

ANALYSIS OF RAW MATERIAL INVENTORY USING THE ECONOMIC ORDER QUANTITY (EOQ) TO OPTIMIZE INVENTORY MANAGEMENT (CASE STUDY AT BEKAWAN COFFEE SHOP)

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ABSTRACT

This study aims to analyze the management of robusta green bean raw material inventory at Bekawan Coffee Shop and evaluate the effectiveness of applying the Economic Order Quantity (EOQ) method in improving raw material procurement efficiency. The research method used is descriptive quantitative with a case study approach. Data was obtained through observation, interviews, and internal company documentation during 2024. The results show that the actual inventory management system is not yet fully efficient because it is carried out without optimal calculations and is still manual. Through EOQ calculations, the optimal order quantity is set at 515,771 grams per transaction with an order frequency of 10 times per year. The total inventory cost based on the EOQ method is IDR 2,038,451 per year, which is much lower than the actual system cost of IDR 22,000,000. In addition, a reorder point of 195,337 grams and a safety stock of 20,944 grams were also determined. To facilitate implementation in the field, the researchers developed a simple EOQ Excel model that can automatically calculate remaining stock, provide reorder alerts, and adjust to daily operational conditions. This model was tested through simulation during January 2024 and proved to be effective in assisting procurement planning and avoiding stock shortages. Thus, the EOQ method and Excel model developed can improve cost efficiency, order accuracy, and operational stability at Bekawan Coffee Shop.

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1. Introduction

Currently, the business world is facing increasingly intense competition in various sectors. One of the factors driving this competition is the high population growth rate and the emergence of new competitors who have the potential to develop diverse and high-quality products. Therefore, every company is required to continuously improve its performance in order to compete and maintain its survival to achieve its objectives (Azhari, Marliyah, and Harahap 2024, 1769-1770). In the context of rapid economic development and

increasingly fierce business competition in Indonesia, entrepreneurs are faced with the need to work more efficiently so that company operations can continue to run smoothly. This requires companies to not only focus on the processes of creation, production, and marketing, but also on more effective and efficient ways of managing their resources (Siregar and Hasibuan 2024, 1-2). Smooth production processes are a key factor in supporting the achievement of profitability. Every company has the primary goal of making a profit. However, the achievement of this goal is influenced by various factors. One of the most decisive factors is the smoothness of the production process. A smooth production process is very important for companies because it directly affects the profits obtained (Siregar and Hasibuan 2024, 2). Increasingly fierce competition between companies has encouraged every organization to manage raw material supplies more effectively so that company operations can run optimally and efficiently. The availability of the right amount of raw materials is very important to maintain smooth production and ensure operational continuity (Deftania, Meri, and Linda 2022, 2). optimal and efficient. The availability of the right amount of raw materials is very important to maintain smooth production and ensure operational continuity (Deftania, Meri, and Linda 2022, 2). Raw material inventory plays a crucial role in ensuring the smooth running of the production process, both for semi-finished and finished goods (Widiawati et al. 2024, 78). Raw material inventory requirements should be neither excessive nor insufficient. A shortage of raw materials will cause delays in a company's production process, which will result in unmet consumer demand and affect the company's profits, as well as decrease consumer confidence in the company. An excess of raw materials can also pose a risk to the company's interest expenses from various additional costs for storing and maintaining raw materials in the warehouse (Rahman et al. 2024, 132). In principle, the smooth running of the entire production process is highly dependent on the company's management's ability to plan and manage raw material supplies appropriately. With good planning and control of supplies, production can run smoothly without obstacles or shortages of raw materials. To solve problems in raw material inventory planning, one approach that can be used is the Economic Order Quantity (EOQ) method (Maesprillanti, Suseno, and Sunarso 2020, 238-239).

The EOQ method is a simple approach to inventory control used to determine the optimal order quantity for each purchase. The goal is to reduce total inventory costs and ensure a smooth production process with efficient spending. EOQ is widely applied because it is easy to use and provides effective solutions for companies. Through this method, companies can determine the most economical order quantity and calculate the total costs incurred related to their raw material inventory (Rochman and Waluyowati 2024, 165). According to research conducted by Nugraha, Jufriyanto, and Rizqi (2023), the EOQ method can minimize costs by determining the optimal order quantity. Meanwhile, research by Tinangon, Arrazi Hasan Jan, and Karuntu (2023) reveals that conventional methods result in high inventory costs, which can be reduced with EOQ by decreasing the frequency of orders. Research by Rochman and Waluyowati (2024) also confirms that EOQ can plan procurement more efficiently, minimize costs, and encourage savings. These findings confirm the superiority of EOQ in optimizing the management of coffee bean raw material inventory. In relation to field practices, one relevant case study is that of Coffee Shop Bekawan. Coffee Shop Bekawan is one of the coffee shops in Tarakan City that has been operating since 2019. As it has grown, Coffee Shop Bekawan has opened many branches that spread across several locations in the city of Tarakan. With so many branches, managing the supply of coffee beans is a very important aspect in maintaining the continuity of operations in each branch. However, until now, Coffee Shop Bekawan does not have a structured inventory recording system. Inventory management is carried out conventionally by ordering raw materials in varying quantities without considering the actual needs of each branch.

Unstructured inventory recording and ordering that is not based on actual demand data has the potential to cause various problems. Stock shortages can hamper operations, while excess stock can increase storage costs and reduce efficiency. This inefficiency in inventory management indicates the need to implement a more systematic method to optimize inventory management. One relevant method is EOQ, which considers storage and ordering costs. When the total costs are reduced, the optimal order quantity is obtained (Efendi, Hidayat, and Faridz 2019, 126). Therefore, this study focuses its analysis on the management of the main raw material, namely robusta green beans, used by Coffee Shop Bekawan. The raw material in question is the material received from suppliers before going through the roasting process, so that inventory analysis is carried out at the initial stage of processing. This study uses the EOQ approach to help companies determine the optimal quantity of raw material orders. As a form of innovation and an effort to support the practical implementation of the EOQ method, this study not only analyzes the optimal order quantity but also develops a simple Excel model. This is designed to help Bekawan Coffee Shop record raw material inventory, automatically calculate the optimal order quantity, and monitor inventory costs in a more structured and efficient manner. With this Excel-based application, it is hoped that inventory management can be carried out more easily, accurately, and in real-time, thereby increasing operational efficiency in each branch. Based on this background, the researcher

decided to conduct a study entitled "Analysis of Raw Material Inventory Control Using the Economic Order Quantity (EOQ) Method to Optimize Inventory Management (Case Study at Coffee Shop Bekawan)".

2.Literatur Review

2.1. Modern Management

The essence of modern management is the integration of people, technology, and the environment, with people as the key factor for success (Handayani 2024, 120). Modern management theory began to develop in the 1950s and views organizations as open systems that need to adapt to changes in their surroundings. This theory combines a mathematical approach with an understanding of human emotions and motivations to create a work environment that supports productivity with the main objective of increasing time, energy, and cost efficiency (Handayani 2024, 120). In everyday life, modern management concepts are applied in various activities such as capital budgeting, product planning, inventory management, scheduling, queue management, and transportation (Ri. Astini et al. 2019, 21). According to Suhardi (2018), one approach in modern management that is relevant to this study is the quantitative approach of management science. In this case, the quantitative approach is used through the EOQ method to help Bekawan Coffee Shop calculate the optimal number of raw material orders. The goal is to improve efficiency and effectiveness, as well as reduce costs and risks of losses arising from improper inventory management.

2.2 Inventory Management

Inventory management is an important part of operational and production management that plays a role in maintaining optimal availability of goods. Along with increasing uncertainty in consumer demand, companies are required to be able to make strategic decisions regarding the quantity and timing of goods orders (how much to order and when to order). In addition, inventory management regulates all activities related to procurement, storage, scheduling, and efficient utilization of goods (Tinangon, Arrazi Hasan Jan, and Karuntu 2023, 219). The goods managed can be raw materials, components, or finished products, depending on the type of business. In practice, these goods enter the warehouse, are stored in the stock area, and then used in the production process or directly shipped to customers (Sukmono and Supardi 2020, 685).

2.3 Inventory

Inventory refers to goods stored by a company for future use or sale (Siregar and Hasibuan 2024, 5). This inventory can take the form of raw materials that support production, semi-finished goods that are part of the production process, or finished goods that are ready for sale to meet market demand (Rochman and Waluyowati 2024, 166). In managing inventory, companies must strike a balance between customer service levels and inventory investment. If inventory is too low, the company may miss opportunities to meet market demand, while if it is too high, the company will face high storage costs (Iswanto and Akbar 2021, 62). Therefore, good inventory management is essential to reduce expenses while ensuring that operations run smoothly.

According to Sujarweni (2021), there are three types of inventory, namely raw material inventory, work-in-process inventory, and finished goods inventory. Raw material inventory consists of goods or materials that are purchased or obtained by other means and stored to be processed through the production stages into semi-finished goods or finished goods in accordance with the company's operational activities (Sukmono and Supardi 2020, 681). Work in process inventory or semi-finished inventory is inventory that is transferred from each section or department within the company and still requires additional production stages to become finished goods that are ready for marketing (Sukmono and Supardi 2020, 681). Finished goods inventory is goods that have been processed in their final form and ready for sale (Sujarweni 2021, 18). These goods are the result of the conversion of raw materials and components that have gone through all stages of production and are then stored in the company's warehouse while awaiting distribution or sale (Nuraeni and Santoso 2024, 384-385).

2.4. Functions of Inventory

The production functions of a company cannot run optimally without adequate inventory, which

arises due to differences between supply and demand levels, so that the available materials are not always in line with what is needed. Inventory acts as a buffer that connects the production and distribution processes to achieve efficiency, which is very important in improving company operations, both internally and externally, so that the company can operate more flexibly (Simbolon 2021, 7).

2.5. Costs in Inventory

One of the main objectives of inventory control is to minimize the company's total operating costs. Inventory costs include all expenses and losses incurred as a result of inventory (Simbolon 2021, 33). According to Simbolon (2021), the costs associated with inventory fall into four main categories. Purchase costs are costs incurred from purchasing goods or raw materials, the amount of which depends on the quantity and unit price of the goods or raw materials (Simbolon 2021, 33). Procurement costs are the total costs that include all costs incurred for ordering, shipping, and storage of goods or raw materials until the goods are ready for use or further processing in production. Procurement costs are divided into two types according to the origin of the goods, namely ordering costs and manufacturing costs (Simbolon 2021, 33-34). Storage costs include all expenses incurred as a result of storing goods or materials (Simbolon 2021, 34-35). Finally, inventory shortage costs arise when demand cannot be met because stocks are depleted or when the necessary materials are not yet available because they are still in the ordering process (Simbolon 2021, 35).

2.5. Total Inventory Costs

Total inventory costs are a combination of ordering costs and storage costs. Storage costs can be minimized if companies can determine the right amount of goods to order from suppliers, so that the inventory ordered matches the needs for production or distribution, without shortages or surpluses. By knowing the right amount to order, companies can also reduce ordering costs. Previous expenses incurred due to over-ordering can be minimized by ordering according to actual needs (Simbolon 2021, 36-37). According to Simbolon (2021), total inventory costs can be formulated as follows:

$$TIC = \frac{D}{Q} \times S + \frac{Q}{2} \times H$$

Economic Order Quantity (EOQ)

Economic Order Quantity (EOQ) is one of the most well-known and oldest inventory management methods introduced by FW. Harris in 1914 (Faisal and Astuti 2022, 124). EOQ is a quantitative method used to calculate the ideal purchase or production quantity of a commodity by considering ordering costs and storage costs (Nugraha, Jufriyanto, and Rizqi 2023, 7318). The purpose of this method is to determine the optimal quantity of goods or raw materials (Q) for each order so that total inventory costs can be minimized (Rochman and Waluyowati 2024, 167).

According to Faisal and Astuti (2022), in order to keep inventory between the minimum and maximum limits, the following steps must be taken:

Determine the *Economic Order Quantity* (EOQ) or the most economical order quantity.

According to Deftania, Meri, and Linda (2022), the EOQ can be calculated using the following formula:

$$EOQ = \frac{\sqrt{2(D)(S)}}{H}$$

Using the EOQ method, the number of orders in a year, also known as the purchase frequency, can be calculated (Deftania, Meri, and Linda 2022, 39). According to (Deftania, Meri, and Linda (2022), the formula used to calculate the order frequency is as follows:

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

1. Reorder Point

Determining the right time to reorder is important in company policy. The reorder point is the right time to reorder, which is when inventory reaches a certain level that indicates the need to procure new materials to avoid stock shortages. Meanwhile, lead time refers to the duration required to receive the economic order quantity after the order is placed (Faisal and Astuti 2022, 124). According to Masengi and Palandeng (2023), the reorder time is determined using the following formula:

$$ReorderPoint = (Ltx Q) + SS$$

2. Safety Stock

If demand for materials or products cannot be predicted with certainty, there is a risk of stock shortages (Faisal and Astuti 2022, 124). *Safety stock* is the minimum amount of inventory that a company must maintain to anticipate possible delays in the arrival of raw materials (Sujarweni 2021, 29). According to Tinangon, Arrazi Hasan Jan, and Karuntu (2023), the formula used to calculate *safety stock* is as follows:

$$SafetyStock = (Pemakaian maksimum - pemakaian rata -rata) \times Lead time$$

3. Maximum inventory

If a company must maintain safety stock, when the ordered goods arrive, the inventory level will reach the minimum level, which is the amount of safety stock. After the ordered materials are received, the inventory level inventory will increase again until it reaches the amount consisting of safety stock plus the Economic Order Quantity (EOQ) (Faisal and Astuti 2022, 124).

3. Research Methodology

3.1 Research Design

This study uses a quantitative approach with a descriptive research type. A quantitative approach is an approach that uses numerical data and statistical techniques to analyze data (Banding 2024, 2). Meanwhile, a descriptive research design describes the characteristics of a phenomenon or population without testing relationships or influences (Banding 2024, 25). The data required in this study includes the amount of coffee beans used, purchases, ordering costs, storage costs, and the number of orders placed. All data was collected during 2024 so that the analysis results would reflect the latest conditions.

3.2. Data Collection Techniques

This study uses primary data. Primary data is data obtained directly from the source by the data collector (Sugiyono 2024, 213). The data collection process was carried out over a period of three months, from February to April 2025. In conducting this research, the researcher used data collection techniques in the form of interviews, observations, and documentation. Interviews were used as a data collection method when the researcher wanted to conduct a preliminary study to identify issues that needed to be researched, as well as to explore more in-depth information from respondents, especially if the number of respondents was small (Sugiyono 2024, 214). Observation in research involves the use of all the senses to directly observe the object being studied, with the aim of collecting the required data (Wada et al. 2024, 121). In this study, documentation was used to collect the quantitative data needed in the EOQ method calculation.

3.3. Data Analysis Techniques

Descriptive statistics are the technique used in this study to describe and summarize the data (Banding 2024, 97). Descriptive statistics are a type of statistics used to analyze data by describing or explaining the collected data as it is without aiming to draw conclusions or generalizations that apply broadly (Sugiyono 2024, 226).

4. Results and Discussion

Actual Conditions of Raw Material Inventory Management at Bekawan Coffee Shop The management of robusta green bean inventory is very important for Bekawan Coffee Shop Shop Bekawan because it is the main ingredient in serving coffee drinks.

The availability of sufficient raw materials in a timely manner supports the continuity of the production process across all branches. If supplies are not managed properly, it will result in operational disruptions and cost waste. Therefore, an effective management system is needed to maintain smooth procurement and minimize the risk of stock shortages.

Currently, raw material procurement is carried out routinely every month based on reports from the office department that monitors daily usage at each branch. The monitoring process is done manually, and replenishment is carried out when stocks start to run low. If the green bean stock in the central warehouse is almost depleted, the production department will report to the owner for direct purchase from suppliers. Raw materials that arrive are stored in the central warehouse and used based on the FIFO system to maintain freshness and efficiency.

Roasted beans from the central warehouse are distributed to branches according to their respective needs based on daily reports. Deliveries are flexible, averaging 2-5 kg per shipment, depending on branch demand. This system is quite effective in supporting daily operations, especially during high demand. However, stock records are still kept manually using WhatsApp and Excel, which are not connected to digital sales data, thus risking data inaccuracy and reporting delays.

Although manual recording helps with short-term needs, the lack of integration between usage and sales data makes accurate stock planning difficult. Production and raw material purchasing are still based on habit rather than quantitative calculations. To improve efficiency, Bekawan Coffee Shop is advised to use the EOQ method. The application of EOQ can help determine the optimal order quantity and timing based on annual demand, storage costs, and ordering costs, thereby supporting more accurate and sustainable inventory management. Optimal Order Quantity of Robusta Green Bean Raw Materials that Bekawan Coffee Shop Should Use Based on the EOQ Method

The Economic Order Quantity (EOQ) method aims to determine the most efficient quantity of raw materials to order in order to minimize storage and ordering costs and avoid stock shortages. When compared to the actual system at Bekawan Coffee Shop, there are striking differences in the quantity and frequency of orders. The current system places 12 orders per year with an average of 445,833 grams per transaction. In contrast, the EOQ method recommends 10 orders per year with 515,771 grams per transaction.

This difference in the number and frequency of orders can still be realistically applied at Bekawan Coffee Shop, as the central warehouse has a capacity of 700–800 kg of green beans. In addition, the roasting process is carried out in stages and distribution to branches is carried out regularly, so that an increase in the number per transaction does not cause major obstacles. Flexible operational patterns support the application of the EOQ method without disrupting distribution and storage activities. This indicates that the EOQ method aligns with the company's operational capabilities. The application of EOQ results in very significant cost efficiencies compared to the actual system. The total annual inventory cost with the actual system reaches IDR 22,000,000, while with the EOQ method it is only around IDR 2,038,451. This means there is a potential savings of up to Rp 19,961,549 per year. The actual system sets a fixed storage cost without considering the actual volume of raw materials stored, which has the potential to cause waste if the stock is not used optimally. Inefficiency in warehouse space utilization can lead to additional costs, such as interest on tied-up capital, maintenance costs, and the risk of material damage. With the EOQ method, the amount of raw materials stored can be adjusted to actual needs so that direct and indirect costs can be reduced. Lower ordering frequency also reduces logistics and annual ordering costs. These findings are supported by various studies that conclude that the EOQ method is able to optimally balance cost efficiency and the sustainability of raw material supplies. Cost Efficiency of Inventory

That Can Be Achieved by Applying the EOQ Method at Bekawan Coffee Shop The current system at Bekawan Coffee Shop uses a fixed storage cost of IDR 22,000,000 per year, without considering the amount of raw materials stored. This creates potential waste because the company still bears the full cost even though the stock is below warehouse capacity. When storage space is not utilized optimally, these fixed costs become inefficient and burden the company's cash flow. This condition hinders financial flexibility for other more strategic needs such as promotion or business development.

The application of the EOQ method offers a more efficient solution by reducing total inventory costs to Rp 2,038,451 per year, saving Rp 19,961,549 compared to the actual system. These savings come from optimizing the quantity and frequency of orders, as well as more efficient use of warehouse space. In addition, the company also sets stock control parameters in the form of safety stock, reorder point, and maximum inventory. These three parameters help maintain the availability of raw materials while reducing storage costs and the risk of stock shortages.

These stock parameters work systematically and complement each other. Maximum inventory is set to prevent overcapacity, which can reduce the quality of green beans. The reorder point serves as an early signal to reorder before stock runs out, which is when inventory reaches

195,337 grams. While waiting for supplies to arrive, a safety stock of 20,944 grams is used as a reserve to keep production running smoothly without interruption.

In addition to the efficiency seen in the figures, the EOQ method also reduces hidden costs such as interest on tied-up capital, the risk of material damage, and warehouse maintenance costs. With a more structured and data-driven approach, Coffee Shop Bekawan can improve procurement flexibility and inventory management accuracy stock management. This makes operations more efficient and sustainable. Overall, the EOQ method provides significant logistical and financial benefits for the company.

Application of a Simple Excel Model to Support Raw Material Inventory Management Efficiency The application of a simple Excel model in managing the inventory of robusta green beans at Coffee Shop Bekawan aims to bridge the gap between theoretical analysis and operational practice in the field. It was found that the optimal order quantity based on the EOQ method is 515,771 grams per transaction. However, because the supplier uses a packaging system in bags with a capacity of 50,000 grams, the company rounded this figure to 500,000 grams or 10 bags per order. This adjustment was made to facilitate logistics, transportation, and storage at the central warehouse. Although 500,000 grams is slightly less than the theoretical EOQ value, this difference is considered insignificant in terms of operational efficiency. The value of 515,771 grams is still used as the basis for analysis because it represents the actual mathematical requirement, while 500,000 grams is used as a value adjusted to the reality in the field. This approach shows that Coffee Shop Bekawan strives to maintain a balance between theoretical analysis results and flexibility in the implementation of operational practices. In addition to the optimal order quantity, setting the reorder point is also an important part of the inventory control system. Based on the calculations, the ROP value of 195,337 grams is rounded up to 200,000 grams for easier use by the operational team. This means that if the green bean stock reaches or falls below this number, reordering must be done immediately so that the production process is not disrupted. This adjustment is important considering that the procurement system is not automated, so delays in decision-making can impact stock availability. After the researcher explained the EOQ and reorder point calculations, Coffee Shop Bekawan stated that they wanted a simple and easy-to-use Excel model, especially for daily operational needs. Therefore, it was agreed that the Excel focus would only cover three main components, namely:

1. Daily usage
2. Optimal order quantity (EOQ)
3. Reorder Point (ROP)

This Excel model is designed to automatically calculate remaining stock, provide alerts when stock is approaching the minimum limit, and make it easier for the team to determine when to reorder. The

ROP has also been adjusted based on delivery wait times and the roasting process before green beans are ready for use. With this approach, distribution to all branches can continue smoothly and will not be disrupted by raw material shortages.

5. Conclusion and suggestion

5.1. Conclusion

Based on the results and discussion outlined above, it can be concluded that the management of robusta green bean raw material inventory at Coffee Shop Bekawan is currently still manual and not yet based on an integrated digital system. The stock recording process is carried out through daily reports from each branch, which are submitted manually to the office and recorded using Excel files. Raw materials are ordered from suppliers on a regular basis based on demand, without taking into account storage costs, ordering costs, or fluctuations in demand. Although the distribution of raw materials to branches is quite flexible and able to meet daily operational needs, this system is not yet able to quantitatively determine when and how much should be ordered. The lack of data integration and reliance on intuition in decision-making creates potential inefficiencies. Therefore, a more measurable approach such as the EOQ method is needed to create an efficient, accurate, and sustainable inventory management system. Based on the EOQ method, the optimal order quantity of robusta green bean raw materials at Coffee Shop Bekawan is 515,771 grams per transaction with a frequency of 10 orders per year. This result is more efficient than the actual system, which orders 445,833 grams 12 times. The EOQ method results in inventory cost savings from IDR 22,000,000 to IDR

2,038,451 per year. This amount is still in line with the available warehouse capacity and does not cause any obstacles in the roasting or distribution process. In addition to reducing ordering and storage costs, the EOQ method also helps prevent excess stock accumulation and minimizes hidden costs such as material damage or warehouse maintenance. A larger order quantity per transaction also reduces the frequency of deliveries without disrupting stock availability. The application of the EOQ method at Bekawan Coffee Shop has proven to provide significant inventory cost efficiency. Compared to the actual system, which sets a fixed storage cost of IDR 22,000,000 per year without considering the amount of stock stored, the EOQ method is able to reduce it to only IDR 2,038,451, resulting in savings of IDR 19,961,549 per year. In the actual system, storage costs are paid in full even though the warehouse is not always filled to capacity, resulting in suboptimal use of storage space and waste. In contrast, the EOQ method regulates the quantity and frequency of orders more efficiently, so that stock is adjusted to actual needs and warehouse usage becomes more effective. Additionally, inventory control with parameters such as a safety stock of 20,944 grams, a reorder point of 195,337 grams, and a maximum inventory of 536,715 grams helps prevent shortages or excesses of raw materials and reduces hidden costs such as damage, quality deterioration, and capital costs. With a more structured and data-driven approach, EOQ not only reduces direct costs but also improves overall logistics efficiency and operational flexibility.

Coffee Shop Bekawan implements a simple Excel model to help manage robusta green bean inventory efficiently. This model is designed based on EOQ calculations of 515,771 grams and a reorder point of 195,337 grams, which are then rounded to 500,000 grams and 200,000 grams to suit operational conditions. The Excel template records daily usage, automatically calculates remaining stock, and provides visual signals based on three categories: safe (green), caution (yellow), and order now (red). Simulation results for January 2025 show that this system is effective in providing early warnings when stock levels begin to run low. A "caution" warning appears when stock reaches 292,998 grams, indicating that the system is able to detect the need to place an order before reaching the minimum limit. With this approach, the monitoring and decision-making processes become more timely and efficient, minimizing the risk of raw material shortages.

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