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Inventory Control of Twin Tub Washing Machine Spare Parts using Continuous Review (Q) and Periodic Review (P) Methods

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Abstract

In an electronics manufacturing industry, the production process of Twin Tub washing machines has not been operating optimally due to an imbalance between the quantity of purchased and required raw materials, namely spin motor, motor wash, v-belt, and water inlet. This condition makes it difficult for the company to determine the appropriate order quantity. This issue may negatively affect production continuity and increase total inventory costs due to shortages and overstocking of raw materials. Therefore, this study aims to control raw material inventory for twin tub washing machines in order to minimize total inventory costs. This study employs the Continuous Review (Q) Lost Sales and Periodic Review (P) Lost Sales methods. The results show that the Continuous Review (Q) Lost Sales method yields a total cost of IDR 2,735,326,321, which is lower than the Periodic Review (P) Lost Sales method with a total cost of IDR 2,751,408,021. Therefore, the Continuous Review (Q) Lost Sales method is selected as it provides the minimum total cost. Compared to the company's current method, which amounts to IDR 2,796,945,917, this method results in cost savings of up to 2.20%. Thus, the projected total inventory cost for the upcoming period is IDR 2,299,642,132. The application of the Continuous Review (Q) Lost Sales method is proven to minimize total inventory costs while maintaining spare part availability to support sustainable production continuity.

Keywords: Continuous review; inventory; lost sales; periodic review; spare part

1. Introduction

Inventory plays an important role in maintaining the continuity of company operations and supporting production activities. Inadequate inventory management may lead to two major problems: excess inventory, which increases storage costs and the risk of material deterioration, and inventory shortages, which can disrupt production processes and reduce customer service levels [1]. Inventory system efficiency can be achieved when companies are able to align stock levels with fluctuating demand patterns [2]. Under probabilistic demand conditions, companies require an appropriate inventory policy to maintain a balance between material availability and operational costs in order to support stable production activities [3]. An imbalance between purchased quantities and actual material usage that has not been properly planned may result in stockout or overstock conditions, which eventually increase total inventory costs [4], [5]. In inventory systems, ordering costs, holding costs, and shortage costs are major cost components that influence the company's total inventory expenditure [6]. Proper determination of reorder point and order quantity is essential to prevent inventory imbalances that may disrupt production activities [7].

In an electronics manufacturing company producing various household appliances, washing machines represent one of the most important production lines. Among the products manufactured, the Twin Tub washing machine has a relatively high production volume with fluctuating market demand. The production process depends on several main spare parts, namely spin motor, motor wash, v-belt, and water inlet, all of which are sourced from external suppliers because they are not produced internally by the company. Fluctuating demand combined with inconsistent ordering lead times make inventory planning more difficult, particularly when consumer demand has not been properly anticipated. This condition frequently results in inventory shortages causing lost sales and a warehouse overcapacity, where raw materials must be stored outside designated storage areas, further increasing total inventory costs [8].

To address these issues, this study proposes the application of the Continuous Review (Q) and Periodic Review (P) methods under lost sales conditions for spare part inventory control of Twin Tub washing machines. These methods are selected for their ability to optimize inventory management by accounting for demand fluctuations while minimizing total inventory costs [9].

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Both methods offer a systematic approach to determining optimal order quantities and order timing, making them more effective for inventory decision-making. The Continuous Review (Q) method continuously monitors inventory levels and triggers a replenishment order of a fixed quantity upon reaching the reorder point [2], while the Periodic Review (P) method places orders at fixed time intervals with variable order quantities adjusted to actual needs [10]. The comparative application of both methods aims to identify the most optimal inventory policy suited to the company's demand characteristics.

Several prior studies have examined inventory control in the context of cost efficiency improvement. Study [2] investigated the Continuous Review system for determining lot size and reorder point to minimize lost sales occurrences while maintaining service levels. Study [10] analyzed the Periodic Review method with fixed order intervals adjusted to demand fluctuations. Study [3] developed a model incorporating variable lead times and lost sales conditions into inventory cost calculations. However, most of these studies focused on make-to-stock production systems, which do not fully accommodate the dynamic demand characteristics inherent in make-to-order environments.

The novelty of this study lies in the comparative application of the Continuous Review (Q) and Periodic Review (P) methods within a make-to-order production system, considering probabilistic demand conditions and lost sales risk. In addition, this study integrates the ARIMA forecasting method to estimate future spare part requirements, allowing the results to provide not only an evaluation of historical conditions but also more accurate demand projections for future inventory planning [11]. This study is therefore expected to contribute to minimizing total inventory costs while ensuring spare part availability to support uninterrupted production operations.

2. Method

2.1. Research location and time

This research was conducted at an electronics manufacturing company located in Surabaya, East Java, Indonesia. The research was carried out starting from September 2025 until all required data for the study were obtained.

2.2. Data collection technique

Data collection in this study was conducted through literature review and field data collection. The literature review was used to obtain theoretical foundations related to inventory management, probabilistic demand, and inventory cost optimization. Meanwhile, field data were obtained through direct observation and interviews with the production and warehouse divisions to understand the current inventory control mechanism applied by the company. The data collected included historical spare part consumption of Twin Tub washing machines covering Spin Motor, Motor Wash, V-belt, and Water Inlet for the period of April 2025 to March 2026, along with inventory cost data comprising purchase price, ordering cost, holding cost, and shortage cost, as well as average inventory levels, order frequency, and procurement lead time.

2.3. Data analysis method

After data collection was completed, data analysis was conducted to address the identified inventory problems and determine the optimal inventory control policy for Twin Tub washing machine spare parts. Inventory control calculations were performed using the Continuous Review (Q) Lost Sales and Periodic Review (P) Lost Sales methods, both solved through the Hadley-Within iterative procedure [12]. The Hadley-Within procedure has been widely applied in inventory control studies to obtain optimal order quantity and reorder point under probabilistic demand conditions [13]. For the Continuous Review (Q) Lost Sales method, the initial lot size q_{01}^* was calculated using the Wilson formula as shown in Equation (1):

$$q_{01}^* = q_{02}^* = \sqrt{\frac{2AD}{h}} \tag{1}$$

where:
q : order quantity (pcs)
A : ordering cost per order (IDR)
D : annual demands (pcs)
h : holding cost per unit per year (IDR)

The probability of stockout (α) and reorder point (r_1^*) were subsequently determined using Equations (2) and (3):

$$a = \frac{hq_{01}^*}{C_u D + hq_{01}^*} \tag{2}$$

$$r_1^* = D_L + Z_a S\sqrt{L} \tag{3}$$

where:
a : probability of stockout
C_u : shortage cost per unit (IDR)
r_1^* : reorder point (pcs)
D_L : expected demand during lead time
L : lead time (year)
S : standard deviation of demand
Z_α : standard normal deviate

The expected shortage per cycle N and updated lot size q_{02}^* was calculated using the following equation:

$$N = \int_{r_1}^{\infty} (x - r_1^*) f(x)dx = S_L[f(Z_a) - Z_a\Psi(Z_a)] \tag{4}$$

$$q_{02}^* = \sqrt{\frac{2D\left[A + C_u \int_{r_1}^{\infty}(x - r_1^*) f(x)dx\right]}{h}} \tag{5}$$

where:
N : expected number of shortage units per cycle
S_L : standard deviation of demand during lead time
$f(Z_a)$: ordinate
$\Psi(Z_a)$: partial expectation

The iteration continued by recalculating α and r_2^* until $r_1^* = r_2^*$, at which point the optimal parameters q_0^* and r^* were obtained. The optimal inventory policy parameters were subsequently determined. Safety stock was calculated using the following equation:

$$SS = Z_a S\sqrt{L} \tag{6}$$

where:
SS : safety stock

Service level was calculated using the following equation:

$$\eta = 1 - \frac{N}{D_L} \times 100\% \tag{7}$$

where:
η : service level (%)
D_L : expected demand during lead time

Total inventory cost was calculated by summing all cost components, including purchase cost, ordering cost, holding cost, and shortage cost, using the following equation:

$$O_T = O_b + O_p + O_s + O_k \tag{8}$$

where:
O_T : total inventory cost
O_b : purchase cost
O_p : ordering cost
O_s : holding cost
O_k : shortage cost

For the Periodic Review (P) Lost Sales method, the initial review interval T_0 was calculated using Equation (9):

$$T_0 = \sqrt{\frac{2A}{Dh}} \tag{9}$$

where:
T_0 : proposed inter-order period (year)
A : ordering cost per order (IDR)
D : annual demand (pcs)
h : holding cost per unit per year (IDR)

The probability of stockout (α) was determined as shown in Equation (10):

$$\alpha = \frac{hT}{hT + C_u} \tag{10}$$

The maximum inventory level *R* was computed as:

$$R = DT + D_L + Z_a S\sqrt{T + L} \tag{11}$$

where:
R : maximum desired inventory (pcs)
T : Inter-order period (year)

The expected shortage per cycle N was calculated as:

$$N = \int_R^{\infty} (z - R) f(z) dz \tag{12}$$

$$N = S\sqrt{T + L}[f(Z_a) - Z_a \Psi(Z_a)] \tag{13}$$

where:
N : expected number of shortage units per cycle
$f(Z_a)$: ordinate
$\Psi(Z_a)$: partial expectation

Total inventory cost was then computed as:

$$O_T = D_p + \frac{A}{T} + h\left(R - D_L + \frac{D_T}{2}\right) + \left(\frac{c_u}{T} + h\right)\int_R^{\infty}(z - R)f(z)dz \tag{14}$$

The iteration was repeated by incrementing T_0 until the minimum total inventory cost O_T was obtained. Demand forecasting was performed using three methods, namely Single Exponential Smoothing, Weighted Moving Average (WMA), and Autoregressive Integrated Moving Average (ARIMA). The best forecasting method was selected based on the smallest Mean Square Error (MSE) value [14], with forecast results subsequently verified using the Moving Range Chart (MRC) to ensure data remained within control limits before being used as the basis for the next period's inventory control calculations [15].

3. Results and Discussion

3.1. Continuous review (Q) lost sales method

The calculation of the Continuous Review (Q) Lost Sales method using the Hadley-Within procedure was carried out through iterative steps to obtain the optimal solution. The following presents the calculation for Spin Motor as a representative example.

$$\frac{\sum(Xi)}{n} = \frac{8{,}232}{12} = 686\ pcs$$

$$\sigma = \sqrt{\frac{\sum(Xi - \bar{X})^2}{n-1}}$$

$$\sigma = \sqrt{\frac{\sum((742-686)^2 + (536-686)^2 + \cdots + (433-686)^2)}{12-1}}$$

$$= 194 \text{ pcs}$$

The initial lot size q_{01}^* was calculated using the Wilson formula:

$$q_{01}^* = q_{02}^* = \sqrt{\frac{2AD}{h}}$$

$$q_{01}^* = \sqrt{\frac{2(330{,}000)(8{,}232)}{6{,}720}} = 899 \text{ pcs}$$

The probability of stockout (α) was then determined:

$$\alpha = \frac{hq_{01}^*}{c_u D + hq_{01}^*}$$

$$\alpha = \frac{(6{,}720)(899)}{(168{,}000)(8{,}232) + (6{,}720)(899)} = 0.0043$$

Based on the standard normal distribution table, α = 0.0043 corresponds to z_α = 2.65.

The reorder point r_1^* was calculated as:

$$r_1^* = D_L + Z_\alpha S\sqrt{L}$$

$$r_1^* = (8{,}232)(1.5/12) + (2.65)(194\sqrt{1.5/12})$$

$$= 1{,}211 \text{ pcs}$$

The expected shortage per cycle N and updated lot size q_{02}^* were computed as:

$$N = S_L[f(Z_\alpha) - Z_\alpha \Psi(Z_\alpha)]$$

$$N = (194)(1.5/12)[(0.0119) - (2.65)(0.0043)]$$
$$= 0.0123$$

$$q_{02}^* = \sqrt{\frac{2D\left[A + c_u \int_{r1}^{\infty}(x - r_1^*) f(x)dx\right]}{h}}$$

$$q_{02}^* = \sqrt{\frac{2(8{,}232)[330{,}000 + (168{,}000)(0.0123)]}{6{,}720}} = 902 \text{ pcs}$$

Recalculating α and r_2^*:

$$\alpha = \frac{(6{,}720)(902)}{(168{,}000)(8{,}232) + (6{,}720)(902)} = 0.0043 \rightarrow z_\alpha = 2.65$$

$$r_2^* = (8{,}232)(1.5/12) + (2.65)(194\sqrt{1.5/12})$$
$$= 1{,}211 \text{ pcs}$$

Since $r_1^* = r_2^* = 1{,}211$ pcs, the iteration converged. The optimal inventory policy for Spin Motor was obtained as follows.

- Safety stock
$$ss = Z_\alpha S\sqrt{L}$$
$$= (2.65)\left(194\sqrt{\frac{1.5}{12}}\right) = 182 \ pcs$$
- Service level
$$\eta = 1 - \frac{N}{D_L} \times 100\%$$
$$= 1 - \frac{0.0123}{(8{,}232)\left(\frac{1.5}{12}\right)} \times 100\% = 99.99\%$$
- Total annual inventory cost

a. Purchase cost
$$O_b = D \times p$$
$$= 8{,}232 \times \text{IDR } 168{,}000 = \text{IDR } 1{,}382{,}976{,}000$$

b. Ordering cost
$$O_p = \frac{AD}{q_0}$$
$$= \frac{(330{,}000)(8{,}232)}{902} = \text{IDR } 3{,}011{,}811$$

c. Holding cost
$$O_s = h\left(\frac{q_0}{2} + r - D_L\right)$$
$$= 6{,}720\left(\frac{902}{2} + 1{,}211 - (8{,}232)\left(\frac{1.5}{12}\right)\right)$$
$$= \text{IDR } 4{,}253{,}779$$

d. Shortage cost
$$O_k = \left(\frac{c_u D}{q_0}\right)\int_r^{\infty}(x - r)(x)dx$$
$$= \left(\frac{(168{,}000)(8{,}232)}{902}\right) \times 0.0123 = \text{ IDR } 18{,}804$$

e. Total cost
$$O_T = O_b + O_p + O_s + O_k$$
$$= \text{IDR } 1{,}390{,}260{,}394$$

The same procedure was applied to Motor Wash, V-Belt, and Water Inlet. The total inventory cost under the Continuous Review (Q) Lost Sales method across all four spare parts amounted to IDR 2,735,326,321.

3.2. Periodic review (P) lost sales method

The calculation of the Periodic Review (P) Lost Sales method using the Hadley-Within procedure was carried out through iterative steps. The following presents the calculation for Spin Motor as a representative example.

The initial review interval T_0 was calculated as:

$$T_0 = \sqrt{\frac{2A}{Dh}}$$

$$T_0 = \sqrt{\frac{2(330{,}000)}{(8{,}232)(6{,}720)}} = 0.1092 \text{ years}$$

The probability of stockout (α) was determined:

$$\alpha = \frac{hT}{hT + c_u}$$

$$\alpha = \frac{(6{,}720)(0.1092)}{(6{,}720)(0.1092) + 168{,}000} = 0.0043 \rightarrow z_\alpha = 2.65$$

Maximum inventory level R was calculated as:

$$R = DT + D_L + Z_\alpha S\sqrt{T + L}$$

$$R = (8{,}232)(0.1092) + (8{,}232)\left(\frac{1.5}{12}\right) + (2.65)$$
$$(194)\sqrt{0.1092 + \left(\frac{1.5}{12}\right)}$$
$$= 2{,}177 \ pcs$$

Expected shortage per cycle N:

$$N = S\sqrt{T + L}[f(Z_\alpha) - Z_\alpha \Psi(Z_\alpha)]$$

$$N = (194\sqrt{0.1092 + \left(\frac{1.5}{12}\right)}(0.0119 - (2.65)$$
$$(0.0043))$$
$$= 0.0475$$

Total inventory cost O_T:

$$O_T = D_p + \frac{A}{T} + h\left(R - D_L + \frac{D_T}{2}\right) + \left(\frac{c_u}{T} + h\right) \times N$$
$$= \text{IDR } 1{,}396{,}808{,}505$$

The same procedure was applied to Motor Wash, V-Belt, and Water Inlet. The total inventory cost under the Periodic Review (P) Lost Sales method amounted to IDR 2,751,408,021.

After calculating both proposed methods, total inventory costs were compared against the company's current method as presented in Table 1.

Table 1. Recapitulation of Inventory Costs Comparing Proposed Methods with the Company Method

Spare Part	Method Q (IDR)	Method P (IDR)	Company Method (IDR)
Spin Motor	1,390,260,394	1,396,808,186	1,416,621,040
Motor Wash	1,085,707,453	1,091,464,061	1,110,009,000
V-Belt	109,359,484	111,102,644	113,915,010
Water Inlet	149,998,990	152,033,130	156,400,867
Total	2,735,326,321	2,751,408,021	2,796,945,917

Based on Table 1, the Continuous Review (Q) Lost Sales method yields the minimum total inventory cost of IDR 2,735,326,321, resulting in a cost saving of IDR 61,619,595 or 2.20% compared to the company's current method. Therefore, the Continuous Review (Q) Lost Sales method is selected as the optimal inventory control policy.

3.3. Forecasting analysis of spare part requirements

Based on historical demand data for Twin Tub washing machine spare parts for the period of April 2025 to March 2026, the data pattern was identified as follows.

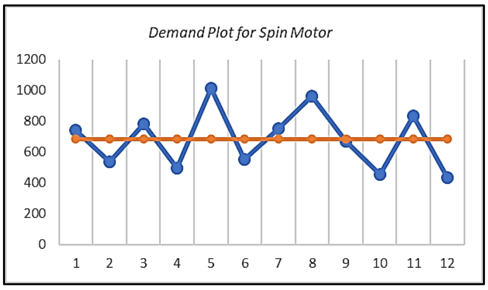

Figure 1. Demand Plot of Spin Motor for the Period of April 2025 to March 2026

Fig. 1 shows the demand plot for Spin Motor over the period of April 2025 to March 2026. The plot shows that demand fluctuates across months with no consistent trend or seasonal pattern, confirming that the demand behavior is probabilistic in nature. The highest demand occurred in August 2025 at approximately 1,013 pcs, while the lowest was recorded in March 2026 at around 433 pcs. The same probabilistic characteristics were also observed in the demand data for Motor Wash, V-Belt, and Water Inlet. Based on these identified patterns, forecasting calculations were performed using Mean Square Error (MSE) for each spare part with results presented in Table 2.

Table 2. MSE Comparison of Forecasting Methods

Spare Part	Mean Square Error (MSE)		
	SES	WMA	ARIMA
Spin Motor	53,216.6	60,862.9	49,988.2
Motor Wash	43,880.9	49,111.3	42,632.0
V-Belt	8,537.3	8,103.1	7,642.0
Water Inlet	8,775.7	7,551.0	6,859.3

Based on Table 2, the ARIMA method yields the smallest MSE values across all spare parts, with MSE values of 49,988.2 for Spin Motor, 42,632.0 for Motor Wash, 7,642.0 for V-Belt, and 6,859.3 for Water Inlet, indicating that ARIMA provides the most accurate demand forecasts compared to Single Exponential Smoothing and Weighted Moving Average. Therefore, ARIMA is selected as the best forecasting method and was subsequently verified using the Moving Range Chart (MRC).

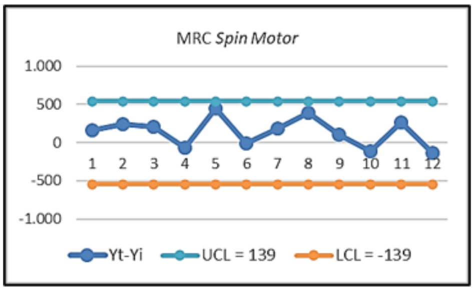

Figure 2. Moving Range Value of Spin Motor

Fig. 2 shows the forecasting data remain within the control limits, indicating that the ARIMA method is suitable for forecasting Spin Motor demand for the period of April 2026 to March 2027. The same results were also observed for Motor Wash, V-Belt, and Water Inlet where all forecasting data remained within the control limits. The forecasting result for Spin Motor is presented in Table 3.

Table 3. Recapitulation of Spare Part Demand Forecasting Results Using the ARIMA Method

Month	Forecast			
	Spin Motor	Motor Wash	V-Belt	Water Inlet
Apr 26	742	526	268	321
May 26	504	377	239	314
Jun 26	688	473	254	310
Jul 26	546	411	246	306
Aug 26	655	451	250	310
Sep 26	571	425	248	309
Oct 26	636	442	249	309
Nov 26	586	431	249	309
Dec 26	624	438	249	309
Jan 27	595	434	249	309
Feb 27	618	437	249	309
Mar 27	600	435	249	309
Total	7,363	5,281	3,001	3,726

Based on Table 3, the forecasting results show total demand values of 7,363 pcs for Spin Motor, 5,281 pcs for Motor Wash, 3,001 pcs for V-Belt, and 3,726 pcs for Water Inlet. After obtaining the forecasting results, the next step was to calculate spare part inventory control using the proposed Continuous Review (Q) Lost Sales method.

3.4. Inventory control of spare parts using the continuous review (Q) lost sales method for the next period

This stage involves calculating spare part inventory control for the period of April 2026 to March 2027 using the Continuous Review (Q) Lost Sales method based on the forecasting results. The calculation for Spin Motor is presented as follows.

The initial lot size q_{01}^* was calculated using the Wilson formula:

$$q_{01}^* = q_{02}^* = \sqrt{\frac{2AD}{h}}$$

$$q_{01}^* = \sqrt{\frac{2(330{,}000)(7{,}363)}{6{,}720}} = 850 \text{ pcs}$$

The probability of stockout (α) was then determined:

$$\alpha = \frac{hq_{01}^*}{c_u D + hq_{01}^*}$$

$$\alpha = \frac{(6{,}720)(850)}{(168{,}000)(7{,}363)+(6{,}720)(850)} = 0.0045$$

Based on the standard normal distribution table, α = 0.0045 corresponds to $z_\alpha = 2.61$.

The reorder point r_1^* was calculated as:

$$r_1^* = D_L + Z_\alpha S\sqrt{L}$$

$$r_1^* = (7{,}363)(1.5/12) + (2.65)(194\sqrt{1.5/12})$$
$$= 979 \text{ pcs}$$

The expected shortage per cycle N and updated lot size q_{02}^* were computed as:

$$N = S_L[f(Z_\alpha) - Z_\alpha \Psi(Z_\alpha)]$$

$$N = (63)(1.5/12)[(0.013) - (2.61)(0.0013)]$$
$$= 0.07604$$

$$q_{02}^* = \sqrt{\frac{2D\left[A + c_u \int_{r1}^{\infty}(x - r_1^*) f(x)dx\right]}{h}}$$

$$q_{02}^* = \sqrt{\frac{2(7{,}363)[330{,}000 + (168{,}000)(0.07604)]}{6{,}720}} = 850 \text{ pcs}$$

Recalculating α and r_2^*:

$$\alpha = \frac{(6{,}720)(850)}{(168{,}000)(7{,}363) + (6{,}720)(850)} = 0.0042 \rightarrow z_\alpha = 2.64$$

$$r_2^* = (7{,}363)(1.5/12) + (2.64)(63\sqrt{1.5/12})$$
$$= 979 \text{ pcs}$$

Since $r_1^* = r_2^* = 979$ pcs, the iteration converged. The optimal inventory policy for Spin Motor was obtained as follows.

- Safety stock

$$ss = Z_\alpha S\sqrt{L}$$
$$= (2.64)\left(63\sqrt{\frac{1.5}{12}}\right) = 59 \text{ pcs}$$

- Service level

$$\eta = 1 - \frac{N}{D_L} \times 100\%$$
$$= 1 - \frac{0.07604}{(7{,}363)\left(\frac{1.5}{12}\right)} \times 100\% = 99.99\%$$

- Total annual inventory cost

a. Purchase cost

$$O_b = D \times p$$
$$= 7{,}363 \times \text{IDR } 168{,}000 = \text{IDR } 1{,}237{,}047{,}333$$

b. Ordering cost

$$O_p = \frac{AD}{q_0}$$
$$= \frac{(330{,}000)(7{,}363)}{850} = \text{IDR } 2{,}857{,}361$$

c. Holding cost

$$O_s = h\left(\frac{q_0}{2} + r - D_L\right)$$
$$= 6{,}720\left((850)/2 + 979 - (7{,}363)\left(\frac{1.5}{12}\right)\right)$$
$$= \text{IDR } 3{,}250{,}034$$

d. Shortage cost

$$O_k = \left(\frac{c_u D}{q_0}\right)\int_r^{\infty}(x - r)(x)dx$$
$$= \left(\frac{(168{,}000)(7{,}363)}{850}\right) \times 0.07604 = \text{IDR } 96{,}100$$

e. Total cost

$$O_T = O_b + O_p + O_s + O_k$$
$$= \text{IDR } 1{,}243{,}250{,}830$$

The same procedure was applied to Motor Wash, V-Belt, and Water Inlet. The total inventory cost under the Continuous Review (Q) Lost Sales method across all four spare parts amounted to IDR 2,299,642,132.

4. Conclusion

Inventory control of Twin Tub washing machine spare parts for the period of April 2025 to March 2026 resulted in a total inventory cost of IDR 2,796,945,916 under the company's current policy and IDR 2,735,326,321 using the Continuous Review (Q) Lost Sales method. The proposed method reduced inventory costs by IDR 61,619,595 or 2.20% compared to the existing company policy. Following the selection of the proposed method, demand forecasting for the period of April 2026 to March 2027 was conducted using the ARIMA method. Based on the forecasting results, the Continuous Review (Q) Lost Sales method generated optimal order quantities of 850 pcs/order for Spin Motor, 750 pcs/order for Motor Wash, 1,225 pcs/order for V-belt, and 1,325 pcs/order for Water Inlet, with a projected total inventory cost of IDR 2,299,642,132. The application of the Continuous Review (Q) Lost Sales method is proven to minimize total inventory costs while maintaining spare part availability to support sustainable production continuity.

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