



Analysis of Planning and Control of Raw Material Supplies for Bus Mattresses Using the EOQ (*Economic Order Quantity*) Method at PT . Kurnia Persada Mitra Mandiri

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Abstract

This study aims to analyze the planning and control of raw material inventory at PT. Kurnia Persada Mitra Mandiri. The analysis was performed using the EOQ (Economic Order Quantity) method. This analysis technique consists of reviewing the reorder point, safety stock, and total annual inventory cost. The results show that by using the EOQ method, the company can find out how many times raw materials are purchased and in the quantity how many times raw material purchases are made, know how much minimum stock is needed to be on guard, determine the time to reorder raw materials, and know the costs. The results showed that by using the EOQ method the company could generate more optimal profits compared to conventional methods. Furthermore, the research results also show that with the application of EOQ, companies can make savings on raw material inventory costs, namely in 2018 amounting to IDR 19,092,034 and in 2019 of IDR 21,053,480. In the end, this research is expected to provide insights for companies to use the EOQ method sustainably so that the process of planning and controlling raw materials is better.

Keywords: Planning, Control, Inventory, Raw Materials, EOQ

1. Introduction

The rapid development of the economy is accompanied by increasingly advanced developments in science and technology (science and technology), as well as increasingly fierce competition between companies, meaning companies must be smarter in responding to these developments. The biggest asset in a company is in the raw material inventory, this of course makes the company have to plan and control the raw material inventory optimally so that the company does not experience losses in the future and the company's goals can be achieved.

According to Sumbawa (2015), achieving goals effectively and efficiently in the use of inventory can be started by planning and controlling raw material inventory. Every company must plan and control raw material inventory in order to reduce costs so that it can minimize the costs that must be incurred so that it can maximize the profits obtained.

PT Kurnia Persada Mitra Mandiri is a company operating in the furniture sector. This company is located on Jalan Sako Baru Palembang. This company is known to the public as the Procella foam factory or Olympic factory because this company has joined the Indonesian Olympic group. This company sells various types of household furniture such as spring beds, foam mattresses, sofas, cupboards, chairs, tables and other furniture. However, only 3 products are produced, namely spring beds, foam mattresses and sofas. Apart from that, other furniture is produced at the company center, namely PT Graha Multi Bintang which is located in Bogor. However, in this study the author limited the scope by only examining 1 division, namely the foam mattress division. The following is a table of the main raw materials for producing foam mattresses.

The main raw materials for producing foam mattresses are TDI, PPG, MC, Amine, Cosmos, and Niak . In practice, raw materials are purchased within a 14 day lead time for purchase. So



the need for raw materials must of course be the center of the company's attention. In its production activities, the company makes policies regarding managing raw material supplies using conventional methods or still using the old method, namely the company purchases raw materials continuously by estimating production needs. This is done to anticipate the problem of excess and shortage of raw materials which could result in the production process being disrupted. However, advantages and disadvantages still often occur in using this policy. The following is data on raw material needs and supplies for 2018-2019.

Table 1. Data on supplies and raw material requirements in 2018

No	Raw Material Name	2018				
		Supply	Need	Lack	Excess	Information
1	PPG	382,000	379,500		2,500	More
2	TDI	270,000	271,500	1,500		Not enough
3	MC	47,500	47,700	200		Not enough
4	AMINE	1,200	1,100		100	More
5	COSMOS	1,700	1,600		100	More
6	NIAK	10,800	10,600		200	More
2019						
No	Raw Material Name	Supply	Need	Lack	Excess	Information
1	PPG	382,000	381,100		900	More
2	TDI	270,000	272,000	2,000		Not enough
3	MC	47,500	47,300		200	More
4	AMINE	1,200	1,150		50	More
5	COSMOS	1,700	1,750	50	0	Not enough
6	NIAK	10,800	10,730		70	More

Source: PT. Kurnia Persada Mitra Mandiri

From table 1 it shows that companies often experience differences between less and more. This will certainly have a detrimental impact on the company. According to Sumbawa (2015) The supply of raw materials plays an important role in the smooth running of the production process. If the supply of raw materials is low/out of stock, the production process will be disrupted, many workers will be unemployed, and consumer loss may occur. On the other



hand, if there is more raw material inventory, it will result in unproductive investment of capital which will result in losses.

According to Rusdiana & Haris (2018), to overcome this problem you can carry out an EOQ (Economic Order Quantity) analysis. The *Economic Order Quantity (EOQ)* method is a model that concerns the procurement or supply of raw materials in a company. By calculating the most economical inventory quantity, the company will be able to plan and control the existing raw material inventory.

EOQ analysis according to Trihudyatmanto (2017) can be used to plan how many times a material is purchased and in what quantity it is purchased. Apart from determining the EOQ, the company also needs to determine the time to reorder the 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. And you can also find out what minimum stock (*safety stock*) is needed in case there is a running out of inventory. All of this analysis will later determine the amount of raw material inventory costs that must be incurred by the company by calculating the total annual raw material inventory costs (*Total Annual Inventory Cost*). The following is data on the cost of raw material supplies for foam mattresses from 2018-2019 according to company calculations.

Table 2. Inventory cost data by company

No.	Raw Material Name	Total Cost of Foam Raw Material Inventory	
		2018	2019
1	PPG	60,100,000	71,250,000
2	TDI	55,300,000	69,280,000
3	MC	16,400,000	21,300,000
4	AMINE	8,120,000	9,160,000
5	COSMOS	13,150,000	15,720,000
6	NIAK	19,700,000	18,800,000
Amount		172,770,000	205,510,000

Source: PT. Kurnia Persada Mitra Mandiri

From table 2 above it can be seen that the company has raw material inventory costs of 172,770,000 in 2018 and 205,510,000 in 2019. This data will later become comparative data. Where it will be analyzed how raw material inventory costs are after using the EOQ method.

Based on research by Trihudyatmanto (2017), the results obtained using the EOQ method stated that by implementing the EOQ method the company could minimize or minimize the cost of raw material supplies. Based on data analysis, researchers obtained results which stated that by applying this method the company could find out the frequency of purchasing raw materials, the point of reordering raw materials, and how much inventory reserves should be available.



Based on research by Andira (2016), the results obtained using a simple method, Roti Puncak Makassar did not implement a reorder *point*. Meanwhile, using the EOQ method, the reorder point is made when the quantity reaches 31,626 kg. The application of the EOQ method to companies results in cheaper costs when compared to the method currently applied by the company.

Based on the description of the background of the problem, the reason the researcher chose the company PT. Kurnia Persada Mitra Mandiri as the research object, because this company is an industry that has a wide market, so it requires planning and control of raw materials in the production process.

2. Method

In this research the author discusses planning and controlling the supply of raw materials for foam mattresses using the EOQ method at PT. Kurnia Persada Mitra Mandiri. Considering that the discussion within this company is quite extensive and the company has not only one division but several divisions including sofas, spring beds and foam mattresses. And foam mattresses are also the product that plays the most role in the production process where spring beds and sofas also use foam mattresses in their production, so the author limits this research to only examining the foam mattress part.

The types of data required in this research are primary data and secondary data. According to Rusdiana & Haris (2018) primary data is data obtained from the source directly by analyzing various documents and written reports in the form of raw material inventory data at PT. Kurnia Persada Mitra Mandiri in Palembang. Meanwhile, secondary data is all forms of data that do not come directly from research objects or subjects, usually in the form of library data, namely various kinds of reading in the form of books, journals, theses, articles, the internet, and various related research results.

The data analysis technique used in this research is the presentation of numbers, tables and explanatory descriptions regarding the analysis of planning and control of supplies of foam raw materials by carrying out the following analysis:

1. Planning Analysis Using the EOQ Method

This analysis is used so that companies can plan to determine the optimal number of orders or purchases each time they place an order. In Fajrin & Slamet (2016) this can be done by carrying out an analysis of the economic purchase quantity calculation or EOQ (*economic order quantity*). The formula is as follows:

$$EOQ = \sqrt{\frac{2 \times R \times S}{P \times I}}$$

Information :

EOQ = Economic Order Quantity

R = Unit Needs 1 year

S = Cost each time you order goods

P = Material Cost Per unit

I = Percentage of annual inventory value

2. Control Analysis Using Safety Stock

In order for the production process to run smoothly, there must be control by determining the minimum stock inventory or often called safety stock. The company must do this to avoid things that are beyond its control, for example the late arrival of raw material orders due to several things. If the company has minimum stock then stock out (out of inventory) will not



occur. The following is the safety stock formula according to Trihudyatmanto (2017), namely:

$$SD = \sqrt{\frac{\sum (x - y)^2}{n}}$$

Information :

SD = Standard Deviation

x = actual usage (needs).

y = Estimated usage (Purchases)

n = Number (number of data)

xy = Difference between purchases and needs (usage)

$$SS = Sd \times Z$$

Information :

SS = *Safety Stock* Quantity

Sd = Standard Deviation

Z = Desired confidence level 95% (1.65)

The higher the service level set by management, the higher the stock that must be prepared. Regarding safety stock, the service level at PT. Kurnia Persada Mitra Mandiri is represented by the z parameter, a standard value in the normal distribution. In this company the service level policy is 95% so the z value = (0.95) = 1.65.

3. Inventory Analysis With Reorder Point (ROP)

According to Nofirza & Gerry (2017) Reorder point is the moment or point at which another order must be placed in such a way that the arrival or receipt of the ordered material is exactly at the time where the inventory above safety stock is equal to zero. Reorder points can be set in various ways, including:

1. Determine the amount of usage during lead time and increase it by a certain percentage.
2. Determine the amount of usage during the lead time and add the usage during a certain period as safety stock.

So the way to calculate ROP can be formulated by determining usage during lead time and adding usage during a certain period as safety stock. Here is the formula:

$$ROP = (dx L) + SS$$

Information :

ROP = Reorder Point

D = Daily Demand

L = *Lead Time* (Waiting time) for ordering goods

SS = Safety Stock Quantity.

4. Analysis of Total Annual Raw Material Inventory Costs

According to Anggraini (2016), this analysis was carried out to find out the total annual inventory costs (Total Annual Inventory Cost). First of all, you will first find the total ordering cost and then the results will be added to the total maintenance cost.

The following is the formula for the analysis of total annual raw material inventory costs:

$$TOC = \frac{R \times S}{EOQ}$$



$$TCC = \frac{PxIxEOQ}{2}$$

$$TAC = TOC + TCC$$

Information :

TAC = Total annual inventory cost (Total Annual Cost)

TOC = Total ordering cost (Total Ordering Cost)

TCC = Total Maintenance Cost (Total Caring Cost)

R = Unit needs for 1 year

EOQ = Economic ordering quantity

S = Ordering cost or per order

P = Material cost per unit

I = Percentage of annual inventory value

3. Results and Discussions

Planning Analysis Calculations Using the EOQ Method

Table 3. Recapitulation of Economic Order Quantity

No.	Raw material	2018			2019		
		Need	EOQ (kg)	Booking	Need	EOQ (kg)	Booking
1	PPG	379,500	23,859	16 times	381,100	22,542	17 times
2	TDI	271,500	18,050	15 times	272,000	16,451	17 times
3	MC	47,400	11,962	4 times	47,300	10,807	4 times
4	AMINE	1,100	663	2 times	1,150	645	2 times
5	COSMOS	1,600	637	3 times	1,750	537	3 times
6	NIAK	10,800	3,486	3 times	10,730	3,292	3 times

Based on table 3, you can get the economic ordering quantity (EOQ) for each raw material and how many times the company must place an order for each type of raw material. In 2018, PPG raw materials had an ordering frequency of 16 times and the quantity per order was 23,859 kg, TDI raw materials had an ordering frequency of 15 times and the quantity per order was 18,050 kg, MC raw materials had an ordering frequency of 4 times and the quantity per order is 11,962 kg, Amine raw materials have an order frequency of 2 times and the quantity per order is 663 kg, Cosmos raw materials have an order frequency of 3 times and the quantity each time an order is made is 637 kg, and materials Baku Niak has an order frequency of 3 times and the quantity each time ordered is 3,486 kg.

In 2019, PPG raw materials had an ordering frequency of 17 times and the quantity per order was 22,542 kg, TDI raw materials had an ordering frequency of 17 times and the quantity per order was 16,451 kg, MC raw materials had an ordering frequency of 4 times and the quantity



per order is 10,807 kg, Amine raw materials have an order frequency of 2 times and the quantity per order is 645 kg, Cosmos raw materials have an order frequency of 3 times and the quantity each time an order is made is 537 kg, and materials Baku Niak has an order frequency of 3 times and the quantity each time ordered is 3,292 kg.

Analysis Calculations Using Safety Stock

Table 4. Safety Stock Recapitulation

No.	Raw Material Name	Safety Stock	Safety Stock
		Year 2018 (Kg)	2019 (Kg)
1	PPG	1,191	429
2	TDI	714	952
3	MC	96	96
4	AMINE	48	23
5	COSMOS	48	23
6	NIAK	96	33

Based on table 4 of the safety stock recapitulation , it can be concluded that the safety stock that must be provided by the company in 2018 for PPG is 1,191 kg, TDI is 714 kg, MC is 96 kg, amine is 48 kg, cosmos is 48 kg, and niak is 96 kg. . Meanwhile in 2019 the safety stock for PPG was 429 kg, TDI was 952 kg, MC was 96 kg, amine was 23 kg, cosmos was 23 kg, and niak was 33 kg.

Inventory Analysis Calculations With Reorder Point (ROP)

Table 5. Reorder Point (ROP) Recapitulation

No.	Raw Material Name	ROP	ROP
		Year 2018 (Kg)	2019 (Kg)
1	PPG	15,947	15,255
2	TDI	11,270	11,536
3	MC	1,958	1,930
4	AMINE	90	65
5	COSMOS	104	93
6	NIAK	502	453

Based on table 5 of the reorder point recapitulation, the reorder point (ROP) results are obtained for all types of raw materials. In 2018, companies can reorder raw materials if the



stock of raw materials is at the reorder point. The reorder point at PPG was 15,947 kg, TDI was 11,270 kg, MC was 1,958 kg, amine was 90 kg, cosmos was 104 kg, and niak was 502 kg. In 2019, the reorder point for PPG was 15,255 kg, TDI was 11,536 kg, MC was 1,930 kg, amine was 65 kg, cosmos was 93 kg, and niak was 453 kg.

Analysis of Total Annual Raw Material Inventory Costs

Table 6. Total Annual Raw Material Inventory Costs
Based on 2018 EOQ and Company Calculations

No	Raw Material Name	2018	
		EOQ	Company
1	PPG	57,261,505	60,100,000
2	TDI	54,149,792	55,300,000
3	MC	14,354,929	16,400,000
4	AMINE	5,969,625	8,120,000
5	COSMOS	10,891,193	13,150,000
6	NIAK	11,050,922	19,700,000
Total		153,677,966	172,770,000

Based on table 6, in 2018 the total annual raw material inventory costs based on calculations using the EOQ method resulted in 153,677,966, while according to the company the total annual raw material inventory costs that had to be incurred were 172,770,000. So if the company uses the EOQ method, the company can minimize costs by 19,092,034.

Table 7. Total Annual Raw Material Inventory Costs

No	Raw Material Name	2019	
		EOQ	Company
1	PPG	67,625,439	71,250,000
2	TDI	66,134,409	69,280,000
3	MC	17,507,256	21,300,000
4	AMINE	7,126,291	9,160,000
5	COSMOS	13,026,131	15,720,000
6	NIAK	13,036,994	18,800,000
Total		184,456,520	205,510,000

Source: PT. Kurnia Persada Mitra Mandiri



Based on table 7 in 2019, the total annual raw material inventory costs based on calculations using the EOQ method resulted in 184,456,520, while according to the company the total annual raw material inventory costs that had to be incurred were 205,510,000. So if the company uses the EOQ method, the company can minimize costs of 21,053,480

4. Conclusion

Based on the results of the explanation regarding the results of the analysis that has been carried out, there are several things that can be concluded, namely:

1. The raw material inventory planning system implemented by PT. Kurnia Persada Mitra Mandiri still doesn't look good. This can be seen from the condition of companies which often experience differences in shortages and excesses in their raw material supplies. Insufficient/exhausted supplies of raw materials will result in the production process being disrupted, many workers being unemployed, and loss of consumers may occur. On the other hand, if there is more raw material inventory, it will result in unproductive investment of capital which will result in losses. By using the EOQ method, companies can plan to determine the optimal number of orders or purchases each time they place an order.
2. The raw material inventory control system implemented by the Company still does not have a minimum stock. Where orders for raw materials are made by looking at stock inventory only and by following the conditions that usually occur on certain days and months. By using the EOQ method with *safety stock* calculations, companies can find out the minimum stock that must be available to overcome frequent stock shortages.
3. The company's raw material inventory does not yet know when the company must order raw materials. By applying the EOQ method the company can find out the point at which the company must reorder. So at a certain point of inventory of raw materials, the company can order raw materials again. Like the results obtained using the EOQ method with ROP calculations, in 2018 the reorder point for PPG was 15,947 kg, TDI was 11,270 kg, MC was 1,958 kg, amine was 90 kg, cosmos was 104 kg, and niak was 502 kg. In 2019, the reorder point for PPG was 15,255 kg, TDI was 11,536 kg, MC was 1,930 kg, amine was 65 kg, cosmos was 93 kg, and niak was 453 kg.
4. The results of the comparison between the EOQ method and the company show that using the EOQ method can provide more optimal profits compared to companies using conventional methods. Using the EOQ method can provide better planning and control of raw materials for the future. Savings in raw material inventory costs using the EOQ method in 2018 amounted to 19,092,034 and in 2019 amounted to 21,053,480.

Based on the results of the explanation regarding the results of the analysis that has been carried out, there are several things that are recommended, namely:

1. Companies can plan using the EOQ method. Because by using the EOQ method companies can develop strategies to achieve company goals.
2. Companies can carry out control using the EOQ method. Because by using the EOQ method the company can maintain the stability of the production process.
3. Companies can maintain optimal supplies of raw materials and can also minimize costs incurred by using the EOQ method.
4. For those who want to do research on inventory control in the future, they can do research by paying attention to discount factors, expiry dates (if any), and other factors that influence raw material supplies.



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