Raw Material Supply Control Analysis with Ordinary Least Square Method and *Economic Order Quantity* (Eoq) at Tandi's Bakery

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ABSTRACT

MSMEsTandi's Bakery produces never stop every day. Therefore, inventory control has a very important position. At Tandi's bakery there are often stock outs and the determination of the Reorder Point is erratic. This study aims to determine the number of orders in the next 1 year using Ordinary Least Square (OLS) and to determine the optimal number of orders that must be issued by business actors, to find out when reorders must be made (ROP), and the application of the EOQ and OLS methods in Tandi's Bakery to optimize inventory costs. This type of research is descriptive in terms of data used primary and secondary data in the form of analysis related to the supply of raw materials for bread.
The results showed that the sales of bread in the next 1 year amounted to87,868 pcs of bread according to the OLS method. The optimal purchase amount for Tandi's Bakery raw materials uses the EOQ method in the 2021/2022 period, namely 256 kg of flour, 55 kg of butter and 113 liters of liquid milk while in the previous period 291 kg of flour, 48 kg of butter and 69 liters of liquid milk. The frequency of orders using the EOQ method in the 2021/2022 period, namely 8 times flour, 4 times butter and 6 times liquid milk, while the order frequency for the previous period was 9 times flour, 4 times butter and 4 times liquid milk. The total inventory cost (TIC) using the EOQ method for the 2021/2022 period is as follows: Flour Rp. 255,148, Butter Rp. 135,417 and liquid milk of Rp. 174,006 while the previous period, namely flour, amounted to Rp. 891,032, Butter Rp. 870,670, liquid milk of Rp. 869,954. The exact time to reorder the reorder point (ROP) according to the EOQ method in the 2021/2022 period is 74,909 kg of flour, 8,438 kg of butter and 22,476 liters of liquid milk. In the previous period flour 97.129 kg, butter 6.387 kg and liquid milk 8.998 liters.

INTRODUCTION

Background of the problem

With the development of technology, buying and selling activities can now be done easily and practically, there have been many online buying and selling application services. Judging from developments in Indonesia itself, based on data from the Central Statistics Agency (BPS), MSMEs (Micro, Small and Medium Enterprises) in 2018 increased to 64.2 million businesses, from 52.8 million businesses in 2010. This increase in numbers has brought MSMEs as the biggest contribution to Gross Domestic Product (GDP), namely 60.3 percent, and MSMEs have also absorbed 97 percent of the total workforce and 99 percent of employment.

Tandi's Bakery is one of the SMEs located in the Bogor area whose processed products are in the form of bread, cakes and other processed flour. Production that never stops every day, inventory control has a very important position, because it has a very large influence on production activities. The main raw materials are flour, butter and liquid milk. Initially wanted to produce something at little cost and according to a desired schedule, eating these goods and supplies had to be available. Companies must determine when to replenish inventory and how much to order at a time.

Table 1. Use of Tandi's Bakery Raw Materials for the 2020-2021 period
Raw Material Usage Data for the Past 1 Year

Period	Month	raw material		
		flour (kg) 1 sack 25 kg	butter (1 kg/25 gr)	liquid milk (1 kg flour/450 liquid milk)
2020	August	246.64	14,665	13.70
	September	172	10	9.56
	October	212	13	11.78
	November	132	7,5	7,33
	December	286.64	17.165	15.92
2021	January	100	5,5	5.56
	February	157.04	9,065	8,72
	March	351.04	21,19	19.50
	April	291.52	17,47	16,20
	May	272	16,25	15,11
	June	161.9555556	18,22	48,59
	July	151.1111111	17	48,59

Source: Tandi's Bakery (2020-2021)

The data in table 1.1 above shows that the use of raw materials at Tandi's Bakery, if observed, has fluctuated, so business owners must be able to buy raw material stock for Safety Stock and when to place orders again. This can cause several problems, including the stock of raw materials that must be prepared to meet the number of orders cannot be ascertained, because requests from consumers usually make pre orders (PO) suddenly.

Thus the business actor should determine the raw material supply policy that can be applied at Tandi's Bakery. Because inventory costs can be reduced as small as possible. To minimize inventory costs, the Economic Order Quantity (EOQ) method can be used. EOQ is the most economical volume or number of purchases to be made at each purchase, and in order to achieve minimum inventory levels, lower costs and better quality. Planning the EOQ method in a company will be able to minimize the occurrence of stock outs so as not to disrupt processes within the company and be able to save on inventory costs incurred by the company because of the efficiency of raw material supplies within the company concerned.

With the application of the EOQ method in the company, it will be able to reduce storage costs, save space, both for warehouse space and work space, solve problems that arise from the large amount of inventory that has accumulated thereby reducing the risks that can arise due to pests because flour, butter and liquid milk are very susceptible to contamination. or damaged. The analysis of the EOQ method can be used easily and practically to plan how many times a material is purchased and in what quantity to buy.

In addition to determining the EOQ, the company must also determine the reorder time for raw materials to be used or the Reorder point (ROP) so that the purchase of materials specified in the EOQ does not disrupt the smooth running of production activities. Reorder Point (ROP) is the point at which the amount of inventory indicates the time to place orders again. From the EOQ and ROP calculations, the minimum and maximum points can be determined, namely when the purchased raw materials arrive. The purpose of determining the repurchase point is so that the funds embedded in the material inventory are not excessive so that waste does not occur.

Based on the description above, Tandi's Bakery often experiences problems related to raw materials, namely the lack of taking into account and paying attention to raw material inventory planning so that the company's production process is disrupted. Based on the various descriptions of the background above, the researcher is interested in choosing the title: "Analysis Of Raw Material Control In Tandi's Bakery"

This study aims at the following objectives:

1. To analyze the number of bread sales for the next year at Tandi's Bakery
2. To analyze purchasing and the optimal amount of raw material requirements at Tandi's Bakery.
3. To analyze the frequency of purchasing raw material inventory during one period at Tandi's Bakery.
4. To analyze how much the total cost of supplying raw materials needed by Tandi's Bakery.
5. To analyze the reorder point of raw materials at Tandi's Bakery during the grace period.

LITERATURE REVIEW

Inventory

Are all types of goods owned by the company and used to support its business processes, Martono (2019: 83). Each company or business unit carries out three stages of the process, namely input and then processing and becoming output products, therefore the company or business unit must have sufficient raw material supplies. The use of inventory is very important to meet consumer demand, with sufficient supplies of raw materials to make the production process run smoothly and avoid stock outs.

According to Handoko (2015: 333) inventory is a general term that denotes everything or organizational resources that are stored in anticipation of fulfilling requests. Inventory is a technique that must be held to ensure smooth operation of production activities, as well as to determine procurement schedules and the number of orders for goods that should be made by the company (Ristono in Andries, 2019). Based on the information above, it can be seen that inventory is very important, meaning that the company or business unit functions to connect successive operations in the manufacture of products and those that will be resold.

Besides that, there is another understanding of inventory, namely inventory is determining the balance between inventory investment and customer service. Inventory goals will not achieve a low-cost strategy without good inventory management (Heizer and Reinder in Andries, 2019). Meanwhile, Heizer and Render (2016: 553) argue that inventory is one of the most expensive assets of many companies, reflecting as much as 50% of the total capital invested. But on the other hand, companies can reduce costs and reduce inventory inventory. The goal of inventory management is to strike a balance between inventory investment and customer service.

Inventory types

Heizer and Render in Najoan, Paladeng, and Sumarauw (2019), stated that based on the production process, inventory is divided into four types, namely:

1. Raw material inventory is material that has been purchased but has not been processed. Materials can be obtained from natural sources or purchased from suppliers (producers of raw materials).
2. Inventories of semi-finished goods (work in process) or goods in process are components or raw materials that have gone through a production process/have gone through several change processes, but have not been completed or will be reprocessed into finished goods.
3. Maintenance/repair/operating supplies (maintenance, repair, operating) supplies are supplies provided for the maintenance, repair, and operational needs to keep machines and processes productive.
4. Inventory of finished goods (finished good inventory) is a product that has been completed in production or processing and is ready for sale.

Inventory Function

According to Ahmad (2018: 169) company inventories must be carried out so that operational activities can still be carried out without having to wait for the availability of inputs or raw materials to be carried out without having to wait for the availability of inputs or raw materials and other needs. Here are some inventory functions.

1. Decoupling function

The company's functions must be carried out so that activities are decoupled by holding operational groupings separately.

2. EconomicSize function
   Inventory in large quantities must be carried out with consideration of discounts on purchases of materials, discounts on quality in the conversion process, and adequate warehouse capacity.
3. Anticipation Function
   Inventory of materials whose function is to rescue must be carried out if there is a delay in the arrival of material orders from suppliers. The main goal is to keep the convection process running smoothly. Setting high prices consistent with products of high status or prestige. Prices are set without reflecting too much on the cost structure or level of competition.

Inventory Control

Inventory control is the recording of inventory to be verified through all ongoing audits. Such an audit is known as cycle counting. With periodic inventory counts, records are verified and inaccuracies found are periodically documented. Causes of inaccuracies are sought and corrective action is taken to ensure inventory integration (Heizer and Render in Najoan, Palandeng, Sumarauw, 2019).

According to Sofjan and Assauri in Lahu and Sumarauw (2017) revealed that inventory control is one of the activities of a sequence of activities that are closely linked to each other in the entire production operation of the company in accordance with what has been planned in advance both time, quantity, quality as well as the costs.

Purpose of Inventory Control

According to Carter in Timothy and Sumarauw (2020) states the basic purpose of raw material inventory control is the ability to place orders at the right time with the best sources to obtain the right quantity at the right price and quality to protect inventory including developing and using security measures to prevent damage to inventory or loss of inventory.

Inventory control implemented by each company has a purpose, in detail according to Assauri in Wijaya, Mandey, Sumarauw (2016). The purpose of inventory can be stated as a form of business to:

1. Take care not to let the company run out of inventory so that it can result in the cessation of production activities.
2. Ensure that the formation of inventory by the company is not too large or excessive, so that the costs arising from the inventory are not too large.
3. Keeping small purchases is avoided as this can result in large order costs.

Inventory Cost

To calculate the cost of inventory, a company or business unit must calculate the cost of ordering and ordering. According to Rangkuti in Wijaya, Mandey, and Sumarauw (2016). Say the cost of inventory consists of:

1. Storage fee (*holding cost)*that is, costs that consist of those costs that vary directly with the quantity of inventory. Storage costs per period will be greater if the quantity of materials ordered is greater or the average inventory is higher. The costs included as storage fees are:
   a. Cost of storage facilities (including lighting, air conditioning, etc.)
   b. capital cost (*opportunity cost of capital),*namely alternative income for funds invested in stock
   c. Obsolescence costs
   d. Cost of physical calculations
   e. Inventory insurance costs
   f. Inventory tax expense
   g. Theft, handling or robbery charges
   h. Inventory handling fees and so on
2. Ordering or purchasing costs (ordering costs or procurement costs) These costs include:
   a. Process orders and shipping costs
   b. Wages
   c. Phone charges

d. Correspondence expenses
e. Packing and weighing costs
f. Inspection fees
g. Shipping costs to the warehouse
h. Current debt costs and so on

3. Setup costs (set-up costs). This happens if the materials are not purchased, but are produced in the company's factory, the company faces setup costs to produce certain components. These costs occur from:
   a. Cost of idle machines
   b. Direct labor preparation costs
   c. scheduling fee
   d. Expedition costs and so on
4. The cost of running out or shortage of materials (storage cost) is the cost incurred if the supply is not sufficient for the demand for materials. The costs included in the cost of material shortages are as follows:
   a. Lost seller
   b. Lost customers
   c. Special order fee
   d. Expedition cost
   e. Price gap
   f. Disruption of operation

Economic Order Quantity (EOQ)

Economic Order Quantity(EOQ) is one of the oldest and most widely known inventory control techniques, this inventory control method answers two important questions, namely when to order and how much to order Heizer and Render in Andries (2019). so according to the explanation above the EOQ method can minimize costs which will later be embedded in a lot of inventory, and know when to order so there are no shortages and excesses with the optimal amount.

Economic Order Quantity(EOQ) answers the question how much to order. Economic Order Quantity (EOQ) or Economic Lot Size (ELS) is the most famous and oldest inventory management method since 1914 which was introduced by FW. Harris. This model can be used today because it is relatively easy to use. Determining the amount of EOQ is calculated by:

$$EOQ = \frac{2P \times I}{C \times K}$$

Information
K= Storage cost (in percentage)
I = Setup Fee
P = Material requirements in one period
C = Price of Materials

Safety Stock and Reorder Point

According to Ahmad (2018: 176) Extra safety stock is stored as collateral in the face of fluctuating demand. Safety stock is calculated by the formula:

Usage per day x average delay in materials.

The reorder point is the inventory level where when the inventory has reached that level, an order must be made by Heizer and Render in Langke, Palandeng and Karuntu (2018). However, according to Ahmad (2018: 175) The reorder point is the point in time where a new order must be placed. Lead time is the time required to receive an economic order quantity when an order is placed. To receive an economic order quantity an order is placed. To be able to calculate the reorder point, the rate (Rate of Usage) and waiting time need to be known.

Usage per day x average waiting time.

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Previous Research

Andries (2019), conducted a study entitled Analysis of Soybean Raw Material Inventories at the Nur Cahaya Tofu Factory in Batu City Using the Method*Economic Order Quantity*(EOQ). The analysis model used is an analysis using the Economic Order Quantity method. The results showed that the raw material inventory control implemented by the Nur Cahaya Tofu Factory was not optimal. The company does not use a safety stock and reorder point system, so it often experiences shortages of soybean raw materials because the system for providing places for soybean raw materials is not sufficient to accommodate large quantities.

Najoan, Palandeng,Sumarauw (2019), conducted a study entitled Analysis of Cement Inventory Control Using the EOQ Method at the Sulindo Gedung Building Store. With the Economic Order Quantity (EOQ) Method. The analysis model used is an analysis using the Economic Order Quantity method. The results showed that the raw material inventory control implemented by Sulindo Gedung Stores was not optimal. The company had run out of raw materials, resulting in unfulfilled consumer demand.

Wow, Sumarauw(2017), conducted a study entitled Analysis of Raw Material Inventory Control to Minimize Inventory Costs at Dunkin Donuts Manado. With the Economic Order Quantity (EOQ) Method. The analysis model used is an analysis using the Economic Order Quantity method. The results showed that the raw material inventory control implemented by Dunkin Donats Manado was not optimal. The company does not run out of raw materials, it's just that it hasn't been able to minimize inventory costs.

Table 2. Previous Research

RESEARCHERS	TITLE	VARIABLE	ANALYSIS	RESULTS
Andries (2019)	Analysis of Soybean Raw Material Inventory at Nur Cahaya Tofu Factory in Batu City Using the Economic Order Quantity (EOQ) Method	Inventories, Raw Materials, Economic Order Quantity (EOQ)	Analysis using the Economic Order Quantity (EOQ) method	The results of raw material inventory control using the EOQ method, safety stock and reorder points have a positive effect on the company because what the company applies is not optimal.
Najoan, Palandeng, sumarauw (2019)	Analysis of Cement Inventory Control Using the EOQ Method at Sulindo Gedung Stores. With the Economic Order Quantity (EOQ) Method	Inventories, Raw Materials, Economic Order Quantity (EOQ)	Analysis using the Economic Order Quantity (EOQ) method	The results of raw material inventory control using the EOQ method, safety stock and reorder points have a positive effect on the company because what the company applies is not optimal.
Lahu, Sumarauw (2017)	Analysis of Raw Material Inventory Control to Minimize Inventory Costs at Dunkin Donuts Manado.	Inventories, Raw Materials, Economic Order Quantity (EOQ)	Analysis using the Economic Order Quantity (EOQ) method	The results of raw material inventory control using the EOQ method, safety stock and reorder points have a positive effect on the company because what the company applies is not optimal.

Source: EMBA Journal (2021)

RESEARCH METHODOLOGY

This research was conducted inTandi's Bakerywhich is located at Jl guntur No 26 RT.01/RW.06, Babakan, Central Bogor District, Bogor City, West Java 16280. This research began in March to August 2021

This type of research is descriptive quantitative

Data collection techniques carried out by the author are observation, interviews and documentation.

On the basis of the research conducted by the author, the method collected is by using primary data research and secondary data. Primary data is data collected directly from the object under study as well as direct field surveys to solve the problems being handled by the author. While secondary data is data obtained indirectly in the form of information that has something to do with data obtained indirectly, in the form of information that has something to do with research that complements or supports primary data.

The data analysis techniques used in this study are Ordinary Least Square (OLS), Economic Order Quantity (EOQ), Purchase frequency and Reorder Point (ROP).

Analysis of the Ordinary Least Square (OLS) method

Is one method in the form of time series data or time series, which requires past sales data to forecast future sales so that the results can be determined. Ordinary Least Square is a forecasting method used to see trends from time series data.

$$Y = a + bx$$

Information:
Y : Number of Sales
a and b : coefficient
x/t : specific time in the form of a code

In determining the value of x/t, alternative techniques are often used by giving a score or code. In this case the data is divided into two groups, namely:

a. If the data is even, then the score for the t value is: ...,-5, -3, -1, 0, 1, 3, 5,...
b. If the data is odd, then the score for the t value is: ..._-3, -2, -1, 0, 1, 2, 3,...

Inventory analysis based on the EOQ method

The Economic Order Quantity (EOQ) method used to calculate EOQ is:

$Q = \frac{\sqrt{2xDx\,S}}{H}$

Information :
Q = Optimal amount per order (Kg)
D = Annual demand (Kg)
S = Order fee per order (Rp)
H = Storage fee (Rp)

Order Fee per period

Ordering costs per period are costs incurred in connection with ordering Bread raw materials for 1 year. To calculate storage costs at Tandi's Bakery, the following formula is used:

Order fee =

$$\frac{D}{Q}S$$

2. Storage Fee per year

Storage costs per year are costs incurred in connection with the cost of storing goods purchased by a business unit in 1 year. To calculate storage costs at Tandi's Bakery, the following formula is used:

Storage fee =

$$\frac{Q}{2}H$$

Total inventory cost

TIC =

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

Order Frequency

To find out the frequency of ordering in one period, the following formula is used:

Order Frequency =

$$\frac{D}{Q}$$

Reorder point

The reorder point calculation is carried out to find out the minimum stock amount when having to place a reorder. In this case, lead time information is needed so that the demand for goods during that lead time can be estimated. Other information needed is the amount of safety stock which is determined based on management policy. The calculation steps are as follows:

1.daily needs

$$d = \frac{\text{D}}{\text{Jumlah hari kerja dalam satu tahun}}$$

2.*Reorder point*

According to Ahmad (2018: 175) To be able to calculate the reorder point, it is necessary to know the rate of usage and waiting time.

Usage per day x average waiting time.

3.*Safety Stock*

According to Ahmad (2018: 176) Security supplies (*safety stock*) is extra inventory held as collateral in the face of fluctuating demand. Safety stock is calculated by the formula.

Usage per day x average material delay

RESEARCH RESULTS AND DISCUSSION

Results

Company Overview

Tandi's Bakery is an UMKM (Micro, Small and Medium Enterprises) engaged in selling food in the form of bread, pastries, cakes and other flour preparations. Tandi's Bakery is a homemade business that was founded in 2017 by a husband and wife named Zahakir Haris and Renata C Tanessia. The location is on Jl Guntur No. 26 Rt 01 Rw 06 Babakan, Central Bogor District, Bogor City.

Tandi's Bakery is still continuing to develop both sales and manufacture of new processed products. The increasing number of orders from customers causes the use of raw materials to be

controlled properly, especially for the use of best seller products such as various Sweet Bread and Bolen, so that the product quality is maintained and which will not interfere with production activities.

Initially, Tandi's Bakery only sold processed sweet bread and pastries, but gradually its products increased in the form of birthday cakes, bolen, pizza and other processed flour products.

Tandi's Bakery has also collaborated with several hotels in the city of Bogor, this is done to improve and introduce the products they sell and find new customers in other segments.

Every company usually has a vision, mission and quality policy which can support the company's operations in order to achieve the desired goals, while the vision, mission and quality policy in Tandi's Bakery are as follows:

Vision: Open a bakery with a feel-at-home concept (Homey)

Mission:

1. Prioritizing product quality without preservatives
2. Quick response and friendly in serving buyers

Discussion

Sales forecasting analysis

In forecasting analysis one year ahead at Tandi's Bakery using the Ordinary Least Squares formula, namely:

$$Y = a + bX$$

next look for the value of a (constant) and b (regression coefficient) where both are used to calculate the sales forecast for each week to come at Tandi's Bakery.

Table 3. Calculation Results Looking for a and b

Y = a + bx		
MENGHITUNG a		MENGITUNG b
a=∑Y/n		b=∑XY/∑X²
1547		38

Source: data processing, 2021

From table 4.2. above, we just have to determine and calculate according to the existing formula. 1547 is the result of Y divided by n while 38 is the result of XY divided by X^2 in table 4.1.

$$a = = 1547\frac{46403,2}{30}$$

$$b = = 38\frac{93758,6}{2480}$$

Once the number of a (constant) and b (regression coefficient) is known, then you can proceed to calculating the number of sales forecasts for the next year using the formula in the Ordinary Least Square (OLS) method. The forecast for bread sales for the next year is 87868 pcs of bread, which is obtained from the weekly sales results in table 4.

Table 4. Sales Forecasting Results for the Next 1 Year

Formula	Point a	value b	Results Forecasting
Y = a + bX	1547	38	87868

Source: data processing, 2021

From the table above, it is known that the forecasting results for the next one year at Tandi's Bakery are87868by using the Ordinary Least Square formula. In this way, business actors can estimate

the need for raw materials to be used, so that they are more efficient and optimal both in terms of ordering and using raw materials.

Calculation of the Number of Bread Raw Material Orders Using EOQ

The EOQ method allows businesses to determine the optimal number of orders with a constant number of requests and lead times. Based on research conducted at Tandi's Bakery, it is known that the purchase of raw materials such as flour, butter and milk has not considered the optimal amount of purchase. Business actors purchase raw materials in a sudden manner with an amount that is sometimes lacking in certain weeks. So it is less efficient in terms of preparing the optimal amount of raw material needs (Vikaliana, 2020). From the results of the sales forecasting that the researchers did, the purchase of bread raw materials for the next 1 year can be seen in the table below:

Table 5. Bread Raw Material Requirement Data for the Next 1 Year

Needs Raw material	Needs Flour (Kg)	Needs Butter (Kg)	Needs Liquid Milk (Liters)
Amount Needs	1953	220	586

Source: Data processing, 2021

Based on table 4.5. It is known that the raw material requirement for flour is 1,953 kg, butter is 220 kg and liquid milk is 586 liters in the next year obtained from the value of forecasting results for one year to come using the Ordinary Least Square method.

Bread Raw Material Inventory Cost Analysis

In the analysis of bread raw material inventory costs, there are two cost components, namely ordering costs and storage costs. Ordering costs are costs incurred because Tandi's Bakery procures goods. Ordering costs for raw materials are carried out simultaneously twice a month. Components of the cost of ordering bread raw material products include telephone and transportation costs. The components of ordering and storage costs for the next year based on Tandi's Bakery policies are presented in the table below:

Table 6. Components of Ordering Costs and Storage Costs of Bread Raw Materials

Telephone and Transportation Booking Fees (Rp)
Flour (Kg) Butter(Kg) Liquid Milk(Liters) **IDR 16,667 IDR 16,667 IDR 16,667**
Storage Fee Per Order (Rp)
Flour(Kg) Butter(Kg) Liquid Milk(Liters) **IDR 1,000 IDR 2,500 IDR 1,550**

Source: Data Processing, 2021

Ordering costs arise because Tandi's Bakery orders 3 main raw materials by telephone and transportation costs. Business actors do not incur costs of lowering orders into warehouses because business actors use private vehicles to purchase stock of raw materials. Telephone and transportation are obtained from the sum of telephone and transportation costs and then divided by the 3 main raw materials which are ordered 2 times a month simultaneously.

The second type of inventory costs is storage costs. To find out the cost of storing flour bread raw materials per unit per kg, which is 1,000 for butter of 2,500 and liquid milk of 1,550. The storage cost is obtained based on the storage cost per unit per kg and liter multiplied by the price of the product and multiplied by 10% of Tandi's Bakery policy to produce storage costs.

If the data requirements, ordering costs and storage costs are known, the optimal purchase quantity can be calculated using the formula:

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

Description : Q = Optimal quantity per order
D = Quantity of use per year
S = Order cost per order
H = Storage fee

	TIC	ROP	
Flour	$TIC = \left(\frac{256}{2} x\ 1.000\right) + \left(\frac{1.953}{256} x\ 16.667\right)$ *TIC* =Rp. 128,000 + Rp. 127,148 *TIC* =Rp. 255,148		
Butter	$TIC = \left(\frac{Q}{2} x\ H\right) + \left(\frac{D}{Q} x\ S\right)$ $TIC = \left(\frac{55}{2} x\ 2.500\right) + \left(\frac{220}{55} x\ 16.667\right)$ *TIC* =Rp. 68,750 + Rp. 66,667 *TIC* =Rp. 135,417		
Liquid milk	$TIC = \left(\frac{Q}{2} x\ H\right) + \left(\frac{D}{Q} x\ S\right)$ $TIC = \left(\frac{113}{2} x\ 1.550\right) + \left(\frac{586}{113} x\ 16.667\right)$ *TIC* =Rp. 87,575 + Rp. 86,431 *TIC* =Rp. 174,006		

Bread Raw Material Reorder Point

If the EOQ method can answer the question of how many orders are optimal, then the reorder point can answer when a business actor must place an order again. A reorder point can be made if the amount of inventory in stock continues to decrease, therefore business actors must determine when the reorder point will be made so that they do not experience a stock shortage or stock out or excess stock or over stock.
The lead time at Tandi's Bakery is 2 weeks, therefore it can be calculated using the formula:

1. Daily Goods Needs

$$d = \frac{\text{D}}{\text{Jumlah hari kerja dalam satu tahun}}$$

2. Reorder Point = Usage per day x average waiting time.

Daily Needs of Goods
J
1. Flour
d =$\frac{1.953}{365}$=5.35 rounded up to 6
The need for goods per day for flour is 6 kg

2. Butter
d =$\frac{220}{365}$=0.60 is rounded off to 1 Kg
The need for goods per day for Butter is 1 Kg

3. Liquid milk

d =$\frac{586}{365}$=1.60 is rounded up to 2 Liters

The daily need for liquid milk is 2 liters

Comparison

Researchers made comparisons with company policies that had been implemented at Tandi's Bakery one year ago, and analyzed calculations using the EOQ method. The aim is for researchers to find out the comparison between company policies and research conducted using the EOQ method so that optimal and efficient values can be identified in the procurement of raw materials; Flour, Butter and Liquid Milk.

Data on raw material requirements at Tandi's Bakery last year are as follows:

Table 7. Bread Raw Material Requirement Data for the Past 1 Year

Needs Raw material	Needs Flour (Kg)	Needs Butter (Kg)	Needs Liquid Milk (Liters)
Amount Needs	2533,946	166,525	220.56
	Weekly average		
Needs Raw material	Needs Flour (Kg)	Needs Butter (Kg)	Needs Liquid Milk (Liters)
Amount Needs	48,7	3,2	4,2

Source: Data processing, 2021

Based on table 4.7. it is known that last year the amount of raw material needed was Flour of 2533.946 Kg Then Butter of 166.525 Kg and Liquid Milk of 220.56 Liters were obtained directly from business actors according to last year's data. In the 2020/2021 period, the average purchase of raw materials every week is flour of 48.7 kg, butter of 3.2 kg and liquid milk of 4.2 liters.

Raw Material Inventory Cost Analysis

In the analysis of bread raw material inventory costs, there are two cost components, namely ordering costs and storage costs. Ordering costs are costs incurred because Tandi's Bakery procures goods. Ordering costs for raw materials are carried out simultaneously twice a month. Components of the cost of ordering bread raw material products include telephone and transportation costs. The components of ordering and storage costs for the next year based on Tandi's Bakery policies are presented in the table below:

Table 8. Components **of Ordering Costs and Storage Costs of Bread Raw Materials**

Telephone and Transportation Booking Fees (Rp)
Flour(Kg) Butter(Kg) Liquid Milk(Liters) IDR 16,667 IDR 16,667 IDR 16,667
Storage Fee Per Order (Rp)
Flour(Kg) Butter(Kg) Liquid Milk(Liters) IDR 1,000 IDR 2,500 IDR 1,550

Source: Data Processing, 2021

Ordering costs arise because Tandi's Bakery orders 3 main raw materials by telephone and transportation costs. Business actors do not incur costs of lowering orders into warehouses because business actors use private vehicles to purchase stock of raw materials. Telephone and transportation are obtained from the sum of telephone and transportation costs and then divided by the 3 main raw materials which are ordered 2 times a month simultaneously.

The second type of inventory costs is storage costs. To find out the cost of storing flour bread raw materials per unit per kg, which is 1,000 for butter of 2,500 and liquid milk of 1,550. The storage cost is obtained based on the storage cost per unit per kg and liter multiplied by the price of the product and multiplied by 10% of Tandi's Bakery policy to produce storage costs.

If the data requirements, ordering costs and storage costs are known then the total inventory control cost can be calculated based on Tandi's Bakery policy which is calculated with the total inventory cost as follows:

	$TIC = \left(\frac{Q}{2} x\ H\right) + \left(\frac{D}{Q} x\ S\right)$ $TIC = \left(\frac{48,7}{2} x\ 1.000\right) + \left(\frac{2533,946}{48,7} x\ 16.667\right)$ *TIC* =Rp. 24,365 + Rp. 866667 *TIC* =Rp. 891032
	$TIC = \left(\frac{Q}{2} x\ H\right) + \left(\frac{D}{Q} x\ S\right)$ $TIC = \left(\frac{3,2}{2} x\ 2.500\right) + \left(\frac{166,525}{3,2} x\ 16.667\right)$ *TIC* =Rp. 4,003 + Rp. 866667 *TIC* =Rp. 870,670
	$TIC = \left(\frac{Q}{2} x\ H\right) + \left(\frac{D}{Q} x\ S\right)$ $TIC = \left(\frac{4,2}{2} x\ 1.550\right) + \left(\frac{220,56}{4,2} x\ 16.667\right)$ *TIC* =Rp. 3,287 + Rp. 866667 *TIC* =Rp. 869,954

Bread Raw Material Inventory Control Analysis Using EOQ

If the EOQ method can answer the question of how many orders are optimal, then the reorder point can answer when a business actor must place an order again. A reorder point can be made if the amount of inventory in stock continues to decrease, therefore business actors must determine when the reorder point will be made so that they do not experience a stock shortage or stock out or excess stock or over stock.

The lead time at Tandi's Bakery is 2 weeks, therefore it can be calculated using the formula:

1. Daily Goods Needs

$$d = \frac{\text{D}}{\text{Jumlah hari kerja dalam satu tahun}}$$

2. Reorder Point =Usage per day x average waiting time.

Raw material	**EOQ**	**ROP**	**Order Frequency**
Flour	EOQ = = 291 Kg $\frac{\sqrt{2x2.533,946x16.667}}{1.000}$	6.942 x 14 = 98	$\frac{2.533,946}{291}$= 8.707 rounded to 9
Butter	EOQ = = 48 Kg $\frac{\sqrt{2x166,525x16.667}}{2.500}$	0.256 x 14 = 7	$\frac{166,525}{48}$= 3.469 round to 4
Liquid milk	EOQ = = 69 Liters $\frac{\sqrt{2x220,56x16.667}}{1.550}$	0.602 x 14	= = 3.196 rounded to 4 $\frac{229,56}{69}$

Total Inventory Cost of Bread Raw Materials

After getting the calculation results of all variables, it can be seen that the optimal total inventory cost or the total inventory cost according to the EOQ method. Optimum total inventory cost or EOQ is the nominal amount spent to carry out raw material inventories economically and efficiently. Calculation of the total inventory cost or total inventory cost in the coming year in detail can be calculated:

	$TIC = \left(\frac{Q}{2} x\ H\right) + \left(\frac{D}{Q} x\ S\right)$ $TIC = \left(\frac{291}{2} x\ 1.000\right) + \left(\frac{2.533,946}{291} x\ 16.667\right)$ *TIC* =Rp. 145,500 + Rp. 145,129 *TIC* =Rp. 290,629
	$TIC = \left(\frac{Q}{2} x\ H\right) + \left(\frac{D}{Q} x\ S\right)$ $TIC = \left(\frac{48}{2} x\ 2.500\right) + \left(\frac{166,525}{48} x\ 16.667\right)$ *TIC* =Rp. 60,000 + Rp. 57,821 *TIC* =Rp. 117,821
	$TIC = \left(\frac{Q}{2} x\ H\right) + \left(\frac{D}{Q} x\ S\right)$ $TIC = \left(\frac{69}{2} x\ 1.550\right) + \left(\frac{229,56}{69} x\ 16.667\right)$ *TIC* =Rp. 53,475 + Rp. 53,275 *TIC* =Rp. 106,750

Tandi's Bakery Policy Comparison Summary With EOQ

The summary of the calculation results for the comparison of the policies used by Tandi's Bakery and the results of the calculation of the Economic Order Quatity (EOQ) and the optimal cost per order, order frequency and total inventory cost for flour, butter and liquid milk raw materials are described for ease of comparison in the following table below.

Comparison of the Optimal Amount of Raw Materials

The results of the comparison of Tandi's Bakery policies and the calculation of the optimal amount of raw materials according to the EOQ calculation can be seen in the table below:

Table 9. Results of Comparison of Optimal Amount of Raw Materials (EOQ)

Raw material	Policy Tandi's Bakery	Method EOQ	Difference (kg)
Flour	48,729	290,628	241.8986943
Butter	3,202	47,120	43.91800928
Liquid milk	4,241	68,871	64.6295426

Source: 2021 data processing

Data in table 4.9. It can be seen that the optimal number of raw material orders for the Tandi's Bakery policy when compared to the EOQ calculation has a significant difference, namely 241.898 kg of flour, 43.918 kg of butter and 64.629 liters of liquid milk. If the business actor applies the optimal amount using the EOQ method, the company can save on costs that must be incurred.

Comparison of Number of Order Frequency

ResultsComparison of the number of frequency orders for Tandi's Bakery policy with the calculation of the frequency of EOQ orders can be seen in the table below:

Table 10. Order Frequency Comparison Results

Raw material	Policy Tandi's Bakery	Method EOQ	Difference
Flour	15	9	6
Butter	15	4	11
Liquid milk	15	4	11

Source: 2021 data processing

Data in table 4.10. It is clear that the frequency of orders applied by business actors is still not efficient, because according to the results of the EOQ calculation the difference obtained is 6 times flour, 11 times butter and 11 times liquid milk. If business actors can apply the frequency of orders optimally according to the EOQ calculation, then the supply of raw materials can be efficient.

Comparison of Total Inventory Cost (TIC)

ResultsComparison of the number of frequency orders for Tandi's Bakery policy with the calculation of the frequency of EOQ orders can be seen in the table below:

Table 11. Comparison Results of Total Order Cost (TIC)

Raw material	Policy Tandi's Bakery	Method EOQ	Percentage
Flour	IDR 891,571	IDR 290,629	33%
Butter	IDR 870,342	IDR 117,821	14%
Liquid milk	IDR 868,811	IDR 106,750	12%

Source: 2021 data processing

Seen in table 4.11. it is clear that Tandi's Bakery can save the total cost of supplying flour by around 33% or Rp. 290,629 then about 14% butter or Rp. 117,821 and about 12% liquid milk or Rp. 106,750. The total inventory cost incurred by business actors is greater than the calculation according to the EOQ method so that in this case the inventory control system implemented by business actors is not optimal. Business actors can actually save on expenses that are usually made to place an order. Savings based on this calculation can be made if the frequency of orders made by business actors is reduced to an optimal point. To get optimal value in ordering flour raw materials.

CONCLUSIONS AND SUGGESTIONS

In accordance with the descriptions above and the results of the calculations and data analysis that have been described previously, the following conclusions can be drawn:

1. Forecasting raw material supplies at Tandi's Bakery using the OLS method in the 2021/2022 period, namely87868 Pcs Bread
2. The optimal purchase amount for Tandi's Bakery raw materials uses the EOQ method in the 2021/2022 period, namely 256 kg of flour, 55 kg of butter and 113 liters of liquid milk while in the previous period 291 kg of flour, 48 kg of butter and 69 liters of liquid milk.
3. The frequency of ordering raw materials for Tandi's Bakery using the EOQ method in the 2021/2022 period, namely 8 times flour, 4 times butter and 6 times liquid milk while the order frequency for the previous period was 9 times flour, 4 times butter and 4 times liquid milk.

4. Totalthe inventory cost (TIC) of Tandi's Bakery raw materials using the EOQ method for the 2021/2022 period as follows: Flour Rp. 255,148, Butter Rp. 135,417 and liquid milk of Rp. 174,006 while the previous period, namely flour, amounted to Rp. 891,032, Butter Rp. 870,670, liquid milk of Rp. 869,954.
   Totalraw material inventory calculated by EOQ is less than the policy issued by Tandi's Bakery, there are savings in raw material inventory costs if Tandi's Bakery uses the EOQ method in raw material inventory.
5. TimeReorder reorder point (ROP) at the right time according to the EOQ method in the 2021/2022 period, namely 74,909 kg of flour, 8,438 kg of butter and 22,476 liters of liquid milk. In the previous period flour 97.129 kg, butter 6.387 kg and liquid milk 8.998 liters

Based on the conclusions above, the researcher can provide suggestions that can be taken into consideration for Tandi's Bakery including:

1. Business actors need to review the control methods applied so far, because based on the processing results using the method used by researchers, the total cost of inventory can still be minimized. Using the EOQ method in the bread raw material procurement policy will get the optimal product purchase quantity at a minimum cost compared to the previous Tandi's Bakery policy.
2. Business actors should determine the Reorder Point (ROP) in raw material inventory control to protect or guard against possible product or item shortages that are greater than expected and to prevent delays in ordered raw materials.

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