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## Analysis Of Raw Material Inventory Control In Dr. Cake "Donat Mini" Denpasar

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**ABSTRACT:** : The Economic Order Quantity (EOQ) method is very helpful when controlling raw materials, so companies do not have excess or lack of raw materials that will be used for production. The research was conducted at Dr. Mini Donut Cake, which is engaged in manufacturing especially donuts and cakes. The purpose of this study, to analyze raw material inventory control by the EOQ method. The research is descriptive with a quantitative approach. Data collection method is done by field interview observation. The data used in this research are raw material inventory data "Dr. KueDonat Mini" in January to December 2019. The analysis technique used in Economic Order Quantity uses safety stock, reorder points, maximum inventory and total cost. The results obtained by the optimal amount of raw material needs per year is 24,299kg. The total amount of raw materials ordered economically is 3,126kg. Whereas the purchase of flour raw materials is carried out every 52 days with a reorder number of 184 kg, butter every 38 days with a reorder number of 34 kg, sugar ordered every 54 days with a reorder number of 43 kg, and milk ordered 35 days with a reorder number of 68 kg. Calculations using the EOQ method, companies can order raw materials optimally with lower frequencies.

**Keyword-***economic order quantity, safety stock, reorder points, maximum inventory, total cost.*

### I. INTRODUCTION

A company can determine inventory policies and control them and make them a competitive weapon in competing against competitors(Lestari, 2015). The optimal inventory in the company must be able to determine how much stock of raw materials are needed, so as not to cause waste of costs because it is able to adjust the needs of raw materials that are not too much or not too little inventory (Farhangi *et al.*, 2015). Raw materials are the main priority and are very vital for an industry in its production process. The required raw materials should be sufficient so that they can guarantee the smooth production. This makes many companies use various methods to manage raw material inventories(Putra & Purnawati, 2018). In addition, when producing a product requires planning raw materials and controlling the supply of raw materials (Apriani, 2017)

The availability of inventory is expected to facilitate the course of the production process of a company (Daud, 2017). Inventories of raw materials in the production process indicate a competitive position in the company, strategies, processes and internal relations with downstream suppliers and customers. Every company, either a manufacturing company or a service company, has the same goal, which is to make a profit. But to achieve these goals is not easy because it is influenced by several factors(Pereira & Gomes Costa, 2017). One of the factors that influence is the problem of the smooth production process(Nilawati & Giyanti, 2016). The smooth process of production is influenced by the availability of raw materials in production owned by the company. The production process always requires raw materials, whereas in the supply of raw materials often there are unexpected problems, namely the lack of raw materials and resulting in the production process can not run smoothly(Darmawan *et al.*, 2015).

The purpose of controlling raw material inventory is to reduce operational costs to a minimum so that the company's performance and profits are more optimal(Lahu & Sumarauw, 2017). The problem of controlling raw materials is certainly very influential on the profits to be obtained by the company. If the control runs optimally, the company's raw material needs can be met and the company can minimize the total inventory costs (Aro-Gordon & Gupte, 2016)In addition, that must be considered in controlling inventory is the time of arrival of raw materials to be ordered back. If the raw materials ordered require a long time in a certain period, then the supply of raw materials must be adjusted at all times and the raw materials ordered thereafter. In addition, the amount of raw material to be ordered must also be adjusted to the storage capacity, the amount of raw material that is too much will cause waste but if too little will result in loss of profits because the company fails to meet customer demand(Rasadanu, 2016). Every company, be it a manufacturing company or a trading company must maintain an adequate supply of raw materials so that the company's production activities can run smoothly and

efficiently (Shah & Vaghela, 2017). In monitoring or controlling this inventory can help reduce the risk as little as possible due to the availability of raw materials that are too large or too small (Soni et al., 2016).

Inventory management has the task of managing how many items must be provided, when and how many purchases must be made (Gahan & Pattnaik, 2017). Inventory is a factor that triggers an increase in costs so inventory control is a very important issue, because the amount of inventory will determine or influence the smooth production process and the effectiveness and efficiency of each company (Chalotra, 2016). The amount of inventory needed by the company varies. Basically, all companies plan and control raw materials with the main goal of minimizing costs and maximizing profits within a certain time (Darmawan *et al.*, 2015). The widely used inventory model is the Economic Order Quantity-EOQ model. The EOQ model assumes that purchase costs should be paid immediately after the shipping time (Tavakoli & Taleizadeh, 2017). The EOQ order quantity model is used in determining the amount of material or goods to be ordered or made at each time of ordering or manufacturing as well as the total cost of procuring materials or goods (Ziukov, 2015).

Some empirical studies, using the EOQ method are more efficient than conventional methods, proven by Fajrin (2016). How to minimize the average cost per unit and determine the raw materials to be used (Olgun *et al.*, 2016). Inventory management is also important to do by the company so as not to burden the company's finances (Barwa, 2015). This statement also shows the same results done by (Andira, 2016). The results of the EOQ calculation on the raw materials of previous researchers are "the level of inventory and the amount of demand for raw materials to be more economical in accordance with production needs. This method applies two types of costs, carrying costs and ordering costs which make the total inventory cost more economical. Thus, this method can be used to obtain the most economical total inventory and reduce the swelling of storage costs" (Susanto, 2018). Based on the analysis from EOQ, an illustration is obtained that the optimum order number (Listyorini, 2016).

The decision to purchase raw materials at the company is very important to minimize costs (Brahmandhika, Dewi, & Suamba, 2016). This can be helped by using the EOQ method, that is, without losing much quality information at the department and company level. Companies strive to optimize their raw material inventory, both in terms of inventory control and production cycle. According to Yang *et al.* (2018) "determine the optimal number of shipments per production cycle for suppliers and the optimal length of time, when there is no shortage of inventory and filling cycles for retailers, so the total profit function has a maximum value". According to Fatma & Pulungan (2018) states that determining the appropriate inventory control method for the company, so that the total inventory costs and the amount of inventory provided by the company can be optimal.

According to Kang *et al.* (2017), the Economic Order Quantity model is one of the oldest and best known inventory control techniques. The Economic Order Quantity (EOQ) method is very helpful when controlling raw materials, so companies do not have excess or lack of raw materials that will be used for production. This is needed for companies in the supply of raw materials. Therefore, "Dr. KueDonat Mini" is able to make the calculation of raw material inventories more efficient and generate more profits than the methods used by the company. EOQ is an appropriate model to be applied in companies in determining the optimal raw material inventory. Based on the formulation of the problem that has been described by researchers, the following research objectives are obtained: 1) Knowing the optimal amount of raw material requirements per year. 2) Knowing the amount of raw materials ordered economically. 3) Knowing the grace period needed to make an order economically. 4) Know when the company "Dr. KueDonat Mini" should order again. 5) Analyze the total cost of raw material inventory using company policy compared to using the EOQ method.

## II. METHODS

This research is a comprehensive case study of inventory in the company "Dr. KueDonat Mini". This research is a descriptive study with a quantitative approach, to answer the company's problems regarding the inventory system, whether it is optimal or not. The company "Dr. KueDonat Mini" produce and sell donut and cake products with various types of products, so it is important to manage inventory optimally. The location of this study was chosen because it was found indicative of problems associated with the supply of raw materials. The object of the research was controlling the inventory of raw materials in the company. used in this study include quantitative and qualitative data, in this study quantitative data is data related to the company's inventory in one period and qualitative data used is data about the general description of the company. In conducting research, data collected will be used to solve existing problems so that the data must be truly reliable and accurate. In a scientific study, data collection methods are intended to obtain relevant, accurate, and trusted materials. Data collection methods used in this study are interviews and observation.

## III. RESULTS

Based on data collection, the amount of raw material inventory in the form of flour, butter, sugar and milk during the period of January to December 2019. The total flour consumed as raw material is 12,430 kg. While the total butter consumed is as much as 2,542 kg. in addition, the quantity of sugar spent in the production

process during 2019 is 3,174 kg. While the raw materials in the form of milk needed during the period of 2019 were 6,355 liters.

The cost of ordering for raw materials of flour is Rp. 60,000, with details, namely shipping costs Rp. 50.000, - and booking a telephone fee of Rp. 10,000. orders for raw materials of butter of Rp. 40,000, - with details of shipping costs Rp. 30,000 and orders in the form of telephone costs Rp. 10,000. The order for raw sugar is Rp. 40,000, - with details of shipping costs Rp. 30,000 and orders in the form of telephone costs Rp. 10,000. While ordering for raw milk ingredients is Rp. 35,000, with details, namely shipping costs Rp. 25,000 and orders in the form of telephone costs Rp. 10,000.

Large storage costs in the form of a warehouse with a total area of 12 m2. In addition, electricity costs are intended for cooling equipment used to store milk and butter and lighting in the form of lamps used to illuminate the warehouse. Electricity costs tend to be low in raw materials for flour and sugar because electricity is needed only for lighting. In addition, lighting is not needed for 24 hours straight. This is different from butter and milk which requires refrigeration for storage. While maintenance costs are expenses that must be incurred in a year intended to repair or replace equipment used in the storage of raw materials.

Waiting time for an order is the time span required for the raw materials ordered from the time of order. This time is the waiting time from the staples ordered until the staples come or to the destination. the waiting time for the raw material of flour is for 3 days. While the waiting time for butter raw materials for 2 days. The waiting time for raw sugar is 2 days. Whereas for milk that is for 1 day.

The economic order quantity is used in determining the amount of goods to be ordered for each order as well as the total cost of procuring raw materials so that the total inventory cost is minimal. The manual calculation of the raw material EOQ obtained the following results.

$$Q = \sqrt{\frac{2DS}{H}} = \sqrt{\frac{2(12,430)(60,000)}{506.84}} = 1,716 \text{ kg} \dots\dots\dots(1)$$

Based on the results of data analysis by calculating the number of economic orders by the EOQ method, the quantity of raw material orders with an efficient inventory cost is obtained. Based on table 4.5, the raw material for wheat flour has an economic order of 1,716 kg. The raw material for butter is its economic order quantity of 261 kg. Sugar raw material has an economic order of 462 kg. Whereas milk has the economic order of 612 liters. In addition, the period of ordering for flour raw materials manually can be calculated as follows.

$$T = \left(\frac{D}{Q}\right) \times 365 = \left(\frac{12,430/\text{kg}}{1,716/\text{kg}}\right) \times 365 \text{ days} = 50 \text{ days} \dots\dots\dots(2)$$

The reorder period is obtained by dividing the optimal number of orders with the annual request and then multiplying by 365 days in a year so that the range of days for the next order is obtained with a frequency of 7 purchases a year. Flour raw materials are ordered every 50 days with a frequency of 10 times a year. Whereas butter raw materials are ordered every 38 days with a frequency of 7 purchases a year. Sugar raw materials are ordered every 53 days. Milk raw materials are ordered every 35 days with a frequency of 10 times a year.

Calculation of safety stocks using the EOQ method using an assumption of a service level of 90 percent is 1.28. That means Dr. Kue "Donat Mini" is able to meet customer demand as much as 90 percent, so the level runs out of 10 percent. Calculation of safety stocks with manual calculations obtained results presented as follows.

$$\text{Safety Stocks} = \text{Std. Dev} \times \text{Service factors} = 62.73\text{kg} \times 1.28 = 80 \text{ kg} \dots\dots\dots(3)$$

To obtain the number of safety stocks obtained by multiplying the standard deviation of raw materials with the service factor. Thus the safety stocks can be obtained. Safety stocks for raw materials are as much as 80 kg flour while safety stocks for butter is as much as 20 kg. Safety stocks of 25 kg sugar raw material and 51 liters of milk safety stock.

Reorder points for mini donuts that are at the request of the customer or existing items at a company. Reorder points must be calculated correctly, because they correlate directly with customer demand and inventory at the warehouse. The calculation of ROP on flour raw material obtained the following results.

$$\begin{aligned} \text{ROP} &= (dxL) + \text{SS} \\ \text{ROP} &= (35\text{kg} \times 3 \text{ days}) + 80\text{kg} \\ \text{ROP} &= 184\text{kg} \dots\dots\dots(4) \end{aligned}$$

Reorder points for each raw material. The raw material for flour has a ROP of 184 kg. Whereas butter has a ROP of 34 kg. in addition, the raw material for sugar has a ROP of 43 kg. the raw material for milk has a 68 liter ROP.

Maximum inventory is a measure of the number of times the average inventory is sold in a period. With manual calculations on flour raw materials obtained the following results.

$$\text{Maximum inventory} = \text{SS} + \text{EOQ} = 80\text{kg} + 1,716\text{kg} = 1,796\text{kg}$$

The maximum inventory that can be stored at the company is as follows. The raw material for flour has a maximum inventory of 1,796 kg. The raw material for butter has a maximum supply of 282 kg. Sugar raw material has a maximum inventory of 487 kg. Milk raw materials have a maximum supply of 662 liters.

Total cost (total cost) inventory with a system of fixed inventory quantities. With manual calculations on flour raw materials obtained the following results.

$$TC = \frac{D}{Q}S + \frac{Q}{2}H = \frac{12,430}{1,716}60,000 + \frac{1,716}{2}506.84 = Rp\ 869,483.....(5)$$

Based on the results of data analysis, “the total inventory cost for one year is obtained for each inventory. Flour raw material has a total inventory cost of one year of Rp. 869,483.00. Butter has a total inventory cost of one year of Rp. 777,689.00. Sugar raw material has a total inventory cost of one year of Rp. 549,909.00. Milk raw material has a total inventory cost for one year of Rp. 727,461.00. In 2019, the raw material for flour has a total inventory cost of one year of Rp. 9,180,000.00. Butter has a total inventory cost of one year of Rp. 9,480,000.00. Sugar raw material has a total inventory cost of one year of Rp. 5,700,000.00. Milk raw material has a total inventory cost for one year of Rp. 9,240,000.00.”

#### IV. DISCUSSION

Based on the explanation above, the raw materials used in production activities are flour, butter, sugar and milk. The four materials are materials that are ordered with a number that is not small so each order period requires a large inventory cost. The optimal amount of raw material can be obtained by multiplying the economic optimal amount to the frequency of purchases in a year. The raw material for flour has an economic order of 1,758 kg with a purchase frequency of 7 times a year. Thus the raw material of wheat flour has an optimal amount of 12,306 kg in a year. While the raw material for butter has an economic order of 268 kg with a purchase frequency of 9 times a year. Thus the raw material for butter has an optimal amount of 2,412 kg in a year. Sugar raw material has an economic order of 473 kg with a frequency of purchase 7 times a year. Thus the sugar raw material has an optimal amount of 3,311 kg in a year. Whereas raw milk has an economic order of 627 liters with a purchase frequency of 10 times a year. Thus the raw material for milk has an optimal amount of 6,270 liters in a year.

The economic order quantity is used in determining the amount of goods to be ordered for each order as well as the total cost of procuring raw materials at the company “Dr. KueDonat Mini” so that overall inventory costs are minimal. EOQ shows the number of items that must be ordered for each order.

The results of the data analysis showed that, First, the raw material for flour had an economic order of 1758 kg. This amount is the quantity that should be ordered in 1 time order period. Second, the raw material for butter has an economic order of 268 kg. Third, the raw material for sugar is the economic order of 473 kg. Fourth, milk raw materials have an economic order of 627 liters. By using the number of economic orders as a reference in ordering raw materials, the “Dr. KueDonat Mini” can certainly make the inventory cost efficient in a certain period. The grace period for carrying out economical order quantities can be reviewed from the purchase period in a range of days. In addition, the frequency of purchases within one year can also be used as a reference. The grace period needed to purchase raw materials for “Dr. KueDonat Mini” differ from one another. This happens because of differences in composition and in the production process. Flour raw materials have a ordering period of 0.14 years and ordering frequency 7 times a year. This shows that the party “Dr. KueDonat Mini” Should buy flour every 50 days. While the butter raw material has a purchase period of 0.10 years with a frequency of ordering 10 times a year. This shows that the party “Dr. KueDonat Mini” should buy butter every 38 days. Sugar raw material has a ordering period of 0.15 years and ordering frequency 7 times a year. This shows that the party “Dr. KueDonat Mini” should buy sugar every 53 days. Milk raw material has a ordering period of 0.10 years and a frequency of ordering 10 times a year. This shows that the party “Dr. KueDonat Mini” should buy milk every 35 days.

Reorder is done to determine the point or quantity to reorder on each item of raw material. Each raw material has a different reorder point. It depends on the safety stock of each raw material and the waiting time of the order. Safety stock shows the extent to which the inventory can be said to be in a safe condition so that the production process can still run smoothly. While waiting time is the time needed for raw materials to arrive from the order. Thus to find out the reorder point it is necessary to calculate the amount of raw materials needed during the waiting time of the order plus the safety stock of the raw materials.

Based on the explanation above, it can be explained the point of reordering raw materials. First, the raw material for flour has a reorder point of 184 kg. Second, the raw material for butter has a reorder point of 34 kg. Third, the sugar raw material has a reorder point of 43 kg. Fourth, the milk raw material has a reorder point of 68 kg. Based on the reorder point, the party “Dr. KueDonat Mini” should order raw materials when each raw material reaches the reorder point. Thus the production process can run and take place conducive.

Based on the company's method, "the raw material for flour has a total inventory cost of one year of Rp. 9,180,000.00. Butter has a total inventory cost of one year of Rp. 9,480,000.00. Sugar raw material has a total inventory cost of one year of Rp. 5,700,000.00. Milk raw material has a total inventory cost for one year of Rp. 9,240,000.00. Based on the EOQ method, the raw material for flour has a total inventory cost of one year of Rp. 869,483.00. Butter has a total inventory cost of one year of Rp. 777,689.00. Sugar raw material has a total inventory cost of one year of Rp. 549,909.00. Milk raw material has a total inventory cost for one year of Rp. 727,461.00."

**Table 1. Total Inventory Cost by EOQ Method**

Data	Flour	Butter	Sugar	Milk
Annual Requests (D)	12.430 kg	2.542 kg	3.174 kg	6.355 litre
Booking Fee (S)	Rp. 60.000	Rp. 40.000	Rp. 40.000	Rp. 35.000
Storage fee / year and unit (H)	Rp. 506,84	Rp. 2.974,04	Rp. 1190,93	Rp. 1189,61
Optimal Amount (Q)	1.716 kg	261 kg	462 kg	612 liter
<b>Total</b>	<b>Rp. 869.483</b>	<b>Rp. 777.689</b>	<b>Rp. 549.909</b>	<b>Rp. 727.461</b>

Source: Data processed in 2020

In accordance with the calculation results, it is obtained that the calculation using the EOQ method produces smaller results compared to using the company method. This happens because by using the EOQ method the company can order raw materials with an optimal amount so that delivery costs and ordering costs can be reduced. Besides the ordering period on the EOQ method is also smaller than the company method. This has a positive impact because bookings are more effective.

Based on the above explanation, it implies that to achieve the cost of providing efficient parties, "Dr. KueDonat Mini" should order raw materials in accordance with the number of economic orders for each ingredient. "Dr. KueDonat Mini" should buy raw materials in accordance with the specified period. These results imply that in order to achieve optimal benefits the party "Dr. KueDonat Mini" should make purchases with periods and timescales that have been optimal in accordance with their respective raw materials. In addition, the reorder point for each raw material also shows a different quantity or quantity. This depends on the composition and dosage used so that it affects the use of raw materials per day. This implies that to achieve a sustainable production process the parties "Dr. KueDonat Mini" should pay attention to the availability of raw materials in accordance with the reorder point so that the production process does not stop because it runs out of raw materials.

In accordance with the results of the research above, in this study there are some limitations. First, the raw materials used in the production process are not all listed. In the future, this can be overcome by conducting in-depth observations so that the data obtained is optimal. Second, the research period is in the range of 1 year, namely 2019. This can be optimized by adding data from the previous period so that the results obtained can provide more appropriate results.

## V. CONCLUSION

The raw material for wheat flour has an optimal amount of 12,306 kg in a year. The raw material for butter has an optimal amount of 2,412 kg in a year. Sugar raw material has an optimal amount of 3,311 kg in a year. Milk raw material has an optimal amount of 6,270 liters in a year. So the optimal amount of raw material needs per year is 24,299 kg. The raw material for flour has an economic order of 1,758 kg. The raw material for butter has an economic order of 268 kg. The raw material for sugar is the total economic order of 473 kg. Milk raw materials have an economic order of 627 liters. The total amount of raw materials ordered economically is 3,126 kg. Flour raw materials have a period of every 52 days. Butter raw materials have a purchase period every 38 days. Sugar raw materials have an order period every 54 days. Milk raw materials have an order period every 35 days. The raw material for flour has a reorder point of 184 kg. The raw material for butter has a reorder point of 34 kg. Sugar raw material has a reorder point of 43 kg. Milk raw material has a reorder point of 68 kg. Calculations using the EOQ method produce smaller results compared to using the company method. This happens because by using the EOQ method the company can order raw materials with an optimal amount and lower ordering frequency so that delivery costs and ordering costs can be reduced.

Companies should be able to meet the optimal amount of raw materials in a year. This was done in an effort to streamline production activities. The number of economic orders should be used as a reference in ordering various raw materials needed as an effort to reduce as efficiently as possible the cost of providing materials in the form of ordering and storage costs. Order period can be used as a benchmark in making purchases so the company can always provide raw materials in good condition so that the products marketed are in accordance with the wishes of consumers. The reorder point (ROP) should be used as a reference in measuring and weighing to buy back. This is done in order to prevent the run out of material or excess raw

material residue which later tends to increase the cost of supply. The management should apply the EOQ method in the calculation and planning of raw materials to be able to improve the efficiency and effectiveness of the use of resources and costs.

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