Implementation of Continuous Review System Method, Periodic Review System Method and Min-Max Method for Cheese Powder Inventory (Case Study: PT. Mayora IndahTBK)

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Abstract
PT. Mayora Indah, Tbk is a company engaged in manufacturing food and beverage production. This company is located on Jalan Daan Mogot Km. 18 Jakarta-Indonesia. The large demand made PT. Mayora Indah, Tbk requires good inventory control planning. The cheese powder material is an important material for the continuity of the production process of making cheese wafers. Cheese powder in the form of powder/powder used as raw material to produce cheese wafer products.

The problem that often occurs in this company is the discrepancy between the level of purchase of cheese powder material with the level of use being carried out. This excess material will result in a large total inventory cost to be incurred by the company. This will lead to high inventory on hand which will lead to suboptimal storage costs and leads to high message costs. Following is the cheese powder material data. Therefore, as a developing company, we need control of raw materials that can ensure the continuity of the production process. By seeing the importance of controlling raw materials in the production process, through this research it is expected to be able to control the supply of raw materials as needed by considering the lead time. Based on the results of data processing that have been done Method Q produces a total inventory cost of Rp. 478,552,240, - with an efficiency of 82%, Method P produces a total inventory cost of Rp. 616,338,720, - with an efficiency of 77% and the Min-Max Method produces a total inventory cost of Rp. 586,650,000, - with an efficiency of 78% the comparison with the minimum total cost criteria, the Q Method is obtained as the method that produces the most optimal level of inventory with the smallest total cost of Rp. 478,552,240, - with an efficiency of 82% of the total inventory costs incurred by the company.

Keywords *— Class Based Storage Method, New Storage Layout, Displacement, Delivering Goods*

I. INTRODUCTION

In today's modern era, every company will be faced with global market competition, where companies must be able to face stiff competition with other companies. To be able to compete and still exist in their field, companies must be able to satisfy consumers by providing good and optimal quality products, in addition to the price offered can be under the quality provided. An optimal product will be available in the production process is carried out smoothly. Therefore smoothness in the production process is closely related to proper inventory control.

In the manufacturing industry, planning and control of production and inventory are very important to consider. Planning includes planning what, how, when and how much material will be prepared to meet production needs. Meanwhile, the control means control of the production process so that the continuity of the company can run well. One of the planning and control activities in a company is material control. Material is a very important factor in supporting the continuity of the production process. But sometimes there are obstacles and obstacles experienced by manufacturing companies in carrying out supplies of materials and auxiliary materials to support the continuity of production process activities. For this, the company needs treatment or ways to deal with problems that might occur that can hamper the company's progress.

Material inventory control is an activity to determine the level and composition of inventory of parts, raw materials, and products or products so that the company can protect the smooth production and sales, as well as the company's expenditure, needs effectively and efficiently (Assauri, 2004). Material inventory control is a very important management function because inventory is a very large company investment, both of value and future function.

Therefore the company needs to implement a plan regarding inventory control that estimates the accuracy of the inputs into outputs and the accuracy of the amount of material. In the real world, many companies do not pay attention to the importance of material inventory management, this can be found in companies that experience excess material in the warehouse, or run out of material.

According to Rangkuty (2004), inventory is an asset that includes goods belonging to a company to be sold within a certain business period, or inventory of goods that are still in the work or production process, or material inventories that are awaiting their use in a production process. The definition of inventory according to Ristono in Rasyid (2015), inventory is goods stored for use or sale in the future or period. Inventories consist of raw material inventory, semi-finished goods inventory, and finished goods inventory. Inventories of raw materials and semi-finished materials are stored before use and put into the production process, and inventories of finished goods or merchandise are stored before being sold or marketed. According to Prawira in Rasyid (2015), raw material inventory in the company must be controlled so that it does not cause losses for the company.

PT. Mayora Indah, Tbk is a company engaged in manufacturing food and beverage production. This company is located on Jalan Daan Mogot Km. 18 Jakarta-Indonesia. The large demand made PT. Mayora Indah, Tbk requires good inventory control planning. The cheese powder material is an important material for the continuity of the production process of making cheese wafers. Cheese powder in the form of powder/powder used as raw material to produce cheese wafer products.

The problem that often occurs in this company is the discrepancy between the level of purchase of cheese powder material with the level of use being carried out. This excess material will result in a large total inventory cost to be incurred by the company. This will lead to high inventory on hand which will lead to suboptimal storage costs and leads to high message costs. Following is the cheese powder material data.

This condition is not good in terms of cost and storage, so it must be minimized. Looking at data on the purchase and use of cheese powder material that has been described, the continuous review system (Q) method, the periodic review system (P) and the Min-Max method can be used to control inventory levels. In the Q method, inventory status is monitored continuously for each use. To simplify supervision on the availability of raw materials using the P system (Periodic Review System). In the P system, the inventory status will be observed at a fixed order time interval with the assumption that demand will change. While the min-max method is a method of controlling raw materials based on the assumption that raw material inventories are at two levels,

namely the maximum level and the minimum level. If the maximum level and minimum level have been set, then when supplies reach the minimum level of ordering raw materials must be done to place inventory at the maximum level. This is to avoid the amount of inventory that is too big or too small.

Inventory control techniques have been widely studied before. Technique The P and Q methods one of the techniques in controlling raw material inventory in a study by Setyaningsih and Basri (2013) results show savings about the inventory costs of each product. The average savings on the inventory value of the proposed method at Anlene are 92%, Pediasure 80%, Hepatosol 47%, Neosure 89% and Peptament 80%.

Therefore, as a developing company, we need control of raw materials that can ensure the continuity of the production process. By seeing the importance of controlling raw materials in the production process, through this research it is expected to be able to control the supply of raw materials as needed by considering the lead time. The research results are outlined in the thesis entitled "Analysis of Inventory Control of Cheese Wafer Raw Materials Using the Continuous Review System (Q) Method, Periodic Review System (P) Method and Min-Max Method in PT. Mayora Indah Tbk ".

II. METHODS

The data collection method is a way to obtain primary and secondary data for research purposes. Data collection methods used in carrying out this research by taking secondary data. Secondary data is data that is not directly observed by researchers. This data can be in the form of company documentation, past research results, and other related data. In this study there are several data collection methods used, including:

1. Literature Research

This method is in the form of collecting data from several supporting literature that can support in collecting data and discussing the object under study.

2. Field Research (Observation)

a. Direct Observation (Observation)

The observation was carried out by recording and observing the research object to obtain the required data such as Cheese Powder material images.

b. Interview (Interview)

Conducted interviews directly with competent parties within the company, namely the PPIC team to obtain data on message costs.

3. Documentation Study

Collecting data by studying and observing various sources of documents and data held by the Company such as material usage data, storage cost data, material price data, quantity data on hand, and lead time.

Data Processing and Analysis Methods

a. Calculation Method P

The data processing method p in the previous chapter was analyzed to find out the calculation of the maximum inventory level, the optimal ordering period, and the total inventory cost.

b. Calculation Method Q

Q data processing method in the previous chapter was analyzed to be able to find out the calculation of the number of orders, security inventory, reorder points, and the total cost of inventory.

c. Calculation of the Min-Max Method

The q data processing method in the previous chapter was analyzed to find out the calculation of the assumption that the supply of raw materials was at two levels, namely the maximum level and the minimum level.

d. Comparison of the Q Method and the P Method
The results of calculations of the methods Q, P, and Min-max will be compared to see which method is the most optimal results in controlling raw material inventory.

III. RESULT AND DISCUSSION

The data was taken from stock, purchase and usage during on January up to on December 2018, and as for the usage and purchase data was collected in 2018 as shown on Table 1. Ordering or purchasing cost are costs directly related to ordering activities which was carried out by the company such as at PT. Mayora Indah Tbk and the order was made to the supplier. Table 2 shows total calculation cost of material order. For storage cost, based on information was obtained from company regarding the details of the cost saving, the saving cost is 10% multiplied by the price per material. Calculation of saving costs for a month can be done by multiplying the amount of inventory saved by the company with the cost of saving per sheet per month, namely; $10\% \times$ Rp. 100.800,- = Rp. 10.080,- / kg / year = Rp. 840,- / kg / month. Calculation inventory cost of Cheese Powder in the Company Period on January up to on December 2018.

TABLE 1. Data total usage and purchase of cheese powder

Month	Total Usage (kg)	Total Purchase (kg)
January	35.620	58.200
February	36.38	107.620
March	31.595	117.200
April	27.362	108.725
May	22.875	28.800
Jun	14.566	-
July	28.903	-
August	24.789	13.000
September	37260	63.200
October	27.343	63.200
November	34.367	13.000
December	39.837	26.000

TABLE 2. Total Calculation Cost of Material Orders

No.	Explanation	Total Amount (Rp)
1	Clearance Fee	1.858.400
2	Transportation Rental Cost	3.800.400
	Total Ordering cost	**5.758.400**

TABLE 3. Total Calculation of Cheese Powder Inventory Costs in the Company

From Table 3 the policies used by PT. Mayora Indah Tbk in controlling material supplies, costs incurred in the period January - December 2018 amounted to Rp. 2,635,915,520, with a total frequency of purchases 28 times a year.

Calculation of continuous review system method (Q)

$$EOQ = \sqrt{\frac{2SD}{iC}}$$

$$= 2 \times 5.758.400 \times 360.802$$

$$= 0,1 \times 100.800$$

$$= 20.303 \text{ kg}$$

Safety Stock (SS)

The value of the service level is very necessary (servive level) to be achieved by the company is 99%. This means that the inventory held must be able to meet 99.82% demand level and be willing to accept the risk of losing potential sales of 0.18%, then obtained z of 2.9.

$$SS = z \times s \times \sqrt{L}$$

$$= 2,9 \times 7.220,37 \times \sqrt{1}$$

$$= 20.939 \text{ kg}$$

Reorder Point

$$ROP = (AU \times L) + SS$$

$$= (30.066 \times 1) + 20.939$$

$$= 51.005 \text{ kg}$$

From Table 4 show the total inventory cost incurred in the period on January up to on December 2018 based on the Q method was Rp 478.552.240,00,- with a total frequency of purchases 17 times a year.

Calculation of periodic review system method (P)

Order period at P

$$P = \sqrt{\frac{2S}{iCD}}$$

$$P = \sqrt{\frac{2 \times 5.758.400}{0,1 \times 100.800 \times 360.802}}$$

$$= 0,72 = 17 \text{ hari}$$

where: tahun = 292 hari kerja

Safety Stock (SS)

$$SS = z \times \sqrt{P + L \times s}$$

$$= 2,9 \times \sqrt{0,72 + 1 \times 7220,37}$$

$$= 27.430 \text{ kg}$$

Target availability (T)

$$T = ((P + L) \times AU) + SS$$

$$= ((0,72 + 1) \times 30.066) + 27.430 = 79.143 \text{ kg}$$

TABLE 4. The total inventory costs for the January - December 2018 period, along with a material inventory chart.

Month	Purchase Amount	Total Usage	The remaining amount stock	Store cost (Rp)	Purchase Frequency	Ordering Fee (Rp)	Inventory Cost
January	40.606	35.620	15.363	12.964.920	4	11.518.800	24.421.729
February	40.606	38.283	19.684	16.334.560	3	11.516.800	28.891.360
March	40.606	31.595	28.691	24.103.800	3	11.516.800	35.628.600
April	40.606	27.362	41.939	35.229.760	3	11.516.800	46.745.560
May	0	22.875	59.670	50.122.800	-	-	50.122.800
June	40.606	14.566	45.104	37.887.360	1	11.518.800	49.404.160
July	0	28.903	56.307	47.717.680	0	-	47.717.880
August	40.606	24.789	32.018	26.895.120	1	11.518.800	38.411.920
September	40.606	37.260	35.364	29.705.760	2	11.516.800	41.222.560
er	40.606	27.343	48.627	40.846.680	2	11.516.800	52.363.480
October	0	34.567	54.866	46.087.440	1	-	46.887.440
November	20.393	39.837	15.029	12.624.360	1	9.758.400	18.382.760
December							
Total	**345.151**	**360.802**	**453.166**	**389.659.440**	**28**	**97.892.800**	**478.552.240**

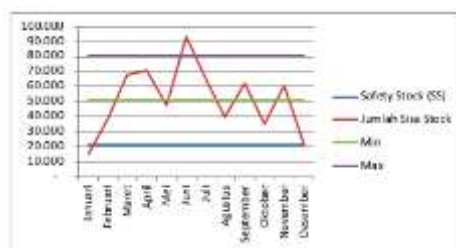The following material inventory chart :

FIGURE 1 Cheese Powder Inventory Chart with the Min-Max Method

Using the min-max method, the minimum stock value is 51,005 kg and the minimum stock is 81,071 kg. Then based on data processing, obtained order quantities for one message is 30,066 kg. From the calculation results, the total inventory cost using the min-max method is Rp 586,650,000 to hold 360,792 kg of material with a purchase frequency of 12 time a year. The details of the costs in the min-max method are the booking fee of Rp 69,100,800 and storage fee of Rp 517,549,200.

TABLE 5 Comparison of Method and Company Results for January - December 2018 Period

Comparison	Company	Q Method	P Method	Min-Max Method
Total Ordering (Kg)	595.000	345.151	394.824	390.858
Purchase Frequency	28	17	15	13
Ordering Fee (Rp)	161.235.200	97.892.800	86.376.000	74.859.200
Storage Cost	2.474.680.320	389.659.440	529.962.720	517.549.200
Total the remaing amount stock	2.635.915.520	478.552.240	616.338.720	592.408.400

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Storage Cost (Rp)	2.474.680.320	389.659.440	529.962.720	517.549.200
Total the remaining amount stock (Rp)	2.635.915.520	478.552.240	616338.720	592.408.400
Reduction in Inventory Cost (Rp)		2.157.363.280	2.019.576.800	2.043.507.120
Efficiency		82%	77%	78%
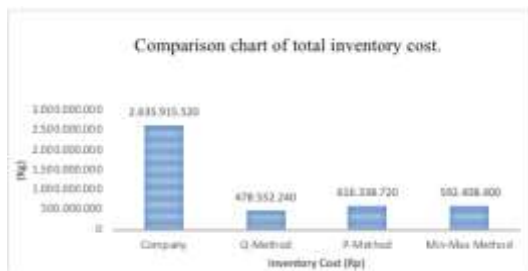
FIGURE 2 Comparison of Total Inventory Cost

Controlling Cheese Powder material inventory at PT. Mayora Indah Tbk is advised to use the Q Method, because this method can save booking and storage costs 2. Material inventory control research at PT. Mayora Indah Tbk by using the Q method can be continued for other materials in order to manage inventory with the total cost criteria.

Figure 2 shows the comparison graph of total inventory costs, that the total inventory cost if using the company's initial method is the highest compared to the other three methods. Among the Methods Q, P and Min-max, it is obtained data that the Method Q produces the lowest total inventory cost; this is because in addition to the low safety stock for the number of purchases and the lowest final stock amount when compared with other methods.

IV. CONCLUSION

Based on the results of data processing and data analysis related to inventory management at PT.Mayora Indah Tbk that has been discussed, we get several conclusions, namely:

1. Based on the results of data processing that have been done Method Q produces a total inventory cost of Rp. 478,552,240, - with an efficiency of 82%, Method P produces a total inventory cost of Rp. 616,338,720, - with an efficiency of 77% and the Min-Max Method produces a total inventory cost of Rp. 586,650,000, - with an efficiency of 78%.

2. Based on the results of the comparison with the minimum total cost criteria, the Q Method is obtained as the method that produces the most optimal level of inventory with the smallest total cost of Rp. 478,552,240, - with an efficiency of 82% of the total inventory costs incurred by the company

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