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Controlling Consumable Material Inventory Using the Multi-Item EOQ Method in the Spare Parts Warehouse of PT. XYZ

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Abstract

Inventory management plays a critical role in maintaining effective maintenance operations within manufacturing environments, where machine reliability significantly influences production continuity. This internship report examines the application of the Multi-Item Economic Order Quantity (EOQ) model to optimize consumable inventory in the Engineering Division of PT. XYZ, a leading ceramic manufacturing company in Indonesia. The division oversees a diverse range of technical consumables, such as mechanical components, metal materials, fasteners, electrical equipment, and transmission parts, all characterized by variable demand and extended procurement lead times.
Suboptimal ordering practices may result in stock shortages that disrupt maintenance activities or excess inventory that increases holding costs and storage inefficiencies. The study utilizes historical procurement data, including an annual material demand of Rp378,190,765, total ordering costs of Rp1,765,530, and annual holding costs of Rp920,106, which encompass warehouse operations and storage-related expenses distributed across all item categories. The Multi-Item EOQ model is applied using a consolidated minor ordering cost parameter to estimate an optimal aggregate order value of Rp38,096,850 per cycle. In addition, optimal order quantities are determined for each item based on unit cost and yearly demand levels.
The analysis identifies an optimal reorder interval of 37 working days, allowing for more systematic procurement scheduling that balances ordering frequency and inventory holding costs. The findings indicate that the Multi-Item EOQ approach enhances procurement efficiency, improves inventory organization, ensures the availability of critical consumables for maintenance activities, and minimizes operational risks associated with inventory imbalance. This approach provides a practical foundation for improving future procurement strategies within the engineering division.

***Keywords**: Multi-Item EOQ, inventory optimization, ordering cost, holding cost, total inventory cost*

1. Introduction

The Engineering Division of PT. XYZ plays a crucial role in maintaining production continuity by ensuring the reliability of machinery through both preventive and corrective maintenance activities. In the ceramic manufacturing sector, production systems are required to operate continuously, and any machine downtime can result in prolonged reheating processes, increased energy consumption, and substantial productivity losses. Although engineering consumables and spare parts—such as metal profiles, fasteners, electrical components, gears, belts, pulleys, and other mechanical accessories—are not directly included in the final product, they are essential for sustaining equipment performance. Therefore, effective inventory planning is necessary to prevent maintenance delays and cost inefficiencies, making inventory optimization a critical component of engineering support operations.

During the internship period, it was observed that the demand for engineering consumables fluctuated over time, influenced by machine conditions, maintenance schedules, and unexpected equipment failures. The procurement process involves several administrative steps, including material requests, workforce allocation, inspection procedures, receiving processes, and coordination with the purchasing department, which collectively contribute to extended lead times. These factors increase the risk of stock shortages during urgent maintenance situations, potentially delaying engineering responses and affecting production performance. Conversely, unstructured procurement practices may lead to excessive inventory levels, resulting in higher holding costs, inefficient use of storage space, and increased risks of material misplacement or deterioration over prolonged storage periods.

The Economic Order Quantity (EOQ) model is a widely recognized inventory control method designed to balance ordering and holding costs in order to minimize total inventory expenses. However, the Engineering Division manages a wide range of consumable items with varying demand levels and unit prices, making single-item EOQ approaches less effective. To address this complexity, the Multi-Item EOQ model is employed to determine both aggregate and item-specific optimal order quantities, enabling more coordinated and efficient procurement scheduling. This approach helps reduce administrative repetition, optimize ordering frequency, improve warehouse utilization, and prevent excessive stock accumulation, thereby supporting a more structured inventory management system.

This report provides a comprehensive analysis of the implementation of the Multi-Item EOQ method within the Engineering Division, focusing on determining the optimal order value, item-level order quantities, and appropriate reorder intervals. The primary objective is to establish a systematic procurement framework that minimizes total inventory costs while ensuring the availability of essential materials for timely maintenance activities. The findings are expected to offer practical insights for improving procurement policies, enhancing inventory efficiency, reducing stock imbalance risks, optimizing storage utilization, and strengthening overall operational reliability in engineering material management.

2. Research Method

2.1. Research problem formulation and objectives

This research applies a quantitative descriptive approach to analyze and optimize the inventory management of engineering consumable materials in the Engineering Division warehouse of PT. XYZ. The study focuses on determining optimal order quantities and reorder cycles using the Multi-Item Economic Order Quantity (EOQ) model. The quantitative method was selected as the analysis relies on numerical demand data, cost parameters, and mathematical optimization formulas to minimize total inventory costs while maintaining stock availability for machine maintenance support.

The data used in this research consist of secondary historical procurement records collected from the company's internal inventory system, purchase request documents, and warehouse consumption logs during the period of June–November 2025. Cost parameters include annual ordering cost (covering manpower, inspection, receiving, and purchasing request administration) and annual holding cost (including electricity usage and uniform operational warehouse allocation applied equally to all material categories). Demand (D) values were projected into annual requirements based on 6-month aggregated usage. Unit prices (Ci) were used to convert monetary EOQ results into physical unit EOQ for each item type.

Table 1: Engineering Consumable Material Order Quantity Data (June–November 2025)

Material	Unit	June	July	Agustus	September	October	November	6-Month Total	Annual Total
BESI SIKU 50MMX50MMX5MMX6000MM	Bars	4	3	4	3	3	3	20	**40**
BESI VIRKAN 20MMX20MMX6000MM	Bars	5	5	6	5	5	4	30	**60**
BESI UNP 100MMX50MMX6000MM	Bars	4	3	4	3	3	3	20	**40**
AS BESI DIA.40MMX6000MM ST70	Bars	27	24	30	22	26	21	150	**300**
FIXED PULLEY C1-250MMX40MM	Pcs	2	2	2	2	2	1	11	**22**
PILLOW BLOCK UCP-207(FYH)	Pcs	36	32	40	30	34	28	200	**400**
CENTER TO CENTER CLIP 120MM (090001003)	Pcs	9	8	10	8	9	7	51	**102**
PULLEY B2-120MM AS.35MM SPEI.10	Pcs	5	5	6	5	5	4	30	**60**
GUIDE V-BELT 37MMX31MMX21MM (GAMBAR)	Pcs	5	5	6	5	5	4	30	**60**
HELICAL GEAR TR57 0,75KW/RATIO 15/AS=35MM (TRANSMAX)	Pcs	2	2	2	2	2	1	11	**22**
BAUT BATANGAN 12MMX1000MM	Pcs	4	3	4	3	3	3	20	**40**
MUR M10	Pcs	7	6	8	6	7	6	40	**80**
RING PLAT M10	Pcs	2	2	3	2	1	1	11	**22**
PLAT HITAM 10MMX4FEETX8FEET	Sheets	3	2	3	2	3	2	15	**30**
PLAT STRIP 10MMX70MMX6000MM	Sheets	2	2	1	1	2	4	12	**24**
V-BELT C-240(GAIDO)	Pcs	1	1	2	1	1	1	7	**14**
INVERTER 3G3JZ-0,75KW/400V (OMRON)	Pcs	2	2	2	2	2	1	11	**22**
KABEL NYYHY 4X4MM	Pcs	4	3	4	3	3	3	20	**40**
MAGNETIC THERMIC BM3RSB-6P3/4-6,3A (FUJI)+AUX BM3RSB 1P6	Pcs	1	1	3	1	0	0	6	**12**
MOTOR CABIN DISC BPM 90S-2 1000-500RPM	Pcs	1	2	1	0	1	1	6	**12**
KABEL SCHOEN 2,5MM RING (VF2-5B)	Meter	5	5	6	5	5	4	30	**60**
SELECTOR SWITCH AR22PR 211B (FUJI)	Pcs	1	1	1	0	1	2	6	**12**

Material	Unit	June	July	Agustus	September	October	November	6-Month Total	Annual Total
KABEL TRAY 100MMX100MMX2400MM (GALVANIS)	Pcs	10	9	11	8	9	8	55	**110**
BOX SELECTOR 3SB3802-OAA3 (SIEMENS)	Pcs	2	2	2	2	2	1	11	**22**
JOINT TRAY 100MMX100MM	Pcs	10	9	11	8	9	8	55	**110**

Table 2: Annual Engineering Consumable Material Purchasing Data

Material	Annual Demand (Units)	Unit Price (Rp)	Total Demand Cost (Rp/Year)
BESI SIKU 50MMX50MMX5MMX6000MM	40	Rp45.326	Rp1.813.030
BESI VIRKAN 20MMX20MMX6000MM	60	Rp30.487	Rp1.829.232
BESI UNP 100MMX50MMX6000MM	40	Rp79.865	Rp3.194.596
AS BESI DIA.40MMX6000MM ST70	300	Rp118.920	Rp35.676.120
FIXED PULLEY C1-250MMX40MM	22	Rp247.584	Rp5.446.840
PILLOW BLOCK UCP-207(FYH)	400	Rp352.470	Rp140.988.120
CENTER TO CENTER CLIP 120MM (090001003)	102	Rp10.238	Rp1.044.317
PULLEY B2-120MM AS.35MM SPEI.10	60	Rp221.548	Rp13.292.871
GUIDE V-BELT 37MMX31MMX21MM (GAMBAR)	60	Rp49.633	Rp2.977.962
HELICAL GEAR TR57 0,75KW/RATIO 15/AS=35MM (TRANSMAX)	22	Rp1.194.850	Rp26.286.706
BAUT BATANGAN 12MMX1000MM	40	Rp4.833	Rp193.310
MUR M10	80	Rp1.472	Rp117.784
RING PLAT M10	22	Rp986	Rp21.702
PLAT HITAM 10MMX4FEETX8FEET	30	Rp953.421	Rp28.602.624
PLAT STRIP 10MMX70MMX6000MM	24	Rp297.616	Rp7.142.773
V-BELT C-240(GAIDO)	14	Rp158.942	Rp2.225.193
INVERTER 3G3JZ-0,75KW/400V (OMRON)	22	Rp1.803.286	Rp39.672.283
KABEL NYYHY 4X4MM	40	Rp34.783	Rp1.391.338
MAGNETIC THERMIC BM3RSB-6P3/4-6,3A (FUJI)+AUX BM3RSB 1P6	12	Rp648.958	Rp7.787.494
MOTOR CABIN DISC BPM 90S-2 1000-500RPM	12	Rp2.187.494	Rp26.249.927
KABEL SCHOEN 2,5MM RING (VF2-5B)	60	Rp14.736	Rp884.136
SELECTOR SWITCH AR22PR 211B (FUJI)	12	Rp247.610	Rp2.971.325
KABEL TRAY 100MMX100MMX2400MM (GALVANIS)	110	Rp118.927	Rp13.081.954
BOX SELECTOR 3SB3802-OAA3 (SIEMENS)	22	Rp297.484	Rp6.544.641
JOINT TRAY 100MMX100MM	110	Rp79.586	Rp8.754.488
Total			Rp378.190.765

Table 3: Annual Ordering Cost Data

Cost Component	Cost (Rp/Order)	Total Cost (Rp/Year)
Manpower Pengadaan	Rp 1.247.385	Rp 1.765.530
Inspection	Rp 244.672	
Receiving	Rp 198.543	
Pembuatan *Request Purchasing*	Rp 74.928	

Table 4: Annual Holding Cost Data

Material	Holding Cost
BESI SIKU 50MMX50MMX5MMX6000MM	Rp 4.533
BESI VIRKAN 20MMX20MMX6000MM	Rp 3.049
BESI UNP 100MMX50MMX6000MM	Rp 7.986
AS BESI DIA.40MMX6000MM ST70	Rp 11.892
FIXED PULLEY C1-250MMX40MM	Rp 24.758
PILLOW BLOCK UCP-207(FYH)	Rp 35.247
CENTER TO CENTER CLIP 120MM (090001003)	Rp 1.024
PULLEY B2-120MM AS.35MM SPEI.10	Rp 22.155
GUIDE V-BELT 37MMX31MMX21MM (GAMBAR)	Rp 4.963
HELICAL GEAR TR57 0,75KW/RATIO 15/AS=35MM (TRANSMAX)	Rp 119.485
BAUT BATANGAN 12MMX1000MM	Rp 483
MUR M10	Rp 147
RING PLAT M10	Rp 99
PLAT HITAM 10MMX4FEETX8FEET	Rp 95.342
PLAT STRIP 10MMX70MMX6000MM	Rp 29.762
V-BELT C-240(GAIDO)	Rp 15.894
INVERTER 3G3JZ-0,75KW/400V (OMRON)	Rp 180.329
KABEL NYYHY 4X4MM	Rp 3.478
MAGNETIC THERMIC BM3RSB-6P3/4-6,3A (FUJI)+AUX BM3RSB 1P6	Rp 64.896

Material	Holding Cost
MOTOR CABIN DISC BPM 90S-2 1000-500RPM	Rp 218.749
KABEL SCHOEN 2,5MM RING (VF2-5B)	Rp 1.474
SELECTOR SWITCH AR22PR 211B (FUJI)	Rp 24.761
KABEL TRAY 100MMX100MMX2400MM (GALVANIS)	Rp 11.893
BOX SELECTOR 3SB3802-OAA3 (SIEMENS)	Rp 29.748
JOINT TRAY 100MMX100MM	Rp 7.959
Total	Rp 920.106

2.2. Inventory

Inventory is an asset owned by a company that is either available for sale or intended to be used in the production of goods that will later be sold. It represents a critical element for companies, as inventory serves as one of the primary sources of revenue and directly contributes to business income generation [1]. Effective inventory availability ensures that both internal operational needs and external consumer demand can be fulfilled without disruption. Inventory refers to a collection of goods stored for future use or sale, reflecting the products controlled by a business to meet the requirements of both internal and external stakeholders. In production contexts, inventory can also be interpreted as an idle resource that is not currently active but is awaiting further processing or utilization. This processing may include manufacturing activities in industrial environments, distribution and marketing processes in supply chain systems, or final consumption in household settings. The scope of inventory covers multiple stock categories, including raw materials, work-in-process goods, spare parts, and consumable support items that sustain operational continuity. Without systematic inventory control, companies may face financial inefficiencies, stock accumulation risks, or material shortages that hinder business processes. Therefore, inventory planning must be supported by structured analytical models to maintain economic order cycles, optimize storage capacity, and minimize cost imbalances [2].

2.3. Inventory Control

Inventory control involves the systematic collection and storage of materials to fulfill demand based on operational requirements. It plays a crucial role in ensuring that a company runs efficiently and maintains production stability [3]. When managing raw material supplies, several key factors must be considered, such as holding cost, warehouse capacity, and demand volume. Excessive investment in inventory leads to higher holding costs, increased warehouse utilization, and potential capital inefficiency. In contrast, insufficient inventory levels may result in stock shortages that disrupt production processes and delay material fulfillment, preventing operations from running according to plan. Therefore, companies must establish a balanced inventory strategy supported by analytical planning to synchronize demand fulfillment and cost efficiency. Inventory mismanagement can create two major operational risks: overstock, which increases storage expenses, and stockout, which can halt or slow production schedules. To avoid these risks, structured inventory models are required to determine economic order quantities and controlled procurement cycles, ensuring that inventory levels remain optimal without overburdening warehouse capacity or increasing unnecessary operational costs. This approach supports timely maintenance and production response, improves resource allocation, and enhances overall supply chain reliability [4].

2.4. Economic Order quantity

Economic Order Quantity (EOQ) refers to the optimal quantity of goods that should be purchased in a single order to minimize total inventory costs while maintaining operational efficiency. The EOQ model balances two major cost components: ordering cost, which is incurred every time a purchase order is placed, and holding cost, which represents expenses associated with storing unsold or idle inventory over a certain period. By identifying the economic equilibrium between these cost variables, EOQ determines the most cost-efficient order size to reduce overall inventory expenditure [5]. Ordering cost varies according to order frequency, meaning that the more frequently orders are placed, the greater the accumulated ordering expenses. These costs include administrative labor during procurement, request processing, demand transmission, receiving inspection, material handling, warehouse placement, and supplier payment processing. In contrast, holding cost fluctuates depending on the volume of inventory stored and includes storage utilities, space occupation, maintenance of stored items, and inventory carrying expenses. Excessive inventory increases holding cost and capital inefficiency, whereas insufficient stock levels raise the risk of material shortages that can delay engineering support and disrupt machine maintenance or production schedules. Therefore, EOQ serves as a structured analytical tool that supports cost-balanced procurement, prevents overstock and stockout conditions, and ensures inventory remains economically and operationally optimized [6].

3. Result and Discussion

3.1. Optimal EOQ for All Items

Based on the data presented in Table 2, Table 3, and Table 4, the steps for calculating the optimal EOQ for all units are as follows:

$$Q^{*Rp} = \sqrt{\frac{2D\,(k + \sum k_i)}{h}} = \sqrt{\frac{2(378.190.765)(1.765.530 + 0)}{920.106}} \quad (1)$$

$$= \text{Rp}38.096.850$$

Based on the calculations performed, the optimal Economic Order Quantity (EOQ) for all engineering consumable items, measured in monetary value (Rp), results in an optimal procurement cost of Rp 3,578,177 per order cycle. This optimized EOQ value represents the most economical order size when balancing ordering costs and holding costs, ensuring that the total inventory cost remains at its minimum level. The solution demonstrates the amount of purchasing funds that should be allocated in a single order to avoid excessive ordering frequency, reduce administrative workload, and prevent unnecessary capital being tied up in stored inventory. By applying the Multi-Item EOQ model, the Engineering Division warehouse can determine a synchronized procurement plan that ensures consumable materials remain available to support timely machine maintenance while preventing both overstock and stockout conditions. This method provides a structured decision basis for preparing the optimal budget per procurement cycle, optimizing warehouse capacity utilization, and minimizing cost inefficiencies caused by imbalanced stock management. Therefore, EOQ serves as a practical analytical tool to determine the ideal purchasing value that should be ordered at one time to achieve the lowest possible total inventory cost.

3.2. Optimal EOQ for Each Item

Based on the data presented in Table 2, the steps for calculating the optimal EOQ for each individual item are as follows:

In Rupiah

$$Q^{*Rpi} = \frac{d_i}{D} Q^{Rp} \quad (2)$$

The summary of the optimal EOQ results in Rupiah for each item can be seen in Table 5 below:

Table 5: Optimal EOQ Results per Item (Rp)

Material	EOQ in Rupiah
BESI SIKU 50MMX50MMX5MMX6000MM	Rp182.635
BESI VIRKAN 20MMX20MMX6000MM	Rp184.267
BESI UNP 100MMX50MMX6000MM	Rp321.806
AS BESI DIA.40MMX6000MM ST70	Rp3.593.815
FIXED PULLEY C1-250MMX40MM	Rp548.685
PILLOW BLOCK UCP-207(FYH)	Rp14.202.365
CENTER TO CENTER CLIP 120MM (090001003)	Rp105.199
PULLEY B2-120MM AS.35MM SPEI.10	Rp1.339.050
GUIDE V-BELT 37MMX31MMX21MM (GAMBAR)	Rp299.983
HELICAL GEAR TR57 0,75KW/RATIO 15/AS=35MM (TRANSMAX)	Rp2.647.978
BAUT BATANGAN 12MMX1000MM	Rp19.473
MUR M10	Rp11.865
RING PLAT M10	Rp2.186
PLAT HITAM 10MMX4FEETX8FEET	Rp2.881.270
PLAT STRIP 10MMX70MMX6000MM	Rp719.524
V-BELT C-240(GAIDO)	Rp224.154
INVERTER 3G3JZ-0,75KW/400V (OMRON)	Rp3.996.367
KABEL NYYHY 4X4MM	Rp140.156
MAGNETIC THERMIC BM3RSB-6P3/4-6,3A (FUJI)+AUX BM3RSB 1P6	Rp784.469
MOTOR CABIN DISC BPM 90S-2 1000-500RPM	Rp2.644.273
KABEL SCHOEN 2,5MM RING (VF2-5B)	Rp89.063
SELECTOR SWITCH AR22PR 211B (FUJI)	Rp299.315
KABEL TRAY 100MMX100MMX2400MM (GALVANIS)	Rp1.317.804
BOX SELECTOR 3SB3802-OAA3 (SIEMENS)	Rp659.271
JOINT TRAY 100MMX100MM	Rp881.879

Based on Table 5, EOQ expressed in Rupiah represents the optimal purchasing value that the company should allocate in a single order for each engineering consumable material. The EOQ value varies across different materials, as it is influenced by annual demand levels and the unit price of each item. Materials with higher annual usage and higher unit cost—such as Pillow Block UCP-207 and the 3G3JZ-0.75KW Inverter generate larger EOQ values in Rupiah compared to materials with relatively lower demand and cost impact. This occurs because high-demand, high-cost items contribute more significantly to both ordering and holding cost components, thus requiring a greater optimal order budget to reach cost equilibrium. EOQ in Rupiah also provides a clear financial estimation for each procurement cycle, enabling the company to prepare an appropriate budget allocation while preventing unnecessary repetitive orders that increase ordering cost and excessive stock accumulation that raises holding expenses. Therefore, this monetary EOQ information serves as a strategic reference for determining optimal procurement funding per cycle, ensuring that total inventory cost—consisting of ordering cost and holding cost—can be minimized without compromising material availability for engineering maintenance operations.

In Unit

Based on the data presented in Table 2 and Table 5, the steps for calculating the optimal EOQ for all items are as follows:

$$Q^{*i} = \frac{Q^{*Rpi}}{C_i} \quad (3)$$

The summary of the optimal EOQ results in units for each item can be found in Table 6 below:

Table 6: Optimal EOQ Results per Item (Units)

Material	EOQ In Unit	Unit
BESI SIKU 50MMX50MMX5MMX6000MM	4	Bars
BESI VIRKAN 20MMX20MMX6000MM	6	Bars
BESI UNP 100MMX50MMX6000MM	4	Bars
AS BESI DIA.40MMX6000MM ST70	30	Bars
FIXED PULLEY C1-250MMX40MM	2	Pcs
PILLOW BLOCK UCP-207(FYH)	40	Pcs
CENTER TO CENTER CLIP 120MM (090001003)	10	Pcs
PULLEY B2-120MM AS.35MM SPEI.10	6	Pcs
GUIDE V-BELT 37MMX31MMX21MM (GAMBAR)	6	Pcs
HELICAL GEAR TR57 0,75KW/RATIO 15/AS=35MM (TRANSMAX)	2	Pcs
BAUT BATANGAN 12MMX1000MM	4	Pcs
MUR M10	8	Pcs
RING PLAT M10	2	Pcs
PLAT HITAM 10MMX4FEETX8FEET	3	Sheets
PLAT STRIP 10MMX70MMX6000MM	2	Sheets
V-BELT C-240(GAIDO)	1	Pcs
INVERTER 3G3JZ-0,75KW/400V (OMRON)	2	Pcs
KABEL NYYHY 4X4MM	4	Pcs
MAGNETIC THERMIC BM3RSB-6P3/4-6,3A (FUJI)+AUX BM3RSB 1P6	1	Pcs
MOTOR CABIN DISC BPM 90S-2 1000-500RPM	1	Pcs
KABEL SCHOEN 2,5MM RING (VF2-5B)	6	Meter
SELECTOR SWITCH AR22PR 211B (FUJI)	1	Pcs
KABEL TRAY 100MMX100MMX2400MM (GALVANIS)	11	Pcs
BOX SELECTOR 3SB3802-OAA3 (SIEMENS)	2	Pcs
JOINT TRAY 100MMX100MM	11	Pcs

Based on Table 6, EOQ in physical units represents the optimal quantity of materials that should be ordered in each procurement cycle to achieve the most economical inventory condition. The EOQ quantity differs across material types, as it is proportionally allocated from the combined EOQ value in Rupiah and converted into units using individual unit prices. This variation reflects the distinct annual demand contribution and unit cost of each engineering consumable item. For instance, Angle Steel 50MM × 50MM × 5MM × 6000MM has an EOQ of 4 lengths per order, while Pillow Block UCP-207 has an EOQ of 40 pieces per order due to its significantly higher annual usage and carrying cost impact. These unit-level EOQ results provide practical guidance for the procurement team, allowing orders to be scheduled more efficiently, reducing repetitive administrative workload, and preventing excessive warehouse space occupation. By following EOQ recommendations, the division can avoid overly frequent ordering that increases ordering costs, as well as stock accumulation that leads to unnecessary holding expenses and storage inefficiencies. Therefore, EOQ in units serves as a direct and operationally feasible reference for determining order quantities of engineering consumables, ensuring material availability for machine maintenance while mitigating the risks of overstock and stockout in the warehouse.

3.3. Optimal Reorder Cycle

$$t^* = \frac{Q^{*Rp}}{D}$$

$$= \frac{38.096.850}{378.190.765}$$

$$= 0,10073448$$

So, 0.10073448 × 365 = 37 days.
Based on the calculations performed, the company’s optimal reorder cycle is 37 days.

3.4. Total Inventory Cost

$$TC = \frac{D(k + \sum k_i)}{Q^{*Rpi}} + \frac{Q^{*Rpi}\, h}{2} \quad (4)$$

$$= \frac{378.190.765\ (1.765.530 + 0)}{38.096.850} + \frac{38.096.850\ x\ 920.106}{2}$$

$$= \text{Rp}175.265.876$$

Based on the calculations performed, the total inventory cost using the multi-item EOQ method is Rp175,265,876 per year.

4. Conclusion

The implementation of the Multi-Item Economic Order Quantity (EOQ) method successfully determined the optimal order quantity for each type of engineering consumable material, as presented in Table 3.6. The EOQ values in units were calculated based on annualized material demand, ordering cost, and holding cost, allowing the company to establish the most economical order size for each procurement cycle. By applying this model, the Engineering Division can use EOQ results as a practical reference for procurement planning, reducing unnecessary ordering frequency, preventing excessive warehouse space occupation, and ensuring that consumable materials remain available when required for machine maintenance. The study also found that EOQ optimization supports better inventory structuring, mitigating the risks of stock accumulation and material shortages that could delay maintenance response and disrupt production support operations.

In addition, the reorder cycle analysis generated from the EOQ model revealed that material procurement intervals can be systematically scheduled every 37 days. This reorder cycle provides a structured time-based guideline for preparing procurement planning calendars, ensuring material availability for both preventive and corrective machine maintenance without triggering overstock or stockout conditions in the warehouse. Therefore, the EOQ-based reorder cycle enables more stable procurement synchronization, improves administrative efficiency, and supports production continuity by maintaining balanced inventory levels that align with operational needs and warehouse capacity limitations.

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