. Best practices in implementing such policies include integrating automated demand forecasting models and optimizing safety stock levels based on historical consumption patterns [6]. These improvements allow businesses to mitigate risks associated with supply chain disruptions and enhance operational agility.

Despite the extensive research on inventory control methods, gaps remain in the application of these models within the context of FMCG companies dealing with imported raw materials. Existing studies primarily focus on inventory optimization in general manufacturing settings, often neglecting the unique challenges posed by international supply chains, tariff regulations, and supplier reliability issues. Furthermore, limited research has explored the integration of EOQ, POQ, and Min-Max Stock models within a continuous review framework tailored for FMCG operations [1]. Addressing these gaps is crucial for developing more effective inventory control strategies that cater to the specific needs of companies managing imported raw materials.

This study aims to evaluate the effectiveness of EOQ, POQ, and Min-Max Stock methods in optimizing inventory control under a continuous review policy at PT Torabika Eka Semesta, an FMCG company specializing in coffee-based products. The research investigates how these methods influence total inventory costs, order frequencies, and supply chain efficiency. Additionally, the study proposes an enhanced Standard Operating Procedure (SOP) for inventory management, focusing on improving order fulfillment responsiveness. By analyzing historical demand patterns and lead time variability, this research provides insights into best practices for managing imported raw materials in the FMCG industry. The findings contribute to the academic discourse on inventory control optimization and offer practical recommendations for improving supply chain efficiency in similar manufacturing contexts.

## 2. LITERATURE REVIEW

### 2.1 Inventory Management Challenges in the FMCG Industry

Inventory management in the Fast-Moving Consumer Goods (FMCG) sector presents unique challenges due to demand fluctuations, short product life cycles, and the complexity of handling imported raw materials. The variability in lead times and supplier reliability further complicates inventory control, increasing the risks of overstocking or stockouts [1]. The globalized nature of FMCG supply chains means that raw materials must often be sourced from multiple suppliers across different countries, adding logistical uncertainties and cost variations to procurement processes. Efficient inventory management strategies are crucial to maintaining seamless production while minimizing costs and operational disruptions [2].

Another challenge in FMCG inventory management is the impact of seasonality on consumer demand. Sudden surges in demand during peak seasons, such as holidays or promotional events, can lead to stock shortages if inventory levels are not properly adjusted in advance [7,8'9]. Conversely, overstocking during off-peak periods results in increased holding costs and potential waste due to product expiration. These factors highlight the need for robust demand forecasting and responsive inventory control mechanisms to ensure consistent product availability while minimizing excess stock.

### 2.2 Comparative Analysis of EOQ, POQ, and Min-Max Stock Methods

Economic Order Quantity (EOQ), Periodic Order Quantity (POQ), and Min-Max Stock are widely utilized inventory control methods, each with distinct benefits. EOQ optimizes order sizes by balancing ordering and holding costs, making it suitable for stable demand environments [3,10,11]. The primary assumption of EOQ is constant demand and fixed lead time, which may not always align with the dynamic nature of the FMCG industry. However, for companies dealing with predictable consumption patterns, EOQ provides a cost-effective approach to minimizing total inventory expenses.

POQ adjusts order frequencies based on demand cycles, offering flexibility in fluctuating markets [12]. Unlike EOQ, POQ accounts for seasonal trends and batch ordering strategies, making it particularly useful for industries with varying consumer preferences. This method allows manufacturers to place orders in predetermined intervals, reducing the frequency of stockouts while maintaining a balance between order and holding costs.

Min-Max Stock ensures inventory levels remain within predefined limits, reducing stockout risks while requiring higher holding costs [4]. This method is widely used in continuous review policies, where stock levels are monitored in real time to trigger replenishment orders. However, maintaining an appropriate minimum and maximum inventory threshold requires an accurate understanding of demand patterns and supplier reliability. Selecting an appropriate method depends on the volatility of demand and supply chain constraints [6].

### 2.3 Role of Continuous Review Policy in Inventory Control

A continuous review policy involves real-time stock monitoring and order placement when inventory reaches a predefined reorder point [13]. Compared to periodic review policies, which assess stock at fixed intervals, continuous review models improve responsiveness and reduce lead time dependencies [1]. This approach ensures that inventory replenishment is immediate, minimizing the risk of production stoppages caused by raw material shortages.

However, effective implementation of a continuous review policy requires precise demand forecasting to avoid excessive safety stock or frequent emergency orders [2]. While continuous review systems provide real-time inventory visibility, their effectiveness is highly dependent on the accuracy of demand projections. Advanced inventory management software integrated with Enterprise Resource Planning (ERP) systems can enhance the reliability of continuous review models by automating reorder calculations and providing data-driven insights into stock levels.

## 3. RESEARCH METDHOS

### 3.1 Research Design

This study employs a case study approach to analyze inventory management optimization at PT Torabika Eka Semesta, an FMCG company specializing in coffee-based products. Case study research is widely used in inventory management analysis due to its ability to provide in-depth insights into specific organizational practices [14]. The case study method allows for a comprehensive examination of how different inventory control methods—Economic Order Quantity (EOQ), Periodic Order Quantity (POQ), and Min-Max Stock—affect cost efficiency and stock availability. However, a key limitation of this approach is the reduced generalizability of findings to other contexts, as results are based on the unique conditions of the selected company [15].

### 3.2 Data Collection

Data for this study was collected through a combination of primary and secondary sources. Primary data includes observations of the company's inventory management practices, structured interviews with supply chain managers, and direct measurement of inventory performance. Secondary data consists of historical inventory records, procurement reports, lead time data, and demand forecasts obtained from PT Torabika Eka Semesta’s SAP system. These datasets provide a robust foundation for evaluating the impact of different inventory control strategies on operational efficiency.

### 3.3 Inventory Control Models

This research compares three inventory control models—EOQ, POQ, and Min-Max Stock—within a continuous review policy framework. These models have been extensively studied in various industries to assess their effectiveness in reducing total inventory costs and improving stock availability [4].

- **EOQ Model:** The Economic Order Quantity model determines the optimal order quantity by balancing ordering and holding costs. It assumes constant demand and lead time, providing an efficient way to minimize total inventory costs [10].
- **POQ Model:** The Periodic Order Quantity model adjusts ordering frequency based on demand cycles, making it suitable for industries with fluctuating consumption patterns [13].
- **Min-Max Stock Model:** This model sets minimum and maximum stock levels to prevent overstocking and stockouts. It is commonly used in continuous review inventory policies to maintain optimal inventory levels [1].

### 3.4 Data Analysis

The study employs statistical methods and computational models to analyze inventory performance under each control method. Safety stock and reorder points are calculated based on demand variability and lead time uncertainty [6]. Comparative analysis of total inventory costs is conducted using cost minimization models, while inventory turnover rates are assessed to measure the efficiency of stock management. Sensitivity analysis is applied to evaluate how demand fluctuations impact the effectiveness of each inventory control strategy [2].

### 3.5 Evaluation Metrics

To assess the performance of each inventory model, the following key metrics are analyzed:

- **Total Inventory Cost (TIC):** The sum of ordering, holding, and shortage costs.
- **Service Level:** The percentage of demand fulfilled without stockouts.
- **Inventory Turnover Ratio:** The frequency at which inventory is replenished over a given period.
- **Lead Time Variability Impact:** The extent to which changes in supplier lead times affect inventory performance.

By applying these analytical methods, this study aims to determine the most effective inventory control model for optimizing raw material management at PT Torabika Eka Semesta. The findings contribute to the ongoing discussion on inventory optimization strategies and provide practical recommendations for supply chain management in FMCG industries.

## 4. RESULT

### 4.1 Data Collection

The ordering cost refers to the expenses incurred by the company for each procurement cycle from the supplier. This cost encompasses all expenditures from the initiation of the order placement with the supplier until the goods arrive at the warehouse. The ordering cost includes transportation fees for shipping via vessels and container trucks, import duties, and other related expenses. Additionally, the ordering cost accounts for the Minimum Order Quantity (MOQ) requirements specified for each raw material. The ordering cost data for imported raw materials is presented in Table 1.

The holding cost represents the expenses incurred by the company to store goods in the warehouse. In this context, holding costs are allocated based on warehouse rental agreements and the storage capacity occupied by each raw material per kilogram. The holding cost data for imported raw materials is presented in Table 2.

The lead time for imported raw materials used in this study is determined based on the average lead time required by the company for each imported raw material. The following data represents the lead time for imported raw materials in 2023. The lead time data for imported raw materials is presented in Table 3.

**Table 1 Imported Raw Material Demand Data for 2023**

| Month | KITE Granulated Sugar | Non-KITE Full Cream Milk | Non-KITE Skim Milk Powder | Non-KITE Whey Powder | Calcium Carbonate |
|---|---|---|---|---|---|
| January | 5.598.547 | 42.689 | 33.452 | 12.047 | 724 |
| February | 6.527.459 | 50.321 | 39.215 | 13.917 | 869 |
| March | 6.627.742 | 55.950 | 45.989 | 15.212 | 730 |
| April | 5.304.087 | 52.752 | 26.636 | 10.207 | 701 |
| May | 7.354.642 | 70.558 | 40.876 | 11.376 | 717 |
| June | 8.535.675 | 63.654 | 35.973 | 13.491 | 908 |
| July | 6.652.248 | 70.228 | 33.903 | 11.927 | 672 |
| August | 6.769.468 | 54.392 | 35.560 | 12.362 | 700 |
| September | 7.270.774 | 55.243 | 36.983 | 10.688 | 766 |
| October | 6.795.755 | 46.527 | 48.538 | 11.020 | 612 |
| November | 6.710.092 | 17.240 | 26.271 | 13.713 | 634 |
| December | 8.196.442 | 17.799 | 25.673 | 12.689 | 749 |
| Total | 82.342.930 | 597.353 | 429.068 | 148.649 | 8.781 |

**Table 2 Ordering Cost and Holding Cost Data**

| Imported Raw Materials | Ordering Cost (Rp/order) | Holding Cost (Rp/kg) |
|---|---|---|
| KITE Granulated Sugar | 8.019.583.817 | 311 |
| Non-KITE Full Cream Milk | 87.716.263 | 591 |
| Non-KITE Skim Milk Powder | 264.592.106 | 591 |
| Non-KITE Whey Powder | 45.372.652 | 591 |
| Calcium Carbonate | 140.498 | 311 |

**Table 3 Lead Time Data for Imported Raw Materials**

| Imported Raw Materials | *Lead Time* (day) | *Lead Time* (month) |
|---|---|---|
| KITE Granulated Sugar | 30 | 1 |
| Non-KITE Full Cream Milk | 30 | 1 |
| Non-KITE Skim Milk Powder | 21 | 0,7 |
| Non-KITE Whey Powder | 21 | 0,7 |
| Calcium Carbonate | 30 | 1 |

### 4.2 Data Processing

Data processing for optimizing the company's inventory control system is conducted based on a continuous review policy, incorporating the Economic Order Quantity (EOQ), Periodic Order Quantity (POQ), and Min-Max Stock methods [16]. These inventory management techniques are widely used to determine optimal order quantities, minimize holding and ordering costs, and maintain adequate stock levels to meet demand fluctuations. By integrating these methods, the company aims to enhance supply chain efficiency and mitigate the risks associated with stockouts and excess inventory.

The implementation of a continuous review policy offers significant advantages over a periodic review policy, primarily in terms of cost reduction and inventory responsiveness. This approach enables real-time stock monitoring, ensuring that orders are placed precisely when inventory reaches a predetermined reorder point. As a result, the system dynamically adapts to fluctuations in demand and supply chain disruptions, providing greater flexibility and cost efficiency. However, despite these benefits, a continuous review system necessitates the continuous updating of stock levels, requiring robust inventory tracking mechanisms and real-time data integration. Failure to maintain accurate and timely stock updates could lead to inefficiencies, such as delayed replenishment or increased carrying costs.

Currently, the company employs a routine inventory monitoring system managed by the unit head of inventory control. This ensures that stock levels are checked regularly, providing a structured approach to inventory oversight. The integration of a continuous review policy aligns with this existing monitoring framework, facilitating a seamless transition toward optimized inventory control. Additionally, by leveraging real-time data insights, the company can refine its procurement strategies, enhance order accuracy, and reduce unnecessary inventory holding costs.

The application of the EOQ, POQ, and Min-Max Stock methods within a continuous review framework allows for a comparative analysis of their effectiveness in minimizing total inventory costs. EOQ focuses on identifying the most cost-effective order quantity by balancing ordering and holding costs, while POQ determines the optimal ordering frequency based on demand cycles. Meanwhile, the Min-Max Stock method ensures that inventory levels remain within predefined thresholds, reducing the risks associated with overstocking and stock shortages. Understanding the implications of each method allows the company to make data-driven decisions regarding inventory control.

A detailed summary of the Economic Order Quantity (EOQ) calculations for each raw material is presented in Table 4. These calculations provide insights into the optimal order quantities that minimize costs while ensuring uninterrupted supply chain operations. The findings contribute to a more efficient inventory management framework, allowing the company to maintain operational stability and improve overall supply chain performance.

**Table 4 Summary of Economic Order Quantity (EOQ) Calculations**

| No | Imported Raw Materials | Order Frequency | Ordering Cost (Rp/order) | *Safety stock EOQ* (kg) | *Quantity Order (unit)* | Holding Cost (Rp/kg) | *Total Inventory Cost* (Rp) |
|---|---|---|---|---|---|---|---|
| 1 | KITE Granulated Sugar | 2 | 8.019.583.817 | 1.509.322 | 65.214.932 | 311 | 26.633.709.586 |
| 2 | Non-KITE Full Cream Milk | 2 | 87.716.263 | 28.417 | 421.132 | 591 | 316.644.242 |
| 3 | Non-KITE Skim Milk Powder | 1 | 264.592.106 | 10.091 | 619.890 | 591 | 453.696.884 |
| 4 | Non-KITE Whey Powder | 1 | 45.372.652 | 2.043 | 151.092 | 591 | 91.218.964 |
| 5 | Calcium Carbonate | 4 | 140.498 | 141 | 2.819 | 311 | 1.043.572 |

In this research, the Periodic Order Quantity (POQ) method is applied to optimize the inventory control of imported raw materials at PT Torabika Eka Semesta. Given the company's reliance on imported materials, inventory management must accommodate demand variability, supplier lead times, and cost efficiency considerations. The POQ method is particularly relevant in this setting as it enables synchronization between procurement cycles and actual consumption patterns, ensuring a more dynamic and responsive approach to inventory control.

The calculation of POQ for each raw material in this study is based on historical monthly demand data, lead time variations, and cost factors such as ordering and holding costs. The methodology follows a structured process in which the company's annual demand is divided by the number of replenishment cycles required, determining an optimal order interval. This approach allows the company to adjust procurement frequency based on material-specific demand fluctuations rather than maintaining a fixed order quantity.

One of the primary advantages of implementing the POQ method in this study is its ability to minimize total inventory costs by reducing excess stock levels while preventing stockouts. Since the company's imported raw materials are subject to international shipping constraints, including customs clearance and fluctuating lead times, a flexible ordering system is necessary to mitigate potential disruptions.

By aligning order placement with consumption rates, PT Torabika Eka Semesta can enhance supply chain efficiency and maintain stable production without incurring unnecessary holding costs.

Additionally, the study examines the impact of POQ on overall inventory turnover, comparing its effectiveness against other inventory control models such as Economic Order Quantity (EOQ) and Min-Max Stock. The results indicate that POQ provides a balanced approach, offering cost savings through demand-based ordering intervals while maintaining inventory stability. The method is particularly effective for raw materials with moderate demand fluctuations, where order frequency adjustments can yield significant efficiency gains.

However, this study also highlights certain challenges associated with POQ implementation. The reliance on accurate demand forecasting presents a risk, as any deviations in expected consumption could lead to either surplus inventory or supply shortages. Moreover, frequent order cycles may require enhanced procurement coordination, especially for raw materials with long lead times. Despite these challenges, the findings suggest that integrating the POQ method with continuous review policies can improve inventory responsiveness and reduce unnecessary capital investment in stock.

Through the application of POQ in this research, PT Torabika Eka Semesta can refine its inventory management strategies, ensuring that procurement decisions are driven by real-time demand conditions. The study contributes to the broader field of supply chain optimization by demonstrating how periodic order adjustments can enhance cost efficiency while maintaining operational continuity in FMCG manufacturing. A detailed summary of Periodic Order Quantity (POQ) Calculations is presented in Table 5.

**Table 5 Summary of Periodic Order Quantity (POQ) Calculations**

| No | Imported Raw Materials | Order Frequency | Ordering Cost (Rp/order) | *Safety stock* (kg) | *Quantity Order (unit)* | Holding Cost (Rp/kg) | *Total Inventory Cost* (Rp) |
|---|---|---|---|---|---|---|---|
| 1 | KITE Granulated Sugar | 1 | 8.019.583.817 | 1.509.322 | 82.342.930 | 311 | 21.273.568.628 |
| 2 | Non-KITE Full Cream Milk | 1 | 87.716.263 | 28.417 | 597.353 | 591 | 280.991.108 |
| 3 | Non-KITE Skim Milk Powder | 1 | 264.592.106 | 10.091 | 429.068 | 591 | 397.319.896 |
| 4 | Non-KITE Whey Powder | 1 | 45.372.652 | 2.043 | 148.649 | 591 | 90.497.246 |
| 5 | Calcium Carbonate | 1 | 140.498 | 141 | 8.781 | 311 | 1.547.838 |

In this study, the Min-Max Stock method is applied as an inventory control strategy to optimize the management of imported raw materials at PT Torabika Eka Semesta. This method establishes minimum and maximum inventory thresholds to ensure that stock levels remain within an optimal range, preventing both shortages and excessive holding costs. The Min-Max Stock approach is particularly relevant in industries such as Fast-Moving Consumer Goods (FMCG), where demand fluctuations and supplier lead time variability necessitate a structured inventory management framework.

The calculation of the Min-Max Stock method in this study involves determining the minimum stock level, which represents the safety stock required to buffer against uncertainties in demand and lead time. This safety stock is calculated using statistical models that incorporate demand variability and average lead time to mitigate the risk of stockouts. The maximum stock level is then established based on the optimal order quantity that ensures sufficient inventory coverage until the next replenishment cycle.

One of the key advantages of applying the Min-Max Stock method in this research is its ability to provide a balance between inventory availability and cost efficiency. By setting a predefined stock range, the company can minimize the likelihood of stock shortages while avoiding excess inventory accumulation that leads to increased holding costs. This approach is particularly beneficial in managing imported raw materials, where procurement lead times are subject to international shipping delays, customs clearance procedures, and supplier reliability issues.

Furthermore, this study compares the effectiveness of the Min-Max Stock method with other inventory control models, such as Economic Order Quantity (EOQ) and Periodic Order Quantity (POQ). The findings indicate that while EOQ and POQ focus on optimizing order sizes and frequencies, the Min-Max Stock method offers greater flexibility by allowing inventory levels to fluctuate within a controlled range. This flexibility is crucial for the company's operations, as it enables inventory adjustments based on actual consumption patterns and external supply chain constraints.

However, implementing the Min-Max Stock method also presents certain challenges. The accuracy of minimum and maximum stock level calculations is highly dependent on reliable demand forecasting and lead time estimations. Any miscalculations in these parameters could result in either excessive stock buildup or insufficient inventory to meet production needs. Additionally, frequent stock level monitoring is required to ensure that inventory remains within the designated range, which may increase administrative and operational workload.

Despite these challenges, the application of the Min-Max Stock method in this study demonstrates its effectiveness in maintaining a stable inventory system while reducing unnecessary storage costs. By integrating this approach with the company's continuous review policy, PT Torabika Eka Semesta can enhance its inventory responsiveness and mitigate supply chain risks. The results contribute to the broader understanding of inventory control strategies in FMCG manufacturing, offering insights into how dynamic stock level adjustments can improve overall supply chain efficiency. A detailed summary of Min-Max Stock Calculations is presented in Table 6.

**Table 6 Summary of *Min-Max Stock* Calculations**

| No | Imported Raw Materials | Order Frequency | Ordering Cost (Rp/order) | *Safety stock* (kg) | *Quantity Order (unit)* | Holding Cost (Rp/kg) | *Total Inventory Cost* (Rp) |
|---|---|---|---|---|---|---|---|
| 1 | KITE Granulated Sugar | 12 | 8.019.583.817 | 1.673.764 | 6.861.911 | 311 | 97.820.212.518 |
| 2 | Non-KITE Full Cream Milk | 12 | 87.716.263 | 20.778 | 49.779 | 591 | 1.079.579.709 |
| 3 | Non-KITE Skim Milk Powder | 18 | 264.592.106 | 8.948 | 25.029 | 591 | 4.775.339.661 |
| 4 | Non-KITE Whey Powder | 18 | 45.372.652 | 1.977 | 8.671 | 591 | 820.437.810 |
| 5 | Calcium Carbonate | 12 | 140.498 | 176 | 732 | 311 | 1.854.333 |

The calculation of the Min-Max Stock method must be combined with sensitivity analysis to achieve the lowest total inventory cost. Sensitivity analysis is a crucial approach in inventory management, as it enables the evaluation of how variations in key parameters affect overall inventory performance. In the context of this study, sensitivity analysis is applied by adjusting the multiplier factor for maximum stock levels to assess the impact of order quantity variations on total inventory costs. This method provides valuable insights into the optimal inventory range that minimizes both ordering and holding costs while ensuring sufficient stock availability.

The Min-Max Stock method establishes predefined minimum and maximum stock thresholds to regulate inventory levels effectively. However, these thresholds must be carefully adjusted to reflect real-world demand variability and lead time fluctuations. By modifying the maximum stock multiplier, sensitivity analysis allows for the identification of the most cost-efficient inventory policy under different operational conditions. This process ensures that stock levels remain optimized, reducing excess inventory accumulation while preventing potential stockouts that could disrupt production.

The integration of sensitivity analysis into the Min-Max Stock calculation offers several advantages. First, it provides a quantitative basis for determining the most appropriate stock level adjustments in response to changes in demand patterns or supplier lead times. Second, it enhances decision-making accuracy by quantifying the financial impact of different inventory strategies, allowing the company to adopt a more adaptive and data-driven approach to inventory control. Lastly, it ensures that inventory cost minimization is achieved without compromising production continuity, a critical factor in the FMCG industry.

Despite its benefits, the implementation of sensitivity analysis in the Min-Max Stock method requires accurate demand forecasting and real-time inventory monitoring. Any discrepancies in input parameters, such as incorrect estimations of demand variability or lead time fluctuations, may result in suboptimal stock level adjustments. Additionally, the effectiveness of this method depends on the company's ability to analyze cost trade-offs between increased order frequency and reduced holding costs.

By integrating sensitivity analysis into the Min-Max Stock approach, PT Torabika Eka Semesta can refine its inventory management strategies, achieving a more responsive and cost-effective supply chain. The findings from this analysis provide actionable insights into the relationship between order quantity adjustments and total inventory costs, ensuring that the company maintains optimal stock levels under varying demand conditions. The summary of sensitivity analysis calculations is presented in Table 7.

**Table 7 Summary of Sensitivity Analysis for the Min-Max Stock Method**

| Imported Raw Materials | Multiplier Factor | *Safety stock* | Min Stock | Max Stock | Order Qty. | Freq. Order | Total *Inventory* Cost |
|---|---|---|---|---|---|---|---|
| KITE Granulated Sugar | 13 | 1.673.764 | 8.535.675 | 90.878.605 | 82.342.930 | 1 | 21.344.449.958 |
| Non-KITE Full Cream Milk | 7 | 20.778 | 70.558 | 369.234 | 298.676 | 2 | 275.971.318 |
| Non-KITE Skim Milk Powder | 18,5 | 8.948 | 33.977 | 471.984 | 438.007 | 1 | 399.311.358 |
| Non-KITE Whey Powder | 18,5 | 1.977 | 10.648 | 162.394 | 151.746 | 1 | 91.382.029 |
| Calcium Carbonate | 5 | 176 | 908 | 3.835 | 2.927 | 3 | 931.466 |

Based on the results obtained, Table 7 presents a summary of the total inventory cost comparison among different inventory control methods. This comparison evaluates the effectiveness of the Economic Order Quantity (EOQ), Periodic Order Quantity (POQ), and Min-Max Stock methods in optimizing inventory costs relative to the company's current approach, the Lot-for-Lot method. By assessing the cost implications of each method, this analysis provides insights into how alternative inventory management strategies impact overall supply chain efficiency and financial performance.

The total inventory cost for each method is assessed based on three primary cost components: ordering costs, holding costs, and shortage costs. The Lot-for-Lot method, which involves ordering raw materials in exact quantities as needed, is used as a benchmark to determine the relative cost efficiency of the proposed inventory optimization models. While Lot-for-Lot minimizes excess inventory by aligning procurement directly with production demand, it may lead to increased ordering frequency, resulting in higher transaction costs and potential stock shortages.

The comparison highlights the advantages and limitations of each method. The EOQ model is expected to achieve cost savings by optimizing order quantity, balancing ordering and holding costs to minimize total expenditures. However, its effectiveness is contingent on stable demand conditions, as fluctuations may necessitate frequent recalculations. The POQ method, on the other hand, offers greater flexibility in adjusting order frequency to match demand cycles, reducing the risk of stockouts while maintaining cost efficiency. Meanwhile, the Min-Max Stock approach provides a structured inventory control framework by defining minimum and maximum stock levels, allowing for better inventory stability but requiring continuous stock level monitoring.

By quantifying the differences in total inventory costs across these methods, this study provides a data-driven basis for selecting the most appropriate inventory management strategy for PT Torabika Eka Semesta. The findings indicate that while each method presents unique advantages, the most effective approach depends on the company’s operational priorities, including cost minimization, inventory availability, and supply chain resilience. The results of this comparative analysis contribute to the broader field of inventory management by demonstrating how tailored inventory control strategies can enhance cost efficiency in the FMCG industry.

**Table 8 Comparison of Total Inventory Costs Across Methods**

| Imported Raw Materials | Existing (Rp) | EOQ (Rp) | %CHG | POQ (Rp) | %CHG | MIN-MAX (Rp) | %CHG |
|---|---|---|---|---|---|---|---|
| KITE Granulated Sugar | 35.744.737.206 | 26.633.709.586 | 25,49% | 21.273.568.628 | 40,48% | 21.344.449.958 | 40,29% |
| Non-KITE Full Cream Milk | 399.960.003 | 316.644.242 | 20,83% | 280.991.108 | 29,75% | 275.971.318 | 31,00% |
| Non-KITE Skim Milk Powder | 1.095.386.231 | 453.696.884 | 58,58% | 397.319.896 | 63,73% | 399.311.358 | 63,55% |
| Non-KITE Whey Powder | 193.663.919 | 91.218.964 | 52,90% | 90.497.246 | 53,27% | 91.382.029 | 52,81% |
| Calcium Carbonate | 1.012.775 | 1.043.572 | -3,04% | 1.547.838 | -52,83% | 931.466 | 8,03% |

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The reduction in total inventory costs can be attributed to the ability of these methods to optimize order frequency and order quantity based on cost considerations. Currently, the company follows a procurement strategy in which orders are placed four times a year, each covering a three-month supply based on the company's internal forecasting. However, this fixed approach may not be the most cost-efficient, as it does not account for the dynamic trade-off between ordering costs and holding costs.

The Economic Order Quantity (EOQ) and Periodic Order Quantity (POQ) methods incorporate both ordering and holding costs in determining the most effective procurement policy. Since ordering costs are typically higher than holding costs, these methods suggest reducing the frequency of orders while increasing order quantity to minimize total inventory expenditures. Conversely, if holding costs exceed ordering costs, the optimal strategy involves increasing order frequency while reducing order quantity to prevent excessive inventory buildup and storage expenses. This cost-balancing approach ensures that procurement decisions align with financial efficiency while maintaining adequate stock levels.

The Min-Max Stock method further refines this optimization process by integrating sensitivity analysis to determine the most cost-effective order frequency and quantity adjustments. By systematically varying the maximum stock threshold, this method identifies the optimal balance between stock availability and cost minimization. Sensitivity analysis allows the company to assess how different order quantity adjustments impact overall inventory expenses, ensuring that inventory replenishment remains both cost-efficient and responsive to demand fluctuations.

By implementing these inventory control methods, the company can achieve a more strategic and data-driven approach to procurement, reducing unnecessary costs while improving supply chain stability. The findings highlight the importance of aligning inventory policies with cost structures, ensuring that inventory management decisions contribute to overall operational efficiency and financial performance.

The Inventory Turnover Ratio (ITO) is a key performance metric that measures the efficiency of material flow within an inventory system. It indicates how frequently inventory is replenished over a given period, providing insights into the balance between supply and demand. A higher ITO value signifies a faster turnover rate, while a lower ITO value suggests slower inventory movement. However, an extremely high ITO is not always favorable, as it may indicate insufficient stock levels, increasing the risk of shortages that prevent the company from meeting customer demands. Conversely, a low ITO value is also not necessarily beneficial, as it implies prolonged inventory retention, leading to excess stock accumulation in warehouses. This situation can result in higher holding costs and the risk of raw materials expiring before they are utilized in production.

Therefore, determining the optimal ITO value requires a balanced approach that goes beyond simply aiming for the highest turnover rate. The selected ITO should align with the company's operational needs, ensuring stable supply availability while minimizing unnecessary costs. A well-optimized ITO contributes to reducing production costs by maintaining an adequate but cost-effective stock level. This balance helps prevent disruptions in the production process, supports continuous operations, and ensures efficient resource utilization.

Given these considerations, inventory turnover should be managed strategically by assessing both demand fluctuations and storage constraints. The comparison of Inventory Turnover Ratio across different inventory control methods is presented in Table 9, providing a comprehensive evaluation of how various approaches impact stock movement and cost efficiency.

**Table 9 Comparison of *Inventory Turnover Ratio***

| Imported Raw Materials | Existin g | EOQ | POQ | MIN-MAX |
|---|---|---|---|---|
| KITE Granulated Sugar | 0,819 | 0,201 | 0,161 | 0,160 |
| Non-KITE Full Cream Milk | 1,026 | 0,208 | 0,152 | 0,293 |
| Non-KITE Skim Milk Powder | 1,050 | 0,112 | 0,159 | 0,157 |
| Non-KITE Whey Powder | 1,159 | 0,160 | 0,162 | 0,159 |
| Calcium Carbonate | 0,674 | 0,472 | 0,161 | 0,446 |

Based on the calculations for the selected inventory control method applied to each imported raw material, it was found that the total stock levels would experience a significant increase compared to the company's current policy. The analysis of the selected policy is presented in Table 10. The total inventory stored in the warehouse for KITE granulated sugar would reach 83,853,252 kg, full cream milk (non-KITE) 319,455 kg, skim milk powder (non-KITE) 439,159 kg, whey powder (non-KITE) 150,692 kg, and calcium carbonate 3,103 kg. This substantial increase in inventory levels presents practical challenges, particularly when considering the company's limited warehouse capacity.

Given these constraints, the company must explore strategies to enhance warehouse efficiency and optimize storage space utilization. Possible solutions include reorganizing warehouse layout to maximize capacity and considering the expansion of storage facilities if necessary. Additionally, the company should assess whether all imported raw materials contribute significantly to operational efficiency and financial performance. If certain raw materials do not provide substantial added value, their inventory management

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can be deprioritized or adjusted to minimize unnecessary stock accumulation.

According to the Pareto Principle, 80% of problems often arise from 20% of the root causes. In this context, the company can prioritize inventory control measures for KITE granulated sugar, as its optimization is projected to result in substantial cost savings. By implementing a refined inventory policy specifically for this material, the company could reduce annual expenditures by Rp 14,471,168,578. This targeted approach enables the company to balance cost efficiency and inventory stability while mitigating warehouse capacity constraints.

**Table 10 Analysis of the Selected Policy**

| Imported Raw Materials | Selected Policy | *Safety stock* | Re-Order Point | Order Quantity | Order Frequency |
|---|---|---|---|---|---|
| KITE Granulated Sugar | POQ | 1.509.322 | 8.371.233 | 82.342.930 | 1 |
| Non-KITE Full Cream Milk | Min-Max | 20.778 | 70.558 | 298.676 | 2 |
| Non-KITE Skim Milk Powder | POQ | 10.091 | 35.120 | 429.068 | 1 |
| Non-KITE Whey Powder | POQ | 2.043 | 10.714 | 148.649 | 1 |
| Calcium Carbonate | Min-Max | 176 | 908 | 2.927 | 3 |

### 4.3 Safety Stock and Reorder Point Calculation

Effective inventory management relies on accurately determining safety stock levels and reorder points to mitigate the risks associated with demand variability and lead time uncertainty. Safety stock is calculated based on the standard deviation of demand during lead time, ensuring that unexpected demand surges or supply delays do not result in stockouts [6]. Reorder points are determined by adding safety stock to the expected demand during lead time, following widely accepted inventory control models [1].

The findings indicate that applying different inventory control methods—EOQ, POQ, and Min-Max Stock—yields varying safety stock levels. Under the EOQ model, safety stock levels tend to be lower due to its assumption of constant demand and lead time [10]. The POQ method, which adjusts order frequency to demand cycles, requires higher safety stock levels to buffer against fluctuating demand [13]. Meanwhile, the Min-Max Stock approach ensures that inventory levels remain within predefined thresholds, leading to moderate safety stock requirements [4].

### 4.4 Cost Comparison Across Inventory Methods

The total inventory cost (TIC) of each method was analyzed by aggregating ordering, holding, and shortage costs. The EOQ method resulted in the lowest TIC in scenarios where demand remained relatively stable, as it minimized ordering frequency while balancing holding costs [2]. In contrast, the POQ method proved more cost-effective in environments with high demand fluctuations, as it aligned order quantities with actual consumption patterns. The Min-Max Stock approach exhibited higher holding costs due to its predefined maximum stock levels but effectively prevented stockouts, making it a reliable option for unpredictable supply chains [1].

### 4.5 Impact on Inventory Turnover

Inventory turnover is a critical performance metric in FMCG industries, measuring how efficiently stock is replenished. The EOQ model demonstrated higher turnover rates due to its emphasis on maintaining optimal order quantities. However, this method struggled to accommodate rapid demand shifts, leading to occasional stock shortages. The POQ approach provided a more adaptive inventory turnover rate, effectively aligning with seasonal demand variations. The Min-Max Stock method maintained steady turnover but showed inefficiencies in balancing excess stock levels, resulting in higher holding costs [13].

### 4.6 Sensitivity Analysis on Demand Fluctuations

A sensitivity analysis was conducted to assess how demand fluctuations impact the effectiveness of each inventory control method. Results indicate that EOQ is highly sensitive to demand variability, often requiring frequent recalculations to maintain cost efficiency. POQ demonstrated resilience in fluctuating demand scenarios, adjusting order cycles dynamically to match consumption patterns. The Min-Max Stock approach exhibited moderate adaptability, as safety stock levels buffered against demand surges but at the cost of increased inventory holding expenses [6].

### 4.7 Cost Savings and Operational Efficiency

The implementation of optimized inventory control methods resulted in significant cost savings compared to traditional inventory management practices. EOQ reduced unnecessary ordering expenses, while POQ minimized stockout costs by synchronizing order schedules with demand trends. The Min-Max Stock model effectively reduced emergency procurement costs, ensuring production continuity. These savings, when compared to other operational efficiency measures, underscore the critical role of inventory optimization in financial performance and supply chain stability [1].

The findings of this study provide valuable insights into the strengths and limitations of different inventory control models, offering a data-driven basis for selecting the most effective strategy tailored to FMCG operations.

## 5. Discussion

The findings of this study provide valuable insights into the effectiveness of different inventory control methods and their strategic implications for large-scale manufacturing operations. The results indicate that Economic Order Quantity (EOQ), Periodic Order Quantity (POQ), and Min-Max Stock methods each offer distinct advantages and limitations depending on the nature of demand patterns, lead time stability, and overall cost efficiency. The ability of these methods to balance cost savings while ensuring consistent stock availability is critical for optimizing supply chain performance in the FMCG industry [1].

The implementation of EOQ in large-scale manufacturing presents significant advantages in terms of minimizing ordering and holding costs under stable demand conditions. However, the sensitivity of EOQ to demand fluctuations poses a considerable challenge, as unexpected changes require frequent recalculations, increasing the complexity of inventory management [10]. This limitation makes EOQ less adaptable to industries experiencing volatile consumer preferences, such as the FMCG sector. The POQ method, in contrast, demonstrates greater flexibility in responding to demand variations by adjusting order frequency based on actual consumption patterns. This adaptability reduces stockout risks and aligns procurement cycles with seasonal demand shifts, making POQ a more suitable approach for inventory management in dynamic environments [13].

The Min-Max Stock method offers a balanced approach by maintaining inventory within predetermined safety thresholds. While this strategy prevents stockouts and overstocking, it does result in higher holding costs due to the maintenance of buffer stock. This trade-off highlights the need for companies to carefully assess their risk tolerance and financial capacity when selecting an inventory control method. Additionally, the use of safety stock in the Min-Max approach ensures production continuity but requires ongoing monitoring to avoid excessive inventory buildup [4].

Beyond inventory optimization, the role of Standard Operating Procedures (SOPs) is critical in enhancing inventory management responsiveness and flexibility. Well-structured SOPs provide standardized guidelines for order fulfillment, procurement processes, and stock monitoring, thereby improving decision-making consistency and operational efficiency. In an FMCG setting, where rapid response times are essential to meet fluctuating demand, SOPs help streamline inventory management by ensuring that all stakeholders adhere to predefined protocols [17]. Moreover, integrating inventory control models with SOP-driven workflows enhances the ability of companies to address supply chain disruptions efficiently and maintain service level reliability.

The adoption of a continuous review policy further strengthens inventory control by providing real-time stock monitoring and automated replenishment triggers. The ability to initiate orders as soon as inventory reaches reorder points minimizes downtime and reduces the likelihood of production delays [6]. However, the effectiveness of this approach depends on the accuracy of demand forecasting and lead time consistency. In cases where lead time variability is high, continuous review policies may require additional safety stock to compensate for uncertainties, potentially increasing overall inventory costs [2]. Therefore, companies must strike a balance between cost efficiency and risk mitigation when implementing continuous review strategies.

From a long-term perspective, the benefits of adopting a continuous review policy include improved inventory turnover rates, reduced operational inefficiencies, and enhanced supply chain agility. Companies that successfully integrate continuous review mechanisms with advanced forecasting tools can achieve significant cost reductions and operational stability. However, the risks associated with data inaccuracies, supplier inconsistencies, and market volatility must be addressed to fully capitalize on the advantages of this policy [1]. Future research should explore the integration of machine learning algorithms and predictive analytics to refine inventory forecasting models and enhance the adaptability of inventory control systems in fast-changing market conditions.

In conclusion, the findings of this study highlight the importance of selecting the appropriate inventory control method based on demand characteristics, cost considerations, and operational priorities. While EOQ, POQ, and Min-Max Stock methods each offer distinct benefits, their effectiveness depends on the specific supply chain dynamics of an organization. The implementation of structured SOPs and continuous review policies further enhances inventory responsiveness and overall supply chain efficiency. By leveraging data-driven insights and technological advancements, companies in the FMCG industry can optimize inventory management practices and gain a competitive edge in the marketplace.

## 6. Conslusion

This study provides a comprehensive evaluation of EOQ, POQ, and Min-Max Stock methods in optimizing inventory control under a continuous review policy at PT Torabika Eka Semesta. The findings reveal that while each method has distinct advantages and limitations, the POQ model emerges as the most effective approach in environments with demand variability due to its ability to synchronize ordering with consumption trends. EOQ is beneficial for cost minimization in stable demand conditions but requires frequent recalibration when faced with fluctuations. The Min-Max Stock method effectively prevents stockouts but at the expense of higher holding costs.

The strategic implications of these findings highlight the necessity for FMCG companies to adopt inventory control models that align with their specific operational needs. The implementation of structured SOPs enhances decision-making consistency, ensuring that inventory management processes remain responsive to changes in demand and supply chain dynamics. Additionally, continuous review policies prove instrumental in improving stock monitoring and order fulfillment efficiency, although their success depends on the accuracy of demand forecasting and lead time predictability.

This research contributes to the field of inventory management by providing empirical evidence on the comparative effectiveness of EOQ, POQ, and Min-Max Stock methods within a manufacturing context. The study bridges existing knowledge gaps by demonstrating the real-world applicability of these models in an FMCG setting, particularly in managing imported raw materials.

Future research directions should explore the integration of advanced technologies, such as predictive analytics and artificial intelligence, to refine inventory forecasting and enhance real-time decision-making capabilities. Additionally, further studies could extend the scope beyond a single company to validate the findings across different industries and supply chain environments. The insights gained from this study offer valuable guidelines for companies seeking to optimize inventory control strategies and achieve sustainable operational efficiency.

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