Kilisuci International Conference on Economic & Business

Vol. 3 (2025)

RAW MATERIAL INVENTORY CONTROL ANALYSIS OF SHUTTLECOCK PT. WALET PUTIH

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Article Information

Submission date : January 3, 2025
Revised date : February 14, 2025
Accepted date : March 22, 2025

Abstract

Research aim : *There are 3 objectives in this study, as follows: (1). To determine the most economical order quantity of (shuttlecock) raw materials for PT. Walet Putih. (2). To determine the safety stock level for PT. Walet Putih. (3). To calculate the total inventory cost (TIC) for PT. Walet Putih.*

Design/Methode/Approach : *In this study the method used is quantitative descriptive and the calculation model used isEconomic Order Quantity (EOQ). The subject of this study is the supply of Shuttlecock raw materials. Data collection techniques are carried out using interviews and documentation.*

Research Finding : *The results of this study indicate that the purchase of Shuttlecock raw materials obtained an economic order quantity or can be called the Economic Order Quantity (EOQ) of 1,329 dozens per order. The maximum inventory level based on the average maximum value of 664 dozens. This value is the safety stock value based on the average inventory of 1,692 dozens or the amount of safety stock is 1,028 dozens greater than the company's calculation. The Re-Order Point value is 1,791 dozens. While the Total Cost (TC) value generated is 2,517,849,000 every 12 months. This value is the total sum of the total Inventory (Holding + Set Up) Cost. This value is usually greater than the amount that can be spent Rp. 183,348,800. Or a difference of more than Rp. 2,334,500,200.*

Theoretical contribution/Originality : *The results of this study are expected to be useful and to increase understanding of operational management, especially in raw material inventory using the calculation method with Economic Order Quantity (EOQ).*

Practitionel/Policy implication : *For business people, the results of this study are expected to be applied in their companies to overcome current problems, namely shortages and excesses of raw material supplies*

Research limitation : *The limitation of this study is that the data comes from historical data, so it cannot describe the actual conditions because the condition of raw material inventory can change over time.*

Keywords : *Economic Order Quantity (EOQ), Inventory, and Raw Materials.*

1. Introduction

The increasingly tight competition in the Indonesian badminton industry will force company owners to strive to produce products with superior quality. High-quality raw materials are essential for the smooth running of the badminton production process. Improper management of raw material inventory will certainly hamper the production process. At the same time, companies must meet consumer demand. If a company cannot meet consumer demand, then the company will not be able to compete with other companies.

The current instability of raw materials has resulted in unmet consumer demand, so that PT. Walet Putih has to re-order imported goose feathers from Taiwan. The weight of badminton, according to Djarum Badminton Club, ranges from 4.75 to 5.5 grams. Badminton has a base diameter of around 25 to 28 millimeters, and each feather measures between 62 to 70 millimeters. The right strategy for managing current raw material inventory is Economic Order Quantity (EOQ). This strategy facilitates demand-dependent management and planning by scheduling the right amount of all resources needed. One of the advantages of utilizing Economic Order Quantity (EOQ) is its capacity to substantially reduce the risk associated with determining the amount of components supplied, due to accurate data on demand for each component.

Inventory serves as a control mechanism to determine the amount of stock by identifying the amount of goods to be purchased and calculating the timing of ordering. As a result, effective inventory management can significantly reduce production costs, thereby maximizing the company's profits. To improve the production process, companies must maintain reserve stocks, ensuring greater product reliability which in turn increases customer satisfaction. If the supply of raw materials is not available, the company fails to dominate the market and cannot deliver products at an optimal level. Inventory control can be defined as a technique used to measure the products to be ordered and the timing of ordering goods, as explained by previous studies. With effective management, the company's costs will be low, resulting in optimal profits.

Variability in consumer demand is a constant and significant concern at PT. Walet Putih. This is one of the reasons why the organization must maintain optimal raw material inventory levels. It is essential to manage raw material inventory to ensure a smooth and controlled production process. Effective company monitoring can reduce raw material damage and establish ideal inventory levels.

Scarcity of raw materials hampers the optimal production process. The main raw material for making shuttlecocks is goose feathers. PT. Walet Putih often experiences delays in arrival so that production is not optimal when demand is high. This greatly hampers the efficiency of the production process. This can be one of the factors causing company losses. If the company has excess raw materials, the company will also experience losses. To overcome this, especially in effective management of raw material inventory, the Economic Order Quantity (EOQ) method will be used.

Previous research conducted by examined the management of embroidery raw material inventory in Sukabumi City. The Economic Order Quantity (EOQ) method is explained as one way to optimize raw material inventory. Research conducted by shows that determining the right amount of orders for raw materials for potatoes and curly potatoes at PT. Surya Indah

Food Multirasa can minimize total inventory costs so that it can increase cost efficiency for the company. The study tried to determine the amount, inventory level, and total inventory costs at CV XY Nganjuk. The economic order quantity exceeds the order quantity determined by the company's calculations.

1.1. Statement of Problem

The explanation above shows that the supply of raw materials for shuttlecock production poses a major challenge that can lead to bankruptcy of the company. Inadequate management of raw material supply causes production inefficiency, so that it cannot meet consumer demand optimally.

1.2. Research Objectives

There are 3 objectives in this study, as follows: (1). To determine the most economical order quantity of (shuttlecock) raw materials for PT Walet Putih. (2). To determine the safety stock level for PT Walet Putih. (3). To calculate the total inventory cost (TIC) for PT Walet Putih.

2. Method

This research is a real problem experienced by the company. For approximately 1 month with data used in November 2023 to October 2024. This research was conducted at PT. Walet Putih which is located in Nglaban Village, Loceret District, Nganjuk Regency. The time of the research was conducted in November 2024. PT. Walet Putih produces Shuttlecocks that provide various types, namely B1, B2, and B3. The object of this research is on the control of raw material inventory in product type B1. The data collection method in this study was carried out by interview. Interviews are a data collection technique with question and answer activities with the owner and related workers. Documentation is a data collection technique obtained from the company. This study uses a quantitative descriptive method used to analyze data that will be processed using the Economic Order Quantity (EOQ), Safety Stock (SS), Reorder Point (ROP) and total inventory costs (Total Cost-TIC) calculation methods.

Economic Order Quantity (EOQ) is a set point used to help companies minimize ordering costs and raw material inventory storage costs. The application of this method will be able to meet a certain level of demand and can minimize ordering costs in the company [8]. The calculation formula for Economic Order Quantity (EOQ) is as follows:

$$EOQ = \sqrt{\frac{2SD}{H}}$$

Information:

D = Usage or demand per time period

S = Order Preparation Cost per order

H = Storage Cost per unit per year

Safety stock refers to additional raw material inventory that is intended to prevent shortages caused by delays in scheduled supply deliveries. As a result, additional raw material inventory is required to prevent this scenario. The equation for determining Safety Stock (SS) is as follows:

SS=(DM)2

Information:
SS=*Safety Stock*
D = Maximum use of raw materials
M = Average raw material usage

Re-Order Point is a reorder to meet the needs of raw material inventory when the amount of inventory has reached a certain level. With this method, the amount of raw material inventory can be determined at a certain level which is the order deadline. The calculation formula for Reorder Point (ROP) is as follows:

ROP = (Lead Time x average daily requirement) + (Safety Stock)

Information:
Lead Time = Waiting time
Safety Stock = Additional inventory

Total Cost (TC) refers to the comprehensive expenditure incurred by a company for inventory costs in one manufacturing cycle. The formula for Total Cost (TC) is as follows:

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

Information;
TC = Total inventory cost
D = Annual demand in units for inventory items
S =Booking fee
H = Storage cost per unit per year
Q = Purchase of raw materials

In this study, researchers used the POM QM for Windows Version 5 program for calculations and graphing. This program combines automatic calculation of Total Cost (TC) and curve creation.

3. Results and Discussion / Results and Discussion

The following data is the raw material requirements of PT. Walet Putih in November 2023 to October 2024.

Table 1. Shuttlecock Requirements

PT. White Swallow
As of Q2 2023-2024
Constant Shuttlecock Price RP 115,000

Shuttlecock Needs							
No	**Month**	**Request**	**Type**	**Average Needs**	**Inventory Cost**	**Holding Cost**	**Set Up Cost**
1	November	1200	*Shuttlecock B1*	1200	138,000,000	11,500	500,000
2	December	1700	*Shuttlecock B1*	1700	195,500,000	11,500	500,000
3	January	1250	*Shuttlecock B1*	1250	143,750,000	11,500	500,000
4	February	1300	*Shuttlecock B1*	1300	149,500,000	11,500	500,000
5	March	2550	*Shuttlecock B1*	2550	293,250,000	11,500	500,000
6	April	2000	*Shuttlecock B1*	2000	230,000,000	11,500	500,000
7	May	2000	*Shuttlecock B1*	2000	230,000,000	11,500	500,000
8	June	1750	*Shuttlecock B1*	1750	201,250,000	11,500	500,000
9	July	1250	*Shuttlecock B1*	1250	143,750,000	11,500	500,000
10	August	2300	*Shuttlecock B1*	2300	264,500,000	11,500	500,000
11	September	1600	*Shuttlecock B1*	1600	184,000,000	11,500	500,000
12	October	1400	*Shuttlecock B1*	1400	161,000,000	11,500	500,000
	Total	**20300**		**1691.67**	**2,334,500,000**	**138,000**	**6,000,000**

Source: Owner of PT. Walet Putih

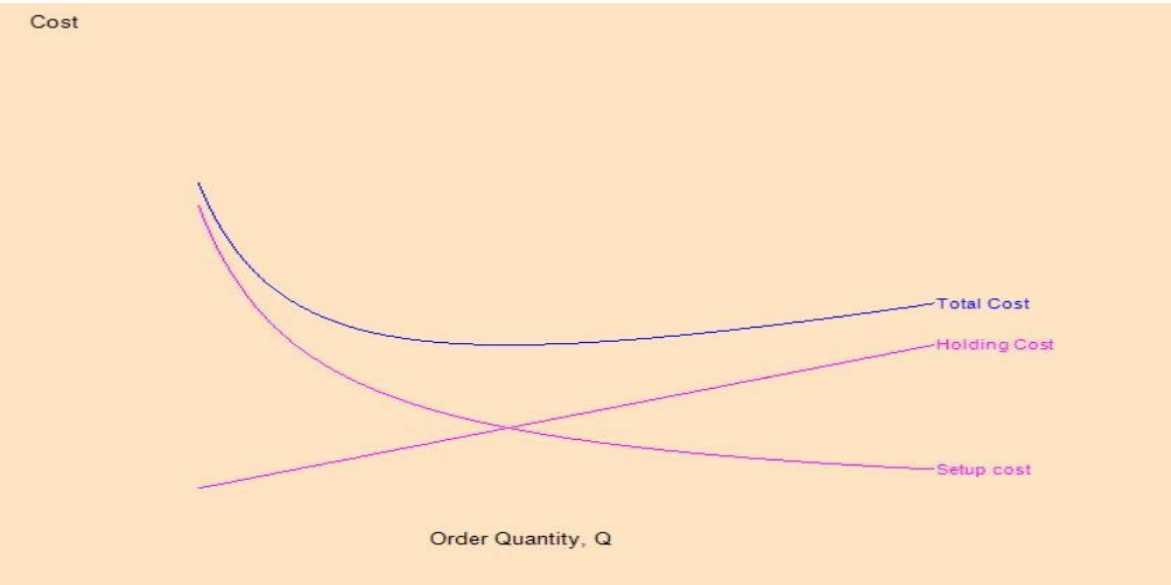
The following are the results of processing the needs data using POM QM Version 5 data processing as follows:

SUTTLECOCK B1 Solution				
Parameter	Value		Parameter	Value
Demand rate(D)	20300		Optimal order quantity (Q*)	1329
Setup/ordering cost(S)	6000000		Maximum Inventory Level (Imax)	1329
Holding/carrying cost(H)	138000		Average inventory	664
Unit cost	115000		Orders per period (N)	15
Days per year (D/d)	340		Annual Setup cost	91674420
Daily demand rate	60		Annual Holding cost	91674420
Lead time (in days)	30		Total Inventory (Holding + Setup) Cost	183348800
			Unit costs (PD)	2334500000
			Total Cost (including units)	2517849000
			Reorder point	1791 units

Graph 1: POM QM V5 Processing

The calculated Economic Order Quantity (EOQ) is 1,329 dozen per order. The peak inventory level, determined by the average maximum value, is 664 dozen. The safety stock value is obtained from the average inventory of 1,692 dozen, indicating that the amount of safety stock exceeds the company's calculation by 1,028 dozen.

The Re-Order Point value is 1,791 dozen. The resulting Total Cost (TC) value is 2,517,849,000 per year. This figure is an aggregate of all Inventory Costs (Storage + Preparation).



Graph 2: POM QM V5 Processing

To ensure the production process runs efficiently, the company must maintain raw material inventory at a cost-effective level. Furthermore, the company must calculate financial inventory to meet capital requirements to secure raw material supplies on demand.

PT. Walet Putih must apply this calculation to ensure the smooth implementation of production activities according to the production schedule. This allows the organization to meet client demand on time. PT. Walet Putih has a cost-effective order quantity of 1,329 dozen per order. This value exceeds the average requirement of 664 dozen to order raw materials.

The company must have a stock reserve of 1,028 dozens in the warehouse to ensure that production is not disrupted according to schedule. The number of reorders is 1,791 dozens per order. The annual expenditure required for the procurement of raw materials is Rp 2,517,849,000. The TC value is the aggregate of inventory costs, including storage and preparation costs. This value usually exceeds the expenditure limit of Rp 183,348,800. Or a larger difference of Rp. 2,334,500,200. To increase the effectiveness of funding as capital and the efficiency of raw material expenditure, the company must carry out the above calculations.

4. Conclusion

This research was conducted because it wanted to optimize the inventory of raw materials at PT. Walet Putih by using the Economic Order Quantity (EOQ) calculation method with the following conclusions:

1. Purchase of raw materials of goose feathers at PT. Walet Putih in November 2023-October 2024 amounting to 20,300 dozens with a purchase frequency of 30 times.
2. The number of purchases using the Economic Order Quantity (EOQ) calculation method was obtained as many as 1,329 dozens in one order.
3. The number of safety stock is 1,692 dozens. While the Re-Order Point value is 1,791 for each order.
4. Total Cost (TC) generated is 2,517,849,000 every 12 months. This value includes ordering costs and warehousing costs.

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