International Journal of Information System & Technology
Akreditasi No. 158/E/KPT/2021 | Vol. 6, No. 1, (2022), pp. 69-77

# Application of Economic Order Quantity and Reorder Point Methods in Improving the Efficiency of Coffee Raw Material Supply (Case Study At PT. Herbal Salam)

*Susi Susilowati*[1], *Ririn Restu Aria*[2]

[1,2]*Universitas Bina Sarana Informatika, Indonesia*

*susi.sss@bsi.ac.id*[1], *ririn.rra@bsi.ac.id*[2]

***Abstract***

*The food industry sector is currently getting tighter competition, especially in the form of food in the form of herbal drinks in the form of powders and liquids. That way it is necessary to control the supply of the right raw materials for the smooth production process. The purpose of this study is to find out and analyze the control of coffee raw material supplies applied by PT. Herbal Salam. So that it can improve the efficiency of raw material supply and can improve the performance of raw material management at PT. Herbal Salam. The research methods used are the EOQ and ROP methods. Research results show that the company's raw material inventory has not been optimal and has not shown a minimum inventory cost. Based on analysis and policy calculations the company produces a total inventory of 72.000 per Kg in a year with an average purchase of 30 times a year, while the Economic Order Quantity (EOQ) method produces a total inventory of 5.280 per kg in a year with an average purchase of at least 14 times a year. This indicates that the EOQ method is smaller or there are savings of more than 50% compared to the company's policies.*

***Keywords:*** *Inventory Control, Economic Order Quantity, Reorder Point*

## 1. Introduction

Inventory control is one of the most important for a company because without proper inventory control the company will experience problems in meeting consumer needs both in the form of goods and services produced by the company. A company must be wise in determining the amount of inventory of goods to be used in the production process because without proper management the company will suffer losses due to costs that should not be incurred by the company such as factory operating costs, building costs, loss costs and damage costs due to being stored for too long. A company conducts planning and control of raw materials that aim to minimize costs and maximize the company's profits. To minimize the cost of these supplies, economic order quantity (EOQ) analysis can be used. Inventory or inventory of goods as the main element of working capital is an asset that is always in a state of spinning and continuously changing [1][2].

The research uses P0M-OM V5.2 For Windows for the resolution of production and operations management problems, which combines and converts various resources used in production subsystems, and organizational operations into value-added products or services in a controlled manner by organizational policies. The output of the research is the classification of raw materials by the level of capital delivery ranging from the highest percentage of capital delivery to the lowest, more optimal supply, known as Economic Order Quantity, and produces a point of reordering thus the costs incurred by the company efficiently [1]. PT. Herbal Salam is a company that produces herbal products with various types of capsules, powdered drinks such as herbal coffee, and liquid drinks such as honey. Control of raw material supplies at PT. Herbal Salam is still done simply, so along with the higher demand for products causes a shortage and even runs out of stock

ISSN : 2580-7250

of raw materials which can certainly hinder the production process. The EOQ (Economic Order Quantity) method is one of the inventory management techniques taking into account storage costs and order fees. If the total cost is lowered, the optimal order quantity will be obtained [3][4]. Based on this background, researchers want to assist the company in handling the problem of controlling its raw material inventory using the EOQ (Economic Order Quantity) method.

## 2. Research Methodology

### 2.1. Research Location

The research was conducted on PT. Herbal Salam located on Mawar VII Street No. 141, Padurenan Village, Mustika Jaya District, Bekasi City.

### 2.2. Data Type

The types of data used in this study are:

a) Qualitative data is data in the form of sentences, words, or images [5].
   Qualitative data in this study in the form of employee data, organizational structure, and theories related to research on PT. Herbal Salam Bekasi City.
b) Quantitative data is haunted data [5].
   Quantitative data in this study in the form of inventory data and inventory costs at PT. Herbal Salam Bekasi City.

### 2.3. Data Source

The data sources in this study are:

a) Primary Data is a data source that directly provides data to data collectors [5].
   Obtained by making observations and asking directly with the observed source, namely PT. Herbal Salam Bekasi City.
b) Secondary data is a source that does not directly provide data to data collectors, for example through documents [5].
   In this case, the researcher requested data related to the object studied, namely in the form of raw material inventory report data and data on the costs of PT. Herbal Salam Bekasi City.

### 2.4. Data Analysis Process

The analytical steps performed are:

a) Determine the cost of storing raw materials per unit and the cost of storing raw materials per unit.
b) Data on the supply of coffee raw materials in 2020, then conducted one analysis by one in the following order:
   1) Total Inventory Cost of the company's actual condition .
   2) Economic order quantity (EOQ) method, frequency of ordering raw materials, total inventory cost.
   3) Based on the EOQ method.
   4) Safety Stock.
   5) Reorder Point (Reorder Point)
c) The results of the calculation are presented in the table.

### 2.5. Inventory Control

Inventory control is a set of control policies to determine the level of inventory to be maintained, when orders to increase inventory should be placed and how large orders should be held, the amount or level of inventory needed varies for each factory company, depending on the volume of production, the type of company and the process [6]. Inventory control is an activity aimed at ensuring that existing supplies or stocks will not

experience shortages and can be maintained at optimal levels so that inventory costs can be optimal [7].

### 2.6. Purpose of Inventory Control

The purpose of inventory control can be interpreted as an attempt to:

a) Keep the company from running out of supplies which results in a halt in production activities.
b) Keep 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.
c) Keeping small purchases can be avoided because this will result in large order costs.

### 2.7. Economic Order Quantity (EOQ)

Economic Order Quantity (EOQ) means the number of units of goods /materials that must be ordered each time to make an order so that the costs associated with procurement of supplies are minimal or the most optimal number of purchase units [8]. Economic order quantity is one of the inventory control techniques that minimize the total cost of ordering and storage [9].

### 2.8. Safety Stock

To order an item until it comes requires a period that can vary from a few hours to several months. The time difference between when ordering and when the goods arrive is known as the grace time (lead time). The grace period time is strongly influenced by the availability of the goods themselves and the distance of the location between the purchase and the supplier are located. Because of the grace period, there need to be supplies reserved for needs while waiting for goods to arrive, which is referred to as safety stock.

Safety inventory is a unit of inventory that must always be in the company to anticipate fluctuations in demand and avoid running out of stock [10].

Safety stock is an additional inventory owned in case of changes in sales levels or delays in production or delivery [11].

### 2.9. Reorder Point

Reorder Point is the time or point at which an order must be held again in such a way that the arrival or receipt of the ordered material is precisely at the time when the inventory above the safety stock is equal to zero [1]. Reorder Point is the time/point at which the order must be made again to fill the inventory [8]. Reorder Point is the point at which a company or business intuition must order goods or materials to create inventory conditions that are constantly under control [12].

## 3. Results and Discussion

### 3.1. Raw Material Requirements

PT. Herbal Salam in procuring raw material supplies is still done by a fairly simple method, namely based on the number of product requests produced and orders made at the time when the raw materials will be close to running out. So coffee raw materials will result in shortages or even running out of stock of raw material supplies when the products requested by the distributor company increase. The following is a table of the number of coffee raw material needs in 2020:

**Table 1**. Coffee Raw Material Requirements in 2020

| Moon | Use of Coffee Raw Materials |
|---|---|
| January | 5.760 Kg |
| February | 5.856 Kg |

| Moon | Use of Coffee Raw Materials |
|---|---|
| March | 5.952 Kg |
| April | 5.952 Kg |
| May | 6.144 Kg |
| June | 6.240 Kg |
| July | 6.240 Kg |
| Agust | 6.144 Kg |
| September | 5.856 Kg |
| October | 5.856 Kg |
| November | 5.952 Kg |
| December | 6.048 Kg |
| **Total** | **72.000 Kg** |

Data Source: PT. Herbal Salam

Based on the table above, the need for coffee raw materials in 2020 in one year amounted to **72.000 Kg**.

### 3.2. Raw Material Purchase

Referring to the data on the purchase order of coffee raw materials in 2020, PT. Herbal Salam places orders or purchases of coffee raw materials 30 times a year.

a) Average purchases

The average purchase of each time ordering coffee raw materials at PT. Herbal Salam is **2.400 Kg**. The figure is obtained from the total needs of coffee raw materials during the one year divided by the frequency of purchase as much as **30 times**.

b) Booking Fee

1) Unloading Costs, including the costs used for the unloading process. It also requires a fee to pay for the power of forklift drivers and the cost of diesel and additional power unloading raw materials. The cost for one unload is Rp10.000 multiplied by the number of coffee purchases in one year, so the calculation is Rp10.000 x 30 times = Rp300.000. While the cost of diesel is Rp475.000 per month, so the calculation is Rp475.000 x 12 months = Rp5.700.000. And if accumulated is Rp300.000 + Rp5.700.000 = Rp6.000.000. So, the cost of unloading the cargo is incurred by PT. Herbal Salam in the period 2020 amounted to Rp6.000.000.

2) Telephone Costs, covering costs incurred due to communication with suppliers or vendors by phone. The following is a table of phone costs for the year 2020.

**Table 2.** Phone Costs Period 2020

| Month | Cost | |
|---|---|---|
| January | Rp | 883.000 |
| February | Rp | 720.800 |
| March | Rp | 914.200 |
| April | Rp | 825.100 |
| May | Rp | 562.500 |
| June | Rp | 765.700 |
| July | Rp | 899.100 |
| Agust | Rp | 540.500 |
| September | Rp | 633.700 |
| October | Rp | 569.800 |
| November | Rp | 586.200 |
| December | Rp | 938.000 |
| **Total** | **Rp** | **8.838.600** |

Data Source: Phone Cost Data for 2020

3) Administrative Costs, including the cost of office stationery consisting of pens, pen correction, staples and their contents, paper and photocopies of documents and other office stationery. Administrative costs incurred by PT. Herbal Salam in the period 2020 amounted to Rp7.345.400.

**Table 3.** Coffee Raw Material Order Fees in 2020

| Types of Costs | Cost | |
|---|---|---|
| Administrative Costs | Rp | 7.345.400 |
| Unloading Costs | Rp | 6.000.000 |
| Phone Costs | Rp | 8.838.600 |
| **Total** | **Rp** | **22.184.000** |

Data Source: Processed Primary Data

The cost of the booking is the total of all components of the booking cost including administrative costs, unloading costs, and telephone costs divided by the total frequency of bookings in one year. So that it generates a fee for one booking of **Rp739.500**.

c) Raw Material Storage Costs

1) Electricity Costs, including costs incurred due to the use of electricity for both lights and air conditioners (Air Conditioner) as long as the raw materials are stored in the warehouse to wait for the production process. The following is a breakdown of electricity costs during the one the year 2020

**Table 4.** Electricity Costs in 2020

| Month | Cost | |
|---|---|---|
| January | Rp | 2.675.575 |
| February | Rp | 3.747.475 |
| March | Rp | 8.142.185 |
| April | Rp | 4.361.620 |
| May | Rp | 5.378.497 |
| June | Rp | 19.934.942 |
| July | Rp | 11.369.988 |
| August | Rp | 8.690.060 |
| September | Rp | 8.521.359 |
| October | Rp | 6.594.960 |
| November | Rp | 7.820.769 |
| December | Rp | 7.815.907 |
| **Total** | **Rp** | **95.053.337** |

Data Source: Processed Primary Data

2) Labor Costs, including employee salaries for the warehouse section consisting of 5 people with a salary of Rp2.000.000 each. So that the salary costs incurred by PT. Herbal Salam in a one-year period of Rp2.000.000 x 5 people x 12 months = Rp120.000.000.
3) Warehouse Maintenance Costs, covering the cost of maintaining the warehouse periodically in the annual period. The maintenance and repair of the warehouse in 2020 is set at Rp60,000,000, -

**Table 5.** Warehouse Maintenance Costs 2020

| Month | Cost | |
|---|---|---|
| Electricity Costs | Rp | 95.053.337 |
| Labor Costs | Rp | 120.000.000 |
| Warehouse | Rp | 60.000.000 |

| Month | Cost |
|---|---|
| Maintenance Costs | |
| **Total** | **Rp 275.053.337** |

Data Source: Processed Primary Data

The cost of storing coffee raw materials is divided by the total needs of raw materials over one year. So the calculation to produce raw material storage costs amounted to Rp3.820,18 or rounded up to **Rp3.820 per Kg**.

### 3.3. Calculation by EOQ Method

Inventory control with the EOQ method can be done by knowing in advance the number of supply needs per week, order fees, and storage costs. Calculation of the EOQ method on PT. Herbal Salam in 2020 is as follows:

a) Booking fee for a year (S) RP739,500
b) year-long raw material requirement (D) 72,000 kg
c) Raw material storage cost (H) IDR 3,820 per kg
d) Average purchase of raw materials 2,400 per kg

$$EOQ = \sqrt{\frac{2 \times D \times S}{H}} \quad (1)$$
$$= \sqrt{\frac{2 \times 72.000 \times 739.500}{3.820}}$$
$$= \sqrt{27.876.440}$$
$$= 5.280 \text{ kg/order}$$

From the calculation obtained that with the EOQ method, the company can make the optimal purchase of raw materials for each order is **5.280 kg of units/orders**.

### 3.4. Frequency of Purchase of Raw Materials

The frequency of purchase of raw materials by companies can be known by:
F = order frequency (times/year)
Q = result of EOQ order amount (unit/order)

$$F = \frac{D}{Q} \quad (2)$$
$$= \frac{72.000}{5.280}$$
$$= 14 \text{ times/year}$$

Based on calculations, it was obtained that the frequency of ordering raw materials can be done by the company at least **14 times a year**.
The booking period can be calculated as follows:
T = time distance between orders (days)

$$T = \frac{\text{number of working days per year}}{F} \quad (3)$$
$$= \frac{360}{14}$$
$$= 25,71$$

So the order period is 25.71 or rounded to **26 days**.

### 3.5. Total Cost of Inventory

To calculate the total cost of supply required the following data:

a) Total raw material requirement (D) 72.000 kg
b) Booking fee once booked (S) 739.500
c) Storage cost per kg (H) 3.820
d) Economical purchase of raw materials (Q) 5.280 kg

$$TIC = \left(\frac{D}{Q} \times S\right) + \left(\frac{Q}{2} \times H\right) \quad (4)$$
$$= \left(\frac{72.000}{5280} \times 739.500\right) + \left(\frac{5280}{2} \times 3820\right)$$
$$= 10.353.000 + 10.084.800$$
$$= 20.437.800$$

Based on the calculation above, the total cost of the company's raw material inventory is **Rp20.437.800**.

### 3.6. Safety Stock

Security supplies are additional supplies held to protect or guard against the possibility of material shortages (stock-outs). To determine the cost of safety supplies used statistical analysis is by considering deviations that have occurred.

**Table 6.** Standard Deviation Calculation of Raw Materials

| Month | Use of Coffee Raw Materials | X | (X-X) | (X-X)2 |
|---|---|---|---|---|
| January | 5.760 | 6.000 | 240 | 480 |
| February | 5.856 | 6.000 | 144 | 288 |
| March | 5.952 | 6.000 | 48 | 96 |
| April | 5.952 | 6.000 | 48 | 96 |
| May | 6.144 | 6.000 | 144 | 288 |
| June | 6.240 | 6.000 | 240 | 480 |
| July | 6.240 | 6.000 | 240 | 480 |
| August | 6.144 | 6.000 | 144 | 288 |
| September | 5.856 | 6.000 | 144 | 288 |
| October | 5.856 | 6.000 | 144 | 288 |
| November | 5.952 | 6.000 | 48 | 96 |
| December | 6.048 | 6.000 | 48 | 96 |
| **Total** | **72.000** | | | **3.264** |

Data Source: Processed Primary Data

$$X = \sqrt{\frac{D}{12}} \quad (5)$$
$$= \sqrt{\frac{72.000}{12}}$$
$$= 6.000 \text{ kg}$$

$$\text{Standart Deviasi} = \sqrt{\frac{\sum(x-x)^2}{12}} \quad (6)$$
$$= \sqrt{\frac{3.264}{12}}$$
$$= \sqrt{272}$$
$$= 16,49$$

To determine the amount of safety inventory required standard deviation value and also safety factor used by the company. The company expects a stock out of only 1% and when viewed from the normal distribution table then the value of Z is 2.33. Then, it can be calculated as follows:

$$SS = Z \times SD \quad (7)$$
$$= 2,33 \times 16,49$$
$$= 38,42$$

Based on the calculations above, the safety stock that must be provided by the company is **38 units**.

### 3.8. Reorder Point

PT Herbal Salam has a waiting time in waiting for the order of coffee raw materials is for 2-3 days, or it can be said that the lead time (L) is 3 days. And with an average number of working days (t) 300 days in a year. Before calculating the amount of ROP, first sought the level of use of raw materials/day in the following way:

$$d = \frac{\text{total raw material}}{\text{number of working days}} \quad (8)$$

$$= \frac{72.000}{300}$$

$$= 240$$

Then the reordering point (ROP) is as follows:

$$ROP = d \times L \quad (9)$$

$$= 240 \times 3$$

$$= 720 \text{ kg}$$

So the company must place an order for raw materials again when the raw materials are in the amount of **720 kg**.

## 4. Conclusion

Based on the results of the research that the author conducted, Raw material supply system at PT. Herbal Salam has not been optimal and has not shown a minimum supply cost. Total raw material inventory needs at PT Herbal Salam amount to 72.000 kg with an order frequency of 30 times a year. Meanwhile, using the EOQ method, the total raw material needs that must be provided by the company are 5280 kg with an order frequency of 14 times a year with a total inventory cost of RP20,437,800. From this, it can be seen that by using the EOQ method there is a saving of more than 50%. PT. Herbal Salam does not carry out security supplies in controlling supplies. While in the EOQ method, companies must carry out security supplies to avoid stock-out shortages. The security supply that must be provided by the company is 16.49 kg. PT. Herbal Salam does not do reorder points. Meanwhile, in the EOQ method, the company must set a return order point to avoid delays in the delivery of raw materials. The reorder point that must be done by the company is when the raw materials are in the amount of 720 kg.

## References

[1] B. Riyanto, *Dasar-dasar Pembelanjaan Perusahaan*. Yogyakarta: BPFE, 2010.
[2] A. , O. O. , & W. G. P. Rofiq, "Analisis Pengendalian Persediaan Obat Dengan Metode ABC, VEN dan EOQ di Rumah Sakit Bhayangkara Kediri," *JPSCR: Journal of Pharmaceutical Science and Clinical Research*, vol. 5, no. 2, pp. 97–109, 2020.
[3] H. Mardiyanto, *Inti Sari Manajemen Keuangan*. Jakarta: PT. Grasindo, 2008.
[4] E. P. , dan S. J. S. B. Lahu, "Analisi Pengendalian Persediaan Bahan Baku Guna Meminimalkan Biaya Persediaan Pada Dunkin Donuts Manado," *Jurnal Emba: Jurnal Riset Ekonomi, Manajemen, Bisnis Dan Akuntansi*, vol. 5, no. 3, pp. 4175–4184, 2017.
[5] Sugiyono, *Metode Penelitian Bisnis*. Bandung: Alfabeta, 2012.
[6] E. Herjanto, *Manajemen Operasi (Edisi Revisi)*. Jakarta: gramedia, 2015.
[7] S. Assauri, *Manajemen Produksi dan Operasi*. Jakarta: Lembaga Penerbit Fakultas Ekonomi UI, 2008.
[8] F. Margaretha, *Manajemen Keuangan Untuk Manajer Non Keuangan*. Jakarta: Erlangga, 2011.

[9] J. dan B. R. Heizer, *Manajemen Operasi-Manajemen Keberlangsungan dan Rantai Pasokan*. Jakarta: Salemba Empat, 2015.
[10] M. dan M. N. Haming, *Manajemen Produksi Modern Operasi Manufaktur dan Jasa*. Jakarta: Mitra Wacana Media, 2012.
[11] D. Sunyoto, *Dasar-dasar Manajemen Keuangan Perusahaan*. Yogyakarta: CAPS, 2013.
[12] I. Fahmi, *Manajemen Produksi dan Operasi*. Bandung: Alfabeta, 2014.