

ANALYSIS OF THE EFFICIENCY OF RICE RAW MATERIAL SUPPLIES USING ECONOMIC ORDER QUANTITY (EOQ) METHOD (Case Study on Pon Djaya Chicken Porridge)

1st Gita Camelina, 2nd Drs. Jusuf Hariyantp, M.Sc

Management Department

Indonesian College of Economic Sciences Jakarta, Indonesia

Gitachan27@gmail.com; jusuf_hariyanto@stei.ac.id

Abstract– *This study aims to analyze efficient inventory levels in rice raw materials using the EOQ (Economic Order Quantity) method.*

The object of this research is Bubur Ayam Pon Djaya located in Pulomas, Jakarta Timur. The data was obtained based on records kept by Bubur Ayam Pon Djaya during the period August 2017 hingga July 2018. The data used in this study are: rice raw materials purchased during the period August to July 2018, data on rice raw materials during the period August 2017 to July 2018, data on ordering costs and storage costs, as well as the frequency of purchases. The analysis was conducted using EOQ methods, safety stock, reorder points, and maximum inventory in the period August 2017 to July 2018.

The results of this study show that the policy of rice raw materials as the main raw material in Pon Djaya Chicken Porridge is considered less efficient and not optimal. Based on the calculation results in this study that used the EOQ method to make the ordered raw materials more efficient and optimal, namely as much as 5,098.5 liters of rice during the period August 2017 to July 2018. By applying EOQ method, Bubur Ayam Pon Djaya can save around Rp 5,265,000 in inventory costs during the period August 2017 to July 2018.

Kata Kunci: *Economic Order Quantity (EOQ), Reorder Point (ROP), Safety Stock (SS).*

I. INTRODUCTION

It is expected that external and internal factors affect a company that wants to progress and develop. Internal factors are derived from within the company that can be controlled or anticipated, while external factors are from outside the company that cannot be controlled directly by the company. The Company must be able to manage and anticipate external and internal factors

of the company, this is for the sustainability of the company's life. One of the internal factors that should be considered by the company is production activities, because this is very influential to the future of the company.

In conducting production activities, there will be costs to produce goods and services. Production costs are the cost required to obtain raw materials (raw) from suppliers and convert them into finished products ready for sale (Sodikin, 2015: 22). Examples are the cost of depreciation of machinery and equipment, the cost of raw materials; the cost of the helper material; the salary costs of employees working in different divisions, both direct and indirectly related to the production process. From the source of these costs the cost that goes into the scope of inventory costs becomes more important to manage for the company. Basically the goal of controlling raw material supplies is to achieve a level of cost efficiency in inventory. Inventory cost efficiency will be achieved if the company has precisely controlled the supply of raw materials.

To meet the growing demand the need for additional raw materials that must be purchased per day. This resulted in the overpurchasing of raw materials due to lack of precise decision-making of raw material supplies. Therefore, there needs to be proper management of raw materials in order for efficiency in the supply of raw materials. The use of EOQ (Economic Order Quantity) method is very precise in handling the supply problems faced by Bubur Ayam Pon Djaya. Determination of the maximum amount of rice raw materials up to the cost savings of supplies, can be done by the method of EOQ (Economic Order Quantity), therefore this method is very precise in dealing with the inventory problems faced by Bubur Ayam Pon Djaya.

II. LITERATURE STUDY

2.1 Research Review

The first research was conducted by Artadi Nugraha, Sukardi and Amzul Rifin (2016) this study used SCOR method to analyze the performance of supply chain, EOQ method, and POQ method compared to the company's method to know the most efficient raw material procurement method. The results showed the EOQ method resulted in the lowest total inventory cost with savings of Rp 222,153.78.

The second research was conducted by Intan Maesti Gani and Marheni Eka Saputri ST, MBA (2015) this study used forecasting the use of wood raw materials in 2015 and the application of *economic order quantity* (EOQ) methods in Purezento Company. Hail research can be concluded that the application of EOQ forecasting and methods can assist the company in inventory decision making, cost savings and control of raw materials that can support the smooth production activities.

The third research was conducted by Wienda Velly Andini and Achmad Slamet (2016) using EOQ Method (*Economic Order Quantity*) which aims to analyze and describe the supply of rayon yarn raw materials on cv. Weaving Gayor / ATBM Rimatex in order to get optimal results. The results of the study obtained the optimal purchase amount using EOQ Method on rayon yarn in 2014 amounted to 8,721 Kg with a purchase frequency of 10 times, safety inventory of 918 Kg, rebooking point 1,477.62 Kg, and total inventory cost of Rp.32,032,628.36.

The fourth study was conducted by Bethriza Hanum and Arda Billy (2018) the data needed in this study then used data retrieval techniques through direct observation of the objects studied, interviews and library studies. The results of this study compare between the company's method and the EOQ method the company must make optimal demand namely rubber raw material amounting to 1,139 Kg and the demand for raw materials ring a total of 69,993 pcs for one order in one year the company only makes 6 times the request.

The fifth research was conducted by Santi, A. I. Jaya and A. Sahari (2019) this study used the Economic Order *Quantity method* to optimize the inventory. The results of the study can be concluded that the difference in costs from the company's policy when using EOQ method is Rp.24,024,488,092,in2016.

The sixth study was conducted by Russarin Jiraruttrakul, Srobol Smutkupt, Wasana Marksin, Liang Liu, and Chanasit Thanathawee (2015) this study using eoq model (Economic Order*Quantity*)to reduce inventory costs. ABC Company's Focus is Beer Importers in Thailand. The results showed that abc companies can achieve cost savings of 50% of the old annual inventory costs. Therefore, abc companies must implement the tested EOQ model and rebooking points, to achieve the ultimate goal of improving customer satisfaction, through purchasing optimal order quantity, achieving the right inventory level, and minimizing inventory costs.

The seventh study was conducted by Eida Nadirah Roslin, Siti Norhafiza Abdul Razak, Mohd Zaki Bahrom, and Muhammad Aizat Abd Rahman (2015) using the level of IMS implementation in the Malaysian automotive services industry identified. The IMS model using *Economic Order Quantity is* proposed to be implemented in independent automotive service workshops as an alternative to high cost investment systems in selected industries. Based on the results, the data predicted with the Simple Moving Average technique provides the most accurate data and this technique is selected in the development of the IMS model.

The eighth study was conducted by Hui Er Pang, R. Chandrashekar and Wan Hanim Nadrah Wan Muda (2018) using the quantity of economic orders and the forecasting techniques identified to be applied in the company. Forecasting techniques are used to predict optimal demand and Economic Order *Quantity is* applied to minimize the total cost of inventory to achieve research objectives. In conclusion, based on the results of this study it is suggested that XYZ companies should practice forecasting techniques for industrial gases in determining the optimal quantity of demand indicating that the minimum EMV for diesel, mine dust, concrete and gas industries is \$269090.22, \$146250.12, \$137726.33 and \$15240.93 respectively. This proves that the best alternative decision for industrial gas in minimizing the total cost of inventory is through the estimated quantity of demand. As for diesel, mine dust and concrete, the actual amount of demand is sufficient to minimize the total cost of supplies.

2.2 Understanding Operational Management

Operation Management describes a crucial thing that exists in the company, this refers to the opinion of the management of operations expressed by the experts which are as follows:

Heizer, Render, Chuck Munson (2017: 3) mengartikan manajemen operasi seperti berikut: "*Operation management (OM) is the set of activitis that creates value in the form of goods and services by transforming inputs into outputs*"

According to Jay Heizer and Barry Render (2015: 3) dubbed by Hirson Kurnia, Ratna Saraswati, and David Wijaya, "Operational management is a series of activities that generate value in the form of goods and services by turning input into results".

2.3 Inventory Management

According to Handoko (2017:333) inventory control is a very important managerial function, because if the company invests too much of its funds in inventory, it leads to excessive storage costs. If the company does not have sufficient supplies, it may result in costs from the shortage of raw materials supplies.

2.4 Supplies

According to Handoko (2017:333) inventory is a general term that indicates organizational resources stored in anticipation of the fulfillment of demand which includes raw materials, goods in progress, finished goods or final products, auxiliary or complementary materials, and other components that are part of the company's product output.

According to Heizer and Render (2015:553), "Inventory is a strikes a balance between inventory investment and customer service. Inventory objectives will never achieve a low-cost strategy without good inventory management".

2.5 Inventory Functions

According to Handoko (2017: 335-336) the operational efficiency of an organization can be improved due to various important functions of inventory. Supplies are a collection of physical products at various stages of the transport process from raw materials to goods in the process and then finished barag. These supplies may remain in storage rooms, warehouses, factories, retailer stores or are being moved around factories, in transport trucks, or ships crossing the ocean.

1. Fungsi *decoupling*

The important function of inventory is to allow the operation of internal and external companies to have freedom, This inventory decouples allow the company to meet subscription demand without depending on the supplier.

2. Economic *lot sizing function*

Through inventory storage, companies can produce and purchase resources in quantities that can reduce costs per unit. Lot sizing inventory needs to take into account purchase savings, transportation costs per unit are cheaper because the company made purchases in greater quantities, compared to the costs incurred due to the availability of inventory.

3. Anticipation function

Companies often face predictable and predictable demand fluctuations based on past experience or data on seasonal demand. In this case the company can hold seasonal supplies.

2.6 Types of Supplies

Menurut Heizer dan Render (2016: 554):

1. Supplies of raw materials, have been purchased, but not yet in the process. These supplies can be used to separate suppliers from the production process.
2. The supply of goods in the process is components or raw materials that have gone through several changes, but have not been completed.
3. *Maintenance Repair Operation* (MRO) is a distribution provided for maintenance equipment, repairs, operations needed to keep the machine and process productive. Mro exists because the need and time for maintenance and repair cannot be known.
4. Supplies of finished goods, is a finished product and just waiting for delivery. Finished goods can be put in to stock because future customer demand is unknown.

2.7 Inventory Costs

Inventory costs according to Heizer and Render (2016: 559-560):

1. Holding Cost (*Holding Cost*)Is the cost associated with storing or carrying supplies for a certain time. Therefore, storage costs also include outdated goods costs and storage-related costs, such as insurance, additional employees and interest payments.
- 2.*Ordering cost*includesthe cost of inventory, form, order processing, purchase, administrative support, and so on. When an order is being produced, the cost of the order is also there, but it is part of the so-called installation cost.

3. Installation cost (*Setup Cost*) Is the cost to prepare the machine or process to produce the order. This includes time and manpower to clean and replace restraint equipment or tools. Operations managers can lower booking costs by reducing installation costs and using efficient procedures, such as bookings and electronic payments.

2.8 Inventory Costs

According to Handoko (2017: 334) the inventory system is a set of wisdom and controls that monitor inventory levels and determine the level of inventory to maintain, when supplies should be filled, and how many messages to do. The system aims to establish and ensure the proper availability of resources, in the right quantity and at the right time.

Menurut Heizer dan Render (2016: 567)

This point indicates that the inventory level at which when the inventory has reached that level, an order must be made immediately to replace the inventory that has been used. This equation assumes that the request during the wait time itself is constant.

2.9 Economic Order Quantity (EOQ)

According to Jay Heizer and Barry Render (2015: 560) economic order quantity model (Economic Order Quantity/EOQ) is one of the most frequently used inventory control techniques. This technique is relatively easy to use, but is based on the following assumptions:

1. The number of known orders is quite constant
2. Waiting time (the time between booking and reception is constant and known)
3. Supplies are immediately received and completed entirely
4. No quantity discount available
5. Variable fees are only for installation and ordering and the cost of storing supplies within a certain time
6. Running out or shortage of supplies can be avoided if bookings are made on time.

Basically each inventory model is useful to minimize costs, be it booking fees or storage costs. Which if we minimize booking costs and heavy storage costs it's the same as minimizing the total cost later. By using the following variables we can determine the optimal order according to EOQ.

- a) Annual booking fee

$$S = \frac{\text{permintaan tahunan}}{\text{jumlah unit pesanan}} \times \text{Biaya pemesanan per pesanan}$$

- b) Annual storage costs

$$h = \frac{\text{permintaan tahunan}}{\text{jumlah unit pesanan}} \times \text{Biaya pemesanan per pesanan}$$

- c) The optimal order quantity, which is determined when the annual cost of the order is equal to the annual storage cost, is:

$$EOQ = \sqrt{\frac{2DS}{h}}$$

We can then determine the total annual cost

TC = booking fee + storage fee

Description:

Q = Number of units per order (liter)

D = needs in one planning period (liters)

S = annual booking fee (RP)

h = annual storage cost (Rp)

TC = total annual cost (Rp)

One of the advantages of using the EOQ model is that it makes perfect sense because it provides satisfactory answers, even with considerable variation in its parameters. After minimizing costs, we can then determine when to reorder *the point*. The time between booking and receipt of a booking is called a wait time or lead *time*.

2.10 Reorder Point (ROP) / Rebooking Point

Reorder Point (ROP) is a level of inventory that requires re-ordering on inventory taking into account the waiting time that will occur when ordering until the order is received. According to Fahmi (2016: 122) is the point at which a company or business institution must order goods or materials to create controlled inventory conditions.

Jay Heizer and Barry Render (2015: 567) stated that the rebooking point is the level of inventory where when inventory has reached the level at which the order should be made. Analysis of *reorder points* used to analyze rebooking points according to Heizer and Render (2015:567) can be used formulas as follows:

$$\begin{aligned} \text{ROP} &= \text{Permintaan per hari} \times \text{Waktu tunggu pesanan baru dalam hari} \\ &= (d \times L) + \text{Safety stock} \end{aligned}$$

Description:

d = Need of raw materials per day

L = Waiting time in days or weeks

Ss = Safety supplies (liter/2 weeks)

2.11 Safety Stock (SS) / Safety Supplies

Safety stock is an additional inventory held to protect or maintain the possibility of material shortages or stock outs (Ikhwanina, 2017). Currently, inventory control is based on previous period experience. In anticipation of high fluctuations in product demand, the company provides safety stock for each product as much as 30% of the difference between the average value of incoming goods (purchases) and outgoing goods (sales) in a given period. The calculation of backup inventory is based on the previous year's request data and this control method applies to all types of products.

III. RESEARCH METHODS

The strategies used in this study according to Neuman (2016: 44) are descriptive in general used if researchers want to reveal information about the problems being studied. A number of tools can be used to explain such as tables, charts, images and charts. The main purpose is to reinforce certain situations or conditions as they are without intending to make general conclusions or generalizations because there is no test of significance and no level of error.

According to Sugiyono (2016: 117) Population is a generalization area consisting of: objects or subjects that have certain qualities and characteristics set by researchers to be studied and then drawn conclusions.

According to Sugiyono (2016: 118) the sample is part of the number and characteristics that the population has. For samples taken from the population must be completely representative. The samples used in this study are all data on purchasing raw materials, usage data, frequency of purchase, and cost data incurred in the procurement

of raw materials, such as storage costs and cost of ordering raw materials every month for one year from August 2017 to July 2018.

Data collection is done to obtain the information needed in order to achieve research objectives. In this study, the method of data collection used is the method of observation and interview (interview). The data sources used in this study are in the form of data, as well as information notebooks on the company.

2.1. Variable Operations

1. Booking fee

According to Heizer and Render (2016:560) covers the cost of inventory. The cost of ordering at Bubur Ayam Pon Djaya is the cost of purchasing rice raw materials per order.

2. Storage costs

According to Heizer and Render (2016:559) the costs associated with storing or carrying supplies over a certain time. Storage costs also include outdated goods and storage-related costs. Pon Djaya Chicken Porridge storage costs consist of maintenance costs and electricity costs.

3. Safety stock

The delay in the production process is a big loss that the company must avoid. One of the causes of the delayed production process is the lack of planning in both managing supplies so that companies often do not have stock reserves or safety stock to replace raw materials that are used up in the production process. The definition of Safety stock according to Manahan P. Tampubolon (2018: 248) is the level of inventory of the company during the lead time or delivery of the ordered goods.

4. Reorder point

According to Heizer and Render (2016:567) this point indicates that the inventory level at which when inventory has reached that level, an order must be made immediately to replace the inventory that has been used. This equation assumes that requests during wait times and wait times themselves are constant. At Bubur Ayam Pon Djaya rebooking is made after seven days of booking coming.

2.1. Data Analysis Tools

According to Heizer and Render (2016: 563-569) the calculation method with EOQ method to determine the optimal cost of economical inventory can be formulated as follows:

1. Number of orders optimum (*economic order quantity*)

Optimum quality points occur when the booking fee is equal to the storage fee. So, after lowering the equation for the optimal order quantity, so that the EOQ formula is obtained is:

$$EOQ = \sqrt{\frac{2Ds}{n}} \dots\dots\dots (3.1)$$

2. Order frequency =

$$\dots\dots\dots (3.2) N = \frac{D}{Q}$$

3. Time between each order..... (3.3) $\frac{\text{Jumlah antar hari kerja pertahun}}{N}$

Description:

- EOQ= Number of orders (liters)
- S= Booking fee (Rp/booking)
- D= Needs of goods per period (liter/year)
- H= Storage cost (Rp/unit/year)
- N= Expected number of pesnan (times)

4. Total cost

The optimal order quantity when the order cost is equal to the storage fee:

$$TC = \frac{D}{Q}S + \frac{Q}{2}H \quad \dots\dots\dots (3.5)$$

5. Annual storage fee = $\dots\dots\dots (3.6)\frac{D}{Q}S$

It is one of the costs incurred in inventory management, in an effort to consolidate supplies to avoid damage, deodority or wear, and loss. Thus the cost of storage on Pon Djaya Chicken Porridge there is a maintenance fee and electricity cost for a year.

6. Annual booking fee = $H\dots\dots\dots (3.7)\frac{Q}{2}$

Description:

- TC= Total cost (Rp/unit)
- Q = Ordered quantity (unit)
- S= Booking fee (Rp/booking)
- D= Needs of goods per period (unit/year)
- H= Storage cost (Rp/unit/year)

7. *SafetyStock*

According to Irham Fahmi (2016: 121) *safety stock is the company's ability to create always safe or secure inventory conditions in the hope that the company never experiences a shortage of inventory. While the understanding according to Jay Heizer and Barry Render (2015: 567) translated by Hirson Kurnia, Ratna Saraswati and David Wijaya namely "Safety stock is an additional inventory that allows the onion of demand inequality, a buffer". Safety stock is calculated with the following formula:*

$$SS = (\text{pemakaian maks} - \text{pemakaian rata} - \text{rata}) \times L \quad \dots\dots\dots (3.5)$$

Description:

- SS = safety supplies (liters)
- L= Waiting time for new orders (Days)

8. *Reorder point*

Reorder point (reorder point), the rebooking point is usually set by adding usage during the grace period with the security inventory of the reorder point usually greater to reduce the probability of a shortage of raw materials before the next order arrives. The Company must reorder (Reorder Point)when the amount of raw material supplies in the warehouse has reached one production period (Yopan Maulana, Tatang Rois, 2018). So, in situations when there is uncertainty in the supply position as well as demand reorder points can be calculated by formula:

$$ROP = d \times L \quad \dots\dots\dots (3.4)$$

Description:

- ROP= Rebooking point (liter)
- d = Request per day (liter)
- L= Waiting time for new orders (Days)

IV. RESEARCH RESULTS AND DISCUSSIONS

4.1 Analysis of Raw Material Supply Control according to Pon Djaya Chicken Porridge Policy

To know the quantity of efficient and optimal rice raw materials in Pon Djaya Chicken Porridge, the amount of raw materials needed each month in one period in Table 4.1 below.

Table 4.1.

Use of Rice Raw Materials Period August 2017 – July 2018

Bulan	Kuantitas (Liter)
Agustus 2017	215
September 2017	256
Oktober 2017	215
November 2017	560
Desember 2017	591
Januari 2018	523
Februari 2018	560
Maret 2018	281
April 2018	544
Mei 2018	460
Juni 2018	210
Juli 2018	560
Jumlah	4.975
Rata-rata	414,6

Source : Bubur Ayam Pon Djaya (2020)

Based on table 4.1. the highest use of rice raw materials occurred in December 2017 at 591 liters, while the lowest use of raw materials occurred in June which was 210 liters, and the total amount of raw material usage during one period was 4,975 liters.

Table 4.2.

Quantity of Purchase, Frequency of Purchase and Use of Rice Raw Materials
Period August 2017 – July 2018

Bulan	Pembelian Bahan Baku (liter)	Frekuensi Pembelian (kali)	Penggunaan Bahan Baku (liter)	Sisa Persediaan Bahan Baku (liter)
Agustus 2017	310	5	215	95
September 2017	280	5	256	24
Oktober 2017	310	5	215	95
November 2017	610	10	560	50
Desember 2017	610	10	591	19
Januari 2018	610	10	523	87
Februari 2018	600	10	560	40
Maret 2018	310	5	281	29
April 2018	600	10	544	56
Mei 2018	465	8	460	5
Juni 2018	310	5	210	100
Juli 2018	610	10	560	50
Jumlah	5.625	31	4.975	650

Source: Pon Djaya Chicken Porridge (2020)

Based on the data in Table 4.2, it can be seen that the highest purchase of raw materials occurred in November, December and January at 610 liters, respectively, while the lowest purchase of raw materials occurred in September of 280 liters. While the highest frequency of purchases according to the number of days in 1 month is 10 times and the lowest as many as 5 times.

4.2 Booking Fees

The cost of booking during a period consists of the cost of transport or the cost of transport, as well as the cost of the telephone. Based on table 4.3 below.

Table 4.3.

Rice Raw Material Order Fee Period August 2017 – July 2018

Months	Carry-on Fee (Rp)	Phone Fee (Rp)	Total Cost (Rp)
August 2017	50.000	10.000	60.000
September 2017	50.000	10.000	60.000
October 2017	50.000	10.000	60.000
November 2017	100.000	10.000	110.000
December 2017	100.000	10.000	110.000
January 2018	100.000	10.000	110.000
February 2018	100.000	10.000	110.000
Maret 2018	50.000	10.000	60.000
April 2018	100.000	10.000	110.000
May 2018	80.000	10.000	90.000
June 2018	50.000	10.000	60.000
July 2018	100.000	10.000	110.000
Amount	930.000	120.000	1.050.000

Source: Pon Djaya Chicken Porridge (2020)

4.3 Storage Costs

The amount of storage costs can be seen in the following table:

Table 4.4.

Cost of Storage of Rice Raw Materials Period August 2017 – July 2018

Jenis Biaya	Jumlah (Rp)
Biaya Pemeliharaan	1.800.000
Biaya listrik	1.200.000
Jumlah	3.000.000

Source: Pon Djaya Chicken Porridge (2020)

Based on the details of storage costs incurred by the company from August 2017 to July 2018 amounting to Rp. 3,000,000. The average perliter of rice raw materials is Rp 533.3.

4.4 Total Ordering Costs and Storage Costs of Rice Raw Materials

The total cost of inventory can be seen in table 4.5below.

Table 4.5.

Total Ordering Costs and Storage Costs of Rice Raw Materials Period August 2017 – July 2018

Cost Type	Description	Amount (Rp)
Booking Fees	Transportation Costs	930.000
	Phone Charges	120.000
Storage Costs	Maintenance Costs	1.800.000

	Electricity costs	1.200.000
Amount		4.050.000

Source: Pon Djaya Chicken Porridge (2020)

Based on the results in table 4.5 above, the largest cost is in maintenance costs amounting to Rp. 1,800,000, while the smallest cost is in the phone cost of Rp. 120,000. The total cost of inventory during the period August 2017 to July 2018 amounted to Rp. 4,050,000.

4.5 Calculation of Raw Material Inventory Using EOQ Method (Economic Order Quantity)

Data on the use of rice raw materials from August 2017 to July 2018 can be seen in the following table.

Table 4.6.

Data on Use of Rice Raw Materials Period August 2017 – July 2018

Description	August 2017 - July 2018
Quantity (liter)	4.975
Price (Rp/liter)	10.000
Total Cost	49.750.000
Booking Fee (Rp/order)	2.877
Storage Cost (Rp/liter)	533

Source: Pon Djaya Chicken Porridge (2020)

From table 4.6 above can be calculated the optimal quantity as follows:

- a. Determination of optimal purchase quantity August 2017 - July 2018

$$EOQ = \sqrt{\frac{2DS}{h}}$$

$$= \sqrt{\frac{(2)(4975)(2877)}{533}}$$

$$= 231,75 \text{ liter}$$

The optimal number of raw material purchases each time ordered in the period August 2017 to July 2018 is 231.75 liters with the frequency of purchase of raw materials required by Bubur Ayam Pon Djaya namely:

$$\frac{4975}{231,75} = 21.5 \text{ rounded } 22 \text{ times}$$

The total purchase of optimal raw materials during the period August 2017 to July 2018 is as much as:

$$231.75 \times 22 = 5,098.5 \text{ liter}$$

The purchase of rice raw materials per day in the period August 2017 to July 2018 is as much as:

$$\frac{5098,5}{350} = 14.6 \text{ liter}$$

4.6 Calculation of Safety Stock Determination

The function of safety stock is to address the risk of raw material shortages that may occur during the production period and also to overcome the constraints of delays in the delivery of raw materials.

Table 4.7.

Deviation Period August 2017 – July 2018

Bulan	Penggunaan X	Rata-rata Xbar	Deviasi X-Xbar	Kuadrat Deviasi
Agustus 2017	215	415	-200	40.000
September 2017	256	415	-159	25.281
Oktober 2017	215	415	-200	40.000
November 2017	560	415	145	21.025
Desember 2017	591	415	176	30.976
Januari 2018	523	415	108	11.664
Februari 2018	560	415	145	21.025
Maret 2018	281	415	-134	17.956
April 2018	544	415	129	16.641
Mei 2018	460	415	45	2.025
Juni 2018	210	415	-205	42.025
Juli 2018	560	415	145	21.025
Jumlah	4.975			289.643

Source: Secondary Data Analysis

$$\begin{aligned} \alpha &= \sqrt{\frac{289643}{12}} \\ &= \sqrt{\frac{289643}{12}} \\ &= 155,36 \text{ liter} \end{aligned}$$

The size of the safety stock every time the message must be in the period August 2017 to July 2018 are:

$$\begin{aligned} \text{Safety Stock} &= Z \times \alpha \\ &= 1,65 \times 155,36 \\ &= 256.34 \text{ liter} \end{aligned}$$

$$\begin{aligned} \text{Safety Stock (per day)} &= \frac{256,34 \times 22}{350} \\ &= \frac{5639,48}{350} \\ &= 16.1 \text{ liter} \end{aligned}$$

So from the above safety stock (*safety stock*) that must exist in the period August 2017 to July 2018 every time the message with a frequency of 22 times is 256.34 liters, and the daily safety supply for a year is as much as 16.1 liters.

4.7 Reorder Point Calculation

In the determination of *reorder point*, punctuality should be carefully considered, because if the rebooking is slightly backward from that time will increase the purchase of raw materials or stock out cost, and if too early the need for extra *carrying cost*.

Then the calculation of ROP is as follows:

$$\begin{aligned} \text{ROP} &= \text{Safety Stock} + (\text{Lead Time} \times \text{daily needs}) \\ \text{Reorder point period August 2017 - July 2018} \\ \text{ROP} &= 256.34 \text{ liters} + \left(1 \times \frac{4975}{365} \text{ liter}\right) \\ &= 256.34 \text{ liter} + 14.63 \\ &= 270.97 \text{ liter} \end{aligned}$$

Reorder point per day

$$ROP = \left(\frac{270,97 \times 22}{350} \right)$$
 = 17.03 liter

So according to the calculation above, Bubur Ayam Pon Djaya must rebook /ROP at the time of supply of raw materials with a frequency of 22 messages of 270.97 liters and the daily ROP calculation is 17.03 liters.

4.8 Maximum Inventory

The maximum inventory is the highest amount of inventory available in the company, so that the existing raw material inventory does not excess. therefore it is necessary to determine what the maximum amount of inventory per year is by using the following formula:

Maximum Inventory = Safety Stock + EOQ
 Maximum Inventory period August 2017 - July 2018
 Maximum Inventory = 256,34 liter + 231,75 liter
 = 488.09 liter
 Maximum Inventory per day

$$Maximum\ Inventory = \left(\frac{488,09 \times 22}{350} \right)$$
 = 30.7 liter

So the maximum amount of inventory in the period August 2017 to July 2018 each time a message with a frequency of 22 times is 488.09 liters and the maximum inventory per day is 30.7 liters.

4.9 EOQ, Safety Stock, ROP dan Maximum Inventory

At the time of inventory level according to EOQ, the amount of Safety Stock required, and rop level, as well as the maximum inventory size is known. Then count the supply of rice raw materials using the EOQ method can be seen in table 4.8 below.

Table 4.8.
 Size of EOQ, Safety Stock, Reorder Point, and Maximum Inventory of Rice Raw Materials
 Period August 2017 – July 2018

Years	F	EOQ	Safety stock	ROP	Maximum Inventory
August 2017	22 kali	231.75 liter	256.34 liter	270.97 liter	488.09 liter
-July 2018	Daily (350)	14.6 liter	16.1 liter	17.03 liter	30.7 liter

Source: Secondary Data Analysis

4.10 Comparison of Company Policy with EOQ Model

From the calculation results that have been analyzed, it has been known the comparison of the cost of purchasing rice raw materials between the company's policies and using the EOQ method.

Table 4.9.

Cost of Purchasing Rice Raw Materials According to Pon Djaya Chicken Porridge Policy with EOQ Policy Period August 2017 – July 2018

Policies/Methods	Quantity of purchase of raw materials (liters)	Price (Rp)	Cost (Rp)
.06 miles away	5.625	10.000	56.250.000
EOQ	5.098,5	10.000	50.985.000
Difference	526,5		5.265.000

Source: *Secondary Data Analysis*

Based on the table above, the quantity of purchase of raw materials according to The Pon Djaya Chicken Porridge policy is 5,625 liters and according to EOQ policy is 5,098.5 liters, the difference is 526.5 liters. Meanwhile, the cost of purchasing raw materials according to The Pon Djaya Chicken Porridge policy is Rp. 56,250,000 and according to EOQ policy is Rp. 50,985,000 with a difference of Rp 5,265,000.

4.11 Comparison of TIC Pon Djaya Chicken Porridge Policy and EOQ Policy

From the calculations that have been analyzed, it has been known the *comparison of Total Inventory Cost* (TIC) between the company's policies and EOQ's policies.

Table 4.10.

TIC According to Pon Djaya Chicken Porridge Policy with EOQ Policy Period August 2017– July 2018

Years	TIC According to Pon Djaya Chicken Porridge (Rp)	TIC According to EOQ (Rp)	Savings (Rp)
August 2017 -July 2018	4.050.000	2.717.673	1.332.327

Source: *Secondary Data Analysis*

As seen in table 4.10 comparison between The Chicken Porridge Policy pon djaya and the policy obtained by using EOQ method for TIC (*Total Inventory Cost*) namely Rp.4.050.000 for The Chicken Pulp Policy Pon Djaya and TIC according to EOQ which is rp. 2,780,795 with total savings of Rp. 1,269,205. Therefore the use of EOQ method is very appropriate for the handling of Raw Material Supplies.

4.12 Analysis of Raw Material Supply Control according to Pon Djaya Chicken Porridge Policy

In doing his business, Bubur Ayam Pon Djaya runs it still in a simple way. The most influential thing in business decision making is previous experience. Therefore sometimes management in terms of procurement of raw materials is sometimes less effective and also causes a lot of waste on inventory costs. This is very detrimental and also has the effect of reducing the profit that can be during each year.

Judging from the analysis of skunder data obtained from Bubur Ayam Pon Djaya that the number of raw material usage during the period August 2017 to July 2018 is 4,975 liters, while the number of purchases of rice raw materials is 5,625 liters. If we look at the comparison of the two dat between the purchase and use of raw materials, the difference is quite large is 650 liters for a year. This caused a lot of waste in the procurement of rice raw materials that had been carried out

by Bubur Ayam Pon Djaya during the period August 2017 to July 2018. For the frequency of purchase of rice raw materials during the period August 2017 to July 2018 is 31 times with the waiting time or lead time is 1 day.

The costs incurred in the procurement of these raw materials include storage costs and booking fees. Recorded in the period August 2017 to July 2018 the cost of storage of rice raw material supplies is Rp. 3,000,000, consisting of maintenance costs and electricity costs. While the booking fee is Rp. 1.050.000, the booking fee consists of telephone fee and transportation fee.

4.13 Analysis of Raw Material Inventory Control according to EOQ Method Policy

EOQ or economical order quantity is one of the oldest methods in inventory control, the use of this method aims to achieve optimal supply of raw materials. This method allows businesses to be able to make savings against waste that occurs in the procurement of raw material supplies during a certain period. Using the table and image below the results of the analysis of raw material inventory policy according to EOQ method can be clearly seen.

Table 4.11.
Total Cost of Supply of Rice Raw Materials with EOQ Method
Period August 2017 – July 2018

Data	
Demand rate, D	4.975
Setup cost, S	2.877
Holding cost, H	533
Result	
Optimal Order Quantity, Q*	231,75
Maximum Inventory	231,75
Average Inventory	115,87
Number of Setups	21,47
Holding cost	61.761,11
Setup cost	61.761,11
Total cost, Tc	50.009.970

Source: Processed Data

Based on the above data can be concluded that the purchase of rice raw material Bubur Ayam Pon Djaya is optimal every time ordered during the period of August 2017 to July 2018 amounting to 231.75 liters while the frequency of purchase is economical for the production process as much as 22 times. So the total cost of supplying rice raw materials during the period August 2017 to July 2018 amounted to Rp. 50,009,970.

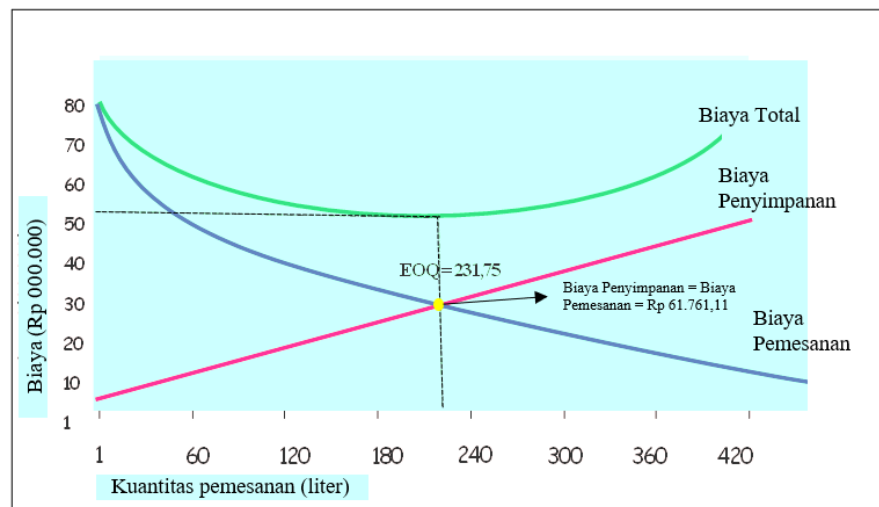


Figure 4.1. Economic Order Quantity Chart of Rice Raw Materials
Period August 2017 – July 2018 (Data processed)

From figure 4.1. it appears that the booking cost chart decreased and storage costs increased, as well as the total cost also increased. The lowest point of the total cost of inventory was achieved at the time of intersecting the order fee and the storage cost of Rp 61,761.11 which is at the time of the order amount of 231.75 liters.

V. SUMMATIONS AND SUGGESTIONS

5.1 Conclusion

Based on the results of the research conducted, it can be concluded as follows:

1. Control of raw materials that are quite simple according to the policy of Bubur Ayam Pond Djaya during the period August 2017 to July 2018 is considered less effective, because many wastes such as the use of raw materials of 5,625 liters, the difference is 650 liters and it is estimated that the difference is wasted due to damage (stale).
2. The quantity of optimum rice raw materials each time ordered with a frequency of 22 times using the EOQ method is 231.75 liters while the quantity of optimum raw materials per day is 14.6 liters.
3. The waiting time for the arrival of rice raw materials is 1 day from the time of ordering the raw materials of rice.
4. *Safety stock* or safety supplies every time order with frequency 22 times according to EOQ method is as much as the policy of Bubur Ayam Pon Djaya of 256.34 liters and per day is 16.1 liters. While in Porridge Ayam Pon Djaya does not use safety stock or safety stock..
5. ROP on rice raw materials each time ordered with a frequency of 22 times according to the policy of EOQ method is 270.97 liters and per day of 17.03 liters, while according to the policy of Bubur Ayam Pon Djaya is not determined the point of re-ordering or ROP.
6. The maximum *inventory of* each message with a frequency of 22 times according to the EOQ method is 488.09 liters and per day of 30.7 liters, while according to the policy of Bubur Ayam Pon Djaya is not determined the maximum amount of inventory.
7. TIC according to The Pon Djaya Chicken Porridge policy is Rp 4,050,000 and TIC according to EOQ method is Rp 2,717,673 a considerable difference between the two policies, if the policy using EOQ method is applied then Pon Djaya Chicken Porridge can save up to Rp 1,332,327.

5.2 Saran

Based on the results of the above research, the advice that can be given to Bubur Ayam Pon Djaya as a consideration material in purchasing raw materials as well as the costs incurred that the company has been doing is as follows:

1. The Company needs to review the methods of inventory control applied so far, because from the processing results with the methods used by researchers, the total cost of inventory can still be minimized by using the EOQ method on the procurement of raw materials the company will get the optimal quantity of raw material purchase at a minimum cost compared to the policy of Chicken Porridge Pon Djaya.
2. The Company should determine the *size of the safety stock* and *reorder points* in the control of raw material supplies to maintain the possibility of a larger than expected shortage of raw materials and to maintain the possibility of delays in raw materials ordered.
3. In the procurement of raw materials, the company should purchase large quantities of raw materials with low frequency in order to minimize inventory costs.

REFERENCE LIST

- Azmi, Zahroh and Mary. 2016. *Analysis of Economic Order Quantity Method as the basis for Controlling The Supply of Auxiliary Raw Materials..* University of Brawijaya.
- Chuong, Sum Chee and Stevenson, William J. 2015. *Operations management..* Jakarta : Salemba four.
- Devi, Welas Wijiantika. 2018. *Control of Raw Material Supplies To Improve The Smooth Production Process in Cv. Surya Indah Mulia Madiun.* Thesis Thesis Thesis, Muhammadiyah Ponorogo University.
- Eldwidho. 2015. *Analysis of Raw Material Inventory Control using Bonansa Bread Company's EOQ Method.* Final Task. State University of Semarang.
- Erma and Lia. 2015. *Analysis of Raw Material Inventory Control Through The Application of Economic Order Quantity (EOQ) at PT Andini Megah Sejahtera Bogor Branch..*
- Fadlallh, A. W. 2015. *The Effect of Applying The Economic Order Quantity Model in The Field of Inventory.* *International Journal of Management (IJM)*. 6(4):9-18.
- Fahmi, Irham. 2016. *Production and Operations Management.* Bandung : Alfabet publisher.
- Heizer, Jay and Barry Render. 2015. *Operations Management Issue 11.* Jakarta : Salemba Empat.
- Heizer, Jay and Barry Render. 2015. *Operations Management, Sustainability and Supply Chain Management (Hirson Kurnia, Ratna Saraswati and David Wijaya : Translator).* Jakarta : Publisher of Salemba Empat.
- Ikhwanina, Qoni'ah. 2017. *Determination Analysis of Soybean Re Order Point (ROP) for the smooth Production Process of Tempeh On Tempeh King in Nganjuk Year 2015.* *Simki-Ekonomik Journal Vol 1 (04).* Kediri: Faculty of Economics Universitas Nusantara PGRI Kediri.
- Martono, Ricky Virona. 2018. *Concept and Application Operations Management.* Jakarta : Salemba Empat.
- Muhaimin, Abdul Wahib & Philanthropist, Johan.. 2015. "Planning and Controlling The Supply of Oyster Mushroom Raw Materials in the Household Industry". *Habitat Journal.* Department of Sausage Economics, Faculty of Agriculture, Universitas Brawijaya, Indonesia, Volume XXVI, No.1. P.22-30.
- Neuman, W. L. 2016. *Social Research Methodology: Qualitative and Quantitative Approach (7th ed.).* Jakarta : PT. Index.

- Rahmawan, Apriya.. 2016. "Analysis of Lubricant & Chemical Supplies Inventory Control to support production at PT. Meratus Jaya *Iron & Steel* in Batulicin". Surabaya. University of Surabaya on August 17, 1945..
- Sodikin. 2015. *Management Accounting, An Introduction*, fifth edition. Yogyakarta : High School of Management Sciences YKPN..
- Surjaweni. 2015. *Accounting of The Cost of Theory and Its Application*. Yogyakarta : New Press Library.
- I'm not going to say that. 2016. *Quantitative, Qualitative and R&D Research Methods*. Bandung : Alfabet.
- Tampubolon, Manahan P. 2018. *Operations Management and Supplier Chain*. Jakarta : Media Discourse Partner Publisher.
- Q. Hani Handoko. 2016. *Management Edition 2*. Yogyakarta : BPFPE Publisher.
- Wahyuni, A and Achmad, S. 2015. *Planning Raw Material Supply Using Shanghai Nut Product Requirement Planing (MRP) Material Method at Gangsar Ngunut-Tulung Agung Company*. *Journal of Industrial Spectrum STT POMOSDA Nganjuk*. 13(2):115-228.
- Wahyudi, R. 2015. *Analysis of Inventory Control of Goods Based on EOQ Method in Samarinda New Era Stores*. *Journal of Business Administration Science*, Vol.2 No.1.
- Maulana, Yopan and Tatang Rois.. 2018. "Analysis of Raw Material Inventory Control Using Economic Order Quantity (Eoq) Method in An Effort to Minimize Production Costs on CV. Eight-Eight Brass", *Indonesian Journal of Strategic Management*, Vol. 1 No. 1

