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THE ANALYSIS OF CONTROL RAW MATERIAL INJECTION PHYTON IN THE IMPLEMENTATION OF ECONOMIC ORDER QUANTITY (EOQ) IN PT. VICTORY CHYNGLUH INDONESIA

Surachman[1] , Umi Mafida Ustahiroha Handayani[2]
[1,2]Bina Bangsa University
Email: rachmanbjr@gmail.com, Umimafida31@gmail.com

Abstract

This study aimed to determine the inventory control of Python Injection (IP) raw materials at PT. Victory Chyngluh Indonesia. The method used in achieving data analysis objectives is to use the *Economic Order Quantity (EOQ) form.* Research results with the total cost of inventory using company policy are Rp. 2,622,540,500, - after using the *Economic Order Quantity (EOQ)* method is Rp. 2,419,006.133,-, thus the company can save the cost of raw material inventory for *Python Injection* (IP) of Rp.203,534,367,-

Keywords: Raw materials, *Economic Order Quantity (EOQ),* Inventory Control

INTRODUCTION

The superiority of a company over its competitors is determined by factors, namely time, quality, cost, and human resources. Time is one of the leading determinants of competitiveness. If a company wants to excel from the time factor, then the company must be able to serve customer requests on time, reducing or eliminating non-value-added activity time. The way for companies to have an advantage in terms of the time factor is to fulfill aspects of raw materials. For this reason, the company is expected to have high competitiveness to survive and win the global competition.

Every company, be it a service company or a manufacturing company, must have the same goal: to make a profit. Achieving this goal is not easy because several factors influence it, and every company must handle these factors. One factor that influences the company's plan to earn a profit is smooth production.

The problem of production is a significant problem for the company because it dramatically affects the profits earned by the company. If the production process runs smoothly, the company's goals can achieve, but if the production process does not run smoothly, the company's plans will not
complete. At the same time, the presence or absence of raw materials affects the smooth production process. The company must be able to manage inventory properly to have optimal stock for the company's smooth operation in the correct quantity, time, quality, and at the lowest possible cost. However, based on initial observations, it turns out that the raw material inventory at PT. Victory Chingluh Indonesia has not been appropriately planned, so the raw material inventory in the company is not optimal, and the production process cannot run according to the specified time.

This inventory is due to the warehouse's lack of raw material inventory. This activity can be seen when PT. Victory Chingluh Indonesia experienced a shortage when exports arrived; the company had just purchased raw materials to overcome export delays because the raw materials in the company were not sufficient for the production process.

This problem can happen due to several factors; these factors can come from issues in PT. Victory Chingluh Indonesia itself or from outside parties as *suppliers* of raw materials, topics from within the company can be in the form of inventory stocks that are not calculated correctly, making the production process unstable. Therefore, it is essential to note that the supply of raw materials is still available, and there is no inventory shortage. The appropriate method used in this case is the *Economic Order Quantity (EOQ) method. EOQ* is a method used to determine the number of purchases with the most minimum cost; the *EOQ* method seeks to achieve the minimum possible inventory level with low price and good quality. Planning the *EOQ* method in a company can minimize the occurrence of *stock-outs* so that it does not interfere with the production process.

Supply

Inventories are stored materials or goods that will be used to fulfill specific purposes, such as the production or assembly process, resale, and spare parts of an equipment or machine. Inventories can be raw materials, auxiliary materials, work in process, finished goods, or spare parts.

They were reporting back to production planning. Inventory generally refers to the existing materials and idle resources of a company. Stocks represent goods that will be sold or manufactured or in the form of raw materials that have not been used. The interval between receiving the purchased part and turning it into the final product varies from industry to industry, depending on the manufacturing cycle. Therefore, it is necessary to have an inventory of various types to act as a buffer between supply and demand for the system's efficient operation. Thus, effective inventory control is necessary to smooth and slow down the production cycle with less disruption.

According to Handoko (2002), inventory is a general term that indicates everything or organizational resources stored in anticipation of meeting demand.

Inventory Function

The production function of a company cannot run smoothly without sufficient inventory. Inventories arising from supply and demand are in different levels so that the materials provided are also other than those needed.

According to Yamit (2003), four factors serve as a function of the need for inventory, namely:

1. The time factor concerns the length of the production and distribution process before the finished goods reach the consumer.
2. The time uncertainty factor from the supplier causes the company to need inventory not to hamper the production process or delay delivery to consumers.
3. Uncertainty factors for use from within the company caused by errors in demand forecasting, machine breakdowns, operating delays, defective materials, and various other conditions.

Control

Every company needs to hold inventory to ensure the continuity of its business; every company must maintain the optimum amount of stock so that it can provide the needs

for the smooth running of the company's activities. Excessive inventory will harm the company because more money or capital is invested, and the costs are incurred by such stock. On the other hand, an too small inventory will constitute a company because the smooth running of production and distribution activities will disrupt.

According to Assauri (2004), inventory control can be regarded as an activity to determine the level and composition of the inventory of parts, raw materials, and products so that the company can protect the smooth production and sales and the company's spending needs effectively and efficiently.

Based on the above understanding, it can conclude that inventory control is an activity carried out so that production can run smoothly and inventory costs are minimal.

Purpose of Inventory Control

According to Rangkuti (2004), inventory control carried out by a company certainly has particular objectives. Inventory control that is carried out aims to balance losses and savings in the presence of a certain level of inventory and the number of costs and capital required to hold the stock.

The purpose of inventory control is to obtain the right quality and quantity of materials available at the necessary time with minimum costs for the company's profits, in other words, to ensure there is inventory at an optimal level so that production can run inventory costs smoothly. This production is minimal.

Aspects of Inventory Control

According to Yamit (2003), to control inventory, three factors need to be considered, namely:

1. Inventory Procurement System

The company must determine the inventory procurement system that will be applied by taking into account the factors that affect inventory control as required above.

2. Determination of Inventory Quantity

Determining the amount of inventory is an essential aspect of inventory control, shortages and excess amounts of stock will affect the company's level of profit.

3. Inventory Administration

A good and consistent inventory administration is required to make inventory control more accessible.

Economic Order Quantity (EOQ)

The number or size of orders held should result in minimal costs incurred in inventory. We must minimize ordering and carrying costs to determine this economic order quantity.

In this case, we are faced with two slightly contradictory characteristics of costs; the first one emphasizes that the number of orders is minimal so that the holding costs are small, but on the other hand, the ordering costs are enormous for one year. By examining these two properties, it is clear that the economic order quantity lies between two extreme constraints, namely, where total ordering costs equal total *ordering costs* or where total ordering costs *equal total ordering costs* for one year.

According to Dr. A.Kadim (2017), *Economic Order Quantity* (EOQ) is an order size that minimizes the total cost of transportation *(carrying cost)* and *ordering cost (ordering cost)*.

According to Assauri (2008), it is the number or size of orders with the *minimum number of ordering costs* and *carrying costs* per year.

Determining or solving this economic order quantity can do it in three ways, namely:

1. *Tabular Approach*

The number of economic orders with the tabular approach is determined by compiling a list or table of the number of orders and the total cost per year. Of course, the number of orders containing the most negligible costs is an *economic order (quantity).*

2. *Graphical Approach*

The number of economic orders with the *graphical approach is* determined by depicting the graphs of *carrying costs, ordering costs*, and total costs in a picture.

3. *Approach Formula*

A cost-effective method of determining the number of orders by deriving them from a mathematical formula is to keep in mind that the lowest inventory costs exist when the ordering cost equals the carrying cost. The symbols or notations used are as follows:

With the symbol notation above, it can determine that the *ordering cost* per year is:

$$\frac{A}{N} \text{ X } P$$

And the *carrying costs* are:

$$\frac{AR}{A/N} \text{ X } 0.5 \text{ x } C = 0.5\ RCN$$

Description:
A = number of needs (units)
R = material price per unit
P = *ordering cost*
C = *carrying cost* expressed as a percentage of the average inventory
N = economic order quantity

The formulas for determining the best number of units per order, the best number of unit orders per year, and the best number per order, *supply per order.*

In this case, N states that the optimum quantity per order can determine if the total *ordering cost* and the total *carrying post* per year are the same. Thus it can be determined:

$$A/N \times P = 0.5\ RCN$$

$$2AP = N2\ RC$$

$$N2 = \frac{2AP}{RC}$$

$$N = \sqrt{\frac{2AP}{RC}}$$

Safety Stock

Minimum inventory is the additional inventory needed to always be ready in the warehouse to prevent the possibility of material shortages. The formula or mathematical equation is used to determine the safety stock value.

According to Awat, I Nafa, and Mulyadi (2003), Rescue supplies are additional supplies held to protect or guard against possible shortages of materials (*stock out*). The effect of procuring rescue supplies on the cost of separation reduces losses due to *stock-outs*, but on the other hand, it will increase the *carrying cost*. The cost reduction or company loss equals the multiplication of the number of rescue supplies held to deal with *stock-outs* with the price of *stock out* per unit.

Determination of the amount of safety stock can be done by comparing the use of raw materials and then looking for the standard Deviation, with the following formula:

$$\text{Standard Deviation} = \frac{(X - \overline{X})}{N}$$

Where:
n = Number of periods of ordering raw materials.
x = Amount of actual use of natural materials per period (prs/year).
X = Average - Average use of raw materials (prs).
To find out how much *safety stock* (safety stock) the following formula is used
Safety Stock = SD x Z
Where:
S d = Standard Deviation
Z = The safety factor is formed based on the company's capabilities.

Reorder Rate
(Reorder Points)

A reorder point is when an item in the warehouse must be stocked up before it runs out. [11] In determining this point, the amount of material used must be considered as long as the ordered materials have not arrived and the minimum inventory. The amount of use while the requested materials have not been reached is determined by two factors, namely *"lead time"* and the average level of service. So, the amount of use of the ordered materials that have not been received results from the multiplication between the time it takes to order and the average amount of use of these materials.
Calculation of ***Re-Order Point*** is as follows:
ROP = Safety Stock + (Lead Time x Q)
Where:
ROP = Reorder point.
Lead time = Waiting time (Days).
Safety stock = Safety stock (prs).
Q = Average raw materials per day (prs/day).

Maximum Inventory

An entire inventory limits the most significant (highest) amount of stock that the company should hold. This maximum inventory limit is sometimes not based on considerations of the efficiency and effectiveness of the company's activities, so it is only based on its ability, especially its financial capacity, existing warehouse capabilities, and restrictions on the properties or damage of these materials.

This entire inventory is held with the intention that in carrying out the production process, a company will not be faced with a shortage of raw materials, which can later interfere with the activities of the production process.

According to Rangkuti (2004), to calculate how much the maximum amount of inventory is obtained from the addition of the most economic quantity or the number of orders (EOQ) with the minimum amount or amount of inventory (*safety stock*). Formulating the minimum amount of inventory as mentioned above will make it easier for companies to prepare or determine the amount of the budget for the needs of raw materials needed in the production process.

As for knowing the maximum amount of inventory can use the formula:

Max. Inventory=Safety Stock + EOQ

Where:

Safety Stock = Safety stock.

EOQ = Optimal purchase quantity.

Total Inventory Cost of Raw Materials *(Total Inventory Cost)*

The total cost of inventory is the total cost of stock that must be incurred by the company or the combination of *carrying costs* with total *ordering costs.*

The formula is:

TIC = $\sqrt{2 \times D \times S \times H}$

Where:

D= Quantity of usage per period (pairs/year)

S = Cost per order (Rp/year)

H=Storage cost per unit (Rp/pair/year)

To find out the optimal quantity of raw material orders in the supply of raw materials for making shoes at PT. Victory Chingluh Indonesia, you must first know the leading raw material needed each month.

Table 1
Raw Material Purchase Table 2019 and 2020

No	Month Purchase	Year (Instal)	
		2020	2019
1	January	125.150	107.330
2	February	111.161	113.400
3	March	94.795	105.160
4	April	56.566	136.740
5	May	40.076	118.505
6	June	38.353	142.215
7	July	23.710	125.849
8	August	16.366	116.332
9	September	54.719	109.435
10	October	83.600	106.363
11	November	99.200	122.910
12	December	78.429	121.953
Amount		**822.125**	**1.426.192**
Average		**68.510**	**116.849**

Source: Company Data

Most of the raw materials available in the warehouse are used for the production process. Some are stored for the next production reserve or as a backup if it is difficult to get raw materials on the market.

Table 2
Raw Material Usage in 2020

No	Month Purchase	Year (Instal)	
		2020	
		Amount	+/-
1	January	112.450	12.700
2	February	100.011	11.150
3	March	95.151	(356)
4	April	57.242	(676)
5	May	45.726	(5.650)
6	June	44.775	(6.422)
7	July	27.570	(3.860)
8	August	22.992	(6.626)
9	September	54.169	550
10	October	82.350	1.250
11	November	95.844	3.353
12	December	72.343	6.086
Amount		**810.623**	**11.502**
Average		**67.552**	**958,5**

Source: Data processed

Ordering costs consist of contract administration fees and shipping costs.

Table 3
Ordering Fee 2020

No	Type Cost	Year
		2020
1	Administrative costs	2.200.000
2	Shipping costs	140.000.000
Administration Percentage		1.5%
Delivery Percentage		98.5%
Amount		**142.200.000**
Average		**11.850.000**

Source: Data processed

The storage cost required for further analysis is calculated in a percentage, which is a percentage of the inventory value. Inventory value is the number of raw materials

ordered every month. The price of raw materials is a variable cost that depends on the number of raw materials each time you order. The company set the number of storage costs for midsole raw materials at 15% of the inventory value.

Table 4
Percentage of holding cost, price per unit, and Storage cost in 2020

Year	% Savings Cost	Unit price	Storage Fee
2020	15%	18.500	36.550

Source: Data processed

The amount of raw material usage, the price of raw materials per pair, and the ordering and storage costs at PT. VCI during the period 2019 – 2020.

Table 5
The use of raw materials, the price of raw materials per pair, and the ordering fee for PT. VCI Year 2020

Year	Usage			Order Fee
	Amount	Price	Total cost	
2020	810.623	18.500	14.996.525.500	142.200.000

RESEARCH METHOD

This research is a case study research, by looking directly at the company what is going on and helping to solve these problems based on what already exists. The method used in this research is *descriptive analysis.* This *descriptive* research method aims to describe or describe the data to be studied, then processed using the calculation of *Economic Order Quantity (EOQ).* The data to be analyzed is the purchase of raw materials and *Python Injection (IP)* raw materials at PT. Victory Chingluh Indonesia (PT.VCI) Cikande Serang

RESULTS AND DISCUSSION

EOQ the calculation results

$$EOQ = \sqrt{\frac{2 \times 810.625 \times 142.200.000}{36.550}}$$

$$= \sqrt{\frac{230.541.750.000.000}{36.550}}$$

$$= \sqrt{6.307.571.819}$$

= 79,420 units

Frequency of Orders with economical quantities:

$$\frac{D}{EOQ} = \frac{810.625}{79.420} = 10 \text{ times}$$

So the economic number in one order is 79,420 units, and the number of orders is 10 times, so the total order is Rp. 794,200 units.

Determination of *Safety Stock* (Safety Stock)

Standard Deviation = 810.623-67.522
= 743.101

Then the Standard Deviation of the use of Phylon Injection raw materials during the 36-day lead time is:

$= \sqrt{\int x(\alpha/6)}$
$X\ 36/30 = \sqrt{(743{,}101 / 6)}$
$= 148.620$

I used a tolerance limit of 5% above the estimate and 5% below the forecast. PT. VCI uses 2 standard deviations of 5% with a value of 1.65 from the Z standard distribution table. The following is the result of the calculation of the *Safety Stock*.

SS = Z x SD
= 1.65 x 148,620
= 245.223

So the safety stock is needed by PT. Victory Chingluh Indonesia is 245,223 units.

Calculation of ReOrder Point (ROP)

ROP = Safety Stock + (Lead Time x Q)

= 245,223 + (36/30 x 2,251)
= 247,924 units

So if the supply of Python Injection in the warehouse has reached 247,924 units, you must order 79,420 (EOQ)

Maximum Value Calculation:

Maximum Inventory = Safety Stock + EOQ
= 247.924 + 79.420
= 327,344 units

Calculation of *Total Inventory Cost:*

$TIC = \sqrt{2 \times D \times S \times H}$
$= \sqrt{2 \times 67\,552 \times 36\,550 \times 11.85 \text{ million}}$
$=\sqrt{58.515.906.720}$
$=2.419.006.133$

TIC according to company calculations:
TIC=(Average Inventory(H)+(P)(n)
= 68,510 x 36,550+11,850,000x10
= 2.622.540.500

A comparison of the total cost of raw material inventory according to EOQ with the comprehensive list of raw materials run by the company and the resulting savings is required to determine the total cost of raw material inventory according to EOQ and the resulting savings. The comparison can be seen in the table below:

Table 6
TIC by EOQ and Company

Th	TIC According to EOQ	TIC By Company	Savings
2020	2.419.006.133	2.622.540.500	203.534.367

CONCLUSION

Conclusion

Based on the results of research and observations that have been made on the raw material inventory system at PT. Victory Chingluh Indonesia then gets several conclusions, namely:

1. While the raw material production system at PT. Victory Chingluh Indonesia is performing well. The company frequently faces stock-outs due to poor inventory management in the warehouse

.

2. To fulfill the optimal number of orders each year, a total inventory cost of Rp. 79,420 is required, with a purchase frequency of ten times and reordering every 36 days, while the warehouse must maintain a safety stock of 245,223 pairs, and the company must repurchase 247,924 pairs.
3. There is a considerable difference between company policies using the EOQ method regarding the total cost of raw material inventory. This result means that if the company uses the EOQ method, the costs to be incurred will be less, and the company can save expenses, especially in terms of inventory costs.

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