

Analysis of Inventory Management using Methodology Rop (Reorder Point) to Minimize Doi (Days of Inventory)

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Abstract:- Inventory is one of the fundamental problems in a company. Inventory can be interpreted as a stock of goods that will be sold or used for a certain period of time. Lack of inventory can result in cessation of the production process. This shows that inventory is a fairly crucial problem in the company. To control and forecasts are really close. It aims to not cause a dead value for the item so that it does not have a sale value because it is too long in the warehouse. The variables used in this study are inventory variables as the dependent variable, while the independent variables are Safety Stock and Reorder Point. The population and sample in this study are products from the production of "XY" which will be marketed in all branches in Indonesia. Sampling is done by considering that the population is very large in number so that it is not possible for the entire population to be data. The product to be analyzed uses ABC for 20 products, the division in ABC analysis for each class is based on Pareto and product focus. class A is based on ABC analysis of 41 products, class B 72 products and class C 117. The author sets different service levels for each class based on the level of importance previously defined. For class A, the service level is set at 99%, while for class B it is 95% and class C is 90%. This service level is used for the calculation of reorder points and safety stock in the analysis to be discussed in the next point. Calculation of class A SS: 103 & ROP 151 Units, class B SS: 24 & ROP 48, class C SS: 28 & ROP 35. Based on data that has been obtained and processed based on ABC concepts, safety stock, and ROP. The DOI calculated using SS and ROP after grouping based on the ABC concept as seen in Figure 4 shows a positive trend, from the month of the month it shows an improving trend if we compare it to the lost opportunity obtained from the month. This is because the products are distributed evenly throughout the branches. The ROP concept is carried out to give a warning (*poka-yoke*) to everyone if the item will run out and must be refilled. If it is compared to the performance or sales achievement of the month, it can be concluded that there will be a positive trend also because the lost opportunity has decreased.

I. INTRODUCTION

Inventory is one of the fundamental problems in a company. Inventory can be interpreted as a stock of goods that will be sold or used for a certain period of time. Without the inventory, the company will be faced with a risk that is not able to fulfill the wishes of its customers. Inventories can intentionally or unintentionally appear when inventory arises if inventory is available because the goods are not sold due to the low number of requests. Companies must focus on inventory control because inventory is one investment that absorbs considerable costs the company must be able to reach the optimum point between inventory investment and the level of service to consumers. Inventory management is fundamental to the determination of corporate excellence / long-term competitive advantage.

Inventory systems can be interpreted as a series of policies and controls that monitor and monitor the amount and level of inventory in order to determine the level of inventory that must be maintained when supplies must be available and how much order to do. The purpose of this system is to establish and guarantee the availability of the right resources in the right quality and at the right time. Or in short, the inventory system aims to minimize total costs through the determination of what, how and when the order is carried out optimally (Optimal Order Point).

Lack of inventory can result in cessation of the production process. This shows that inventory is a fairly crucial problem in the company. Too much storing of goods in the warehouse means allowing the money to die or the lost opportunity cost. Vice versa if we lack goods in the warehouse at the request of consumers, we will experience a stock lost or lost opportunity. Quite simply in theory, but in the application of the company is very complicated. To order inventory so that you can still control and control the stock in warehouse, calculation, and forecasting are really close. It aims to not cause a dead value for the item so that it does not have a sale value because it is too long in the warehouse. Inventory control techniques will estimate what the optimal number of inventory levels must be, and when to reorder point. From the explanation above, for this reason, the author is interested in writing: "**Analysis of Inventory Management Using the ROP (Reorder Point) Methodology to Minimize the DOI (Days of Inventory)**".

II. RESEARCH METHODS

The research method is a method that is carried out in the research process that is obtaining the facts and principles patiently, carefully and mathematically.

III. RESEARCH VARIABLE

The variables are generally divided into two, namely the independent variable and the dependent variable. Independent variables are the type of variable that describes or influences other variables, while the dependent variable is the type of variable that is explained or influenced by the independent variable. The variables used in this study are inventory variables as the dependent variable, while the independent variables are Safety Stock and Reorder Point.

➤ *Sample and Population*

Data obtained from research conducted on all members of the population or enough from some members of the population and conclusions obtained apply to each population that exists. The population is a generalization area consisting of objects or subjects that have certain qualities and characteristics set by researchers to be studied and then conclusions drawn. The population and sample in this study are products from the production of "XY" which will be marketed in all branches in Indonesia. Sampling is done by considering that the population is very large in number so that it is not possible for the entire population to be data.

➤ *Data Types and Sources*

The type of data in this study are:

- Primary data, primary data is data obtained directly from the source, observed and recorded for the first time. In this study, the data can be directly from PT XYZ's central warehouse in Jakarta. Secondary data is data that is not attempted to collect itself by the researcher. Secondary data is obtained from the Bureau of Statistics, company or organization documents, newspapers, and magazines, or other publications. In this study, secondary data obtained is based on published data such as data obtained from internet situations and other data that are directly related to the object under study as a source of calculation so that the data is ready for use.

➤ *Data Collection Technique*

In conducting research, the data collected will be used to solve existing problems so that the data must be truly reliable and accurate. In a scientific study, the method of collecting data is intended to obtain materials that are relevant, accurate, and reliable. The method used in data collection used in this study are:

- *Interview*

The interview as a search technique and information collection is done by coming directly to the respondent to be asked for information about something he knows (can be about an event, fact, or opinion of the respondent). In this

study, interviews were conducted with the owner process of each part.

- *Observation*

Observation is careful and systematic observation and recording of the symptoms (phenomena) being studied. In this case, PT XYZ's observation was carried out in Jakarta.

➤ *Analysis Techniques*

The analysis technique used in this study is by:

- Data processing: grouping data based on the concepts of the ABC and Rank Month Movement. Classification based on the ABC concept is done by grouping inventory based on user value. The steps taken in classifying inventory based on the ABC concept are:
- Make a list of all items to be classified and the purchase price of each item.
- Determine the amount of usage on average per year for each item using the 3-month AMS method. Calculate standard deviation use of goods within a year.
- Calculate the coefficient (cv) whether $cv < 0.5$ or $cv > 0.5$ by: $STDV / AMS 3$

Sorting in such a way the annual usage value of all inventories that have the largest to the smallest value of money so as to facilitate the distribution of inventory for class A, B, or C in accordance with the rules of classification used, namely group A has a percentage of the number of goods 20% and the percentage of goods value 70%, group B has a percentage of goods 20% and percentage value of goods 20% and percentage value of goods 20% and group C has a percentage of goods 70% and percentage value of goods 10 %.

➤ *Calculate the Average Value of Inventory*

- Calculating Safety Stock with a service level plan that is 99% for class A, 95% for class B dan 90% for class C so Z class A= 2.33, Z class B 1.64, Z class C 1.28 by using equations.

$$SS = Z \sigma \sqrt{LT} \dots \dots \dots (1)$$

$$\sigma = \frac{s}{\sqrt{n}} \dots \dots \dots (2)$$

Where :

- SS = Safety Stock
- Z= Service Level
- σ = Deviation Standard
- LT = Lead Time
- S = Standard
- n = Number of samples

- Calculate Reorder Point

$$ROP = DL + SS \dots \dots \dots (3)$$

where :

- D = Demand
- L = Lead Time
- SS = Safety Stock

➤ Calculate Days of Inventory:

$$DOI = \frac{\text{demand of year}}{\text{average inventory}} \dots\dots\dots(4)$$

IV. RESEARCH RESULT

➤ ABC Analysis

The product to be analyzed uses ABC for 20 products, the division in ABC analysis for each class is based on Pareto and product focus. After analyzing using ABC from the existing product the results are as follows:

Class	A Pareto Focus Constant)	B (Non Pareto Focus & Constant)	C (Non Pareto Focus & Uncertain)
Product Total	41 product	72 Product	117 Product
Service Level	99%	95%	90%
Demand Variability	Low & High	Low (cv<0.5)	High (cv>0.5)

Tabel 1:- Class Division

Amount Based on the above data it can be seen that class A is based on ABC analysis of 41 products, class B of 72 products and class C of 117. The author sets different service levels for each class based on the level of importance previously defined. For class A, the service level is set at 99%, while for class B it is 95% and class C is 90%. This service level is used for calculating reorder points and safety stock in the analysis that will be discussed in the next point.

➤ Calculate Safety Stock (SS)

- example calculate SS for product class A:

Where:

- ✓ Average Month Sales :143 Unit Sales
- ✓ STDEV 1 Year : 76.2 Unit Sales
- ✓ Service Level : 99%
- ✓ Z : 2.33

$$SS = 2.33 \times 76.2 \sqrt{0.33}$$

$$SS = 103 = 103 \text{ Unit}$$

- example calculate SS for product class B

Where :

- ✓ Average Month Sales : 73.3 Unit Sales
- ✓ STDEV 1 Year : 25.8 Unit Sales
- ✓ Total Lead Time : 0.32 month
- ✓ Service Level : 95%
- ✓ Z : 1.64

$$SS = 1.64 \times 25.8 \sqrt{0.32}$$

$$SS = 24 \text{ Unit}$$

- Implemented into daily:Class C :

Where:

- ✓ Average Month Sales : 20.7 Unit Sales
- ✓ STDV 1 Year : 39.0 Unit Sales
- ✓ Total Lead Time : 0.32 Month
- ✓ Service Level : 90%
- ✓ Z : 1.28

$$SS = 1.28 \times 39.0 \sqrt{0.32}$$

$$SS = 28 \text{ Unit}$$

➤ Calculate Reorder Point (ROP)

- Calculate SS & ROP example for product Class A:

Where:

- ✓ Average Month Sales : 73.3 Unit Sales
- ✓ Total Lead Time : 0.33 month
- ✓ SS : 103 Unit

$$ROP : (143 \times 0.33) + 103$$

$$ROP = 151 \text{ Unit}$$

- Calculate SS & ROP example for product Class B

Where

- ✓ Average Month Sales : 20.7 Unit Sales
- ✓ Total Lead Time : 0.32 month
- ✓ SS : 28 Unit

$$ROP : (20.7 \times 0.32) + 28$$

$$ROP = 35 \text{ Unit}$$

➤ Grafik Reorder Point & Safety Stock

- Based on the sample data above, each class that has calculated its safety stock and reorder point if depicted in graphical form can be seen in the graph below:Examples of SS & ROP calculations for Class A products if implemented into daily:SS: 103 & ROP 151

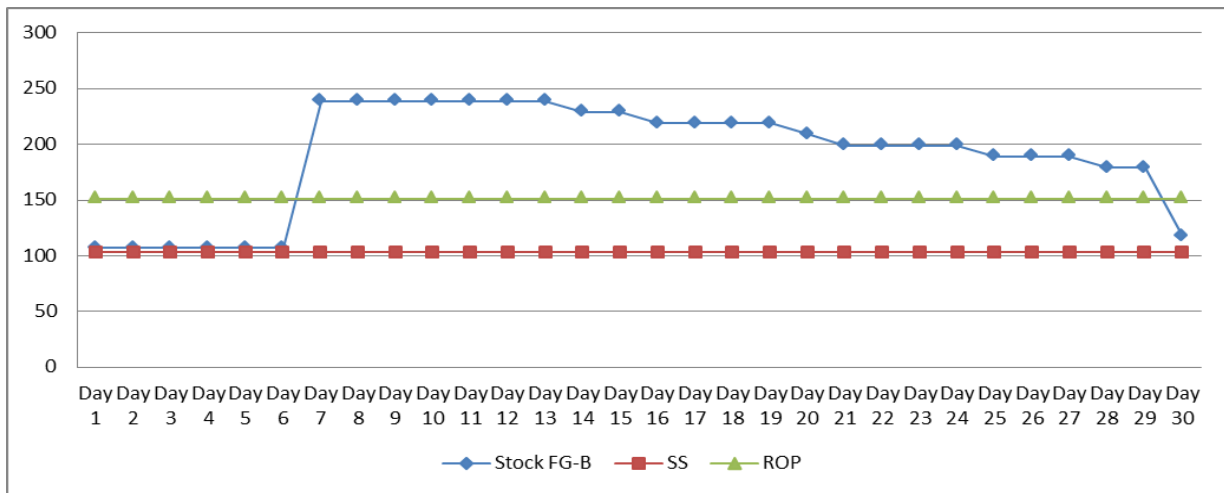


Fig 1:- Grafik Class A

- Calculate SS & ROP example for productClass Bif implemented into daily: SS: 24 & ROP 48

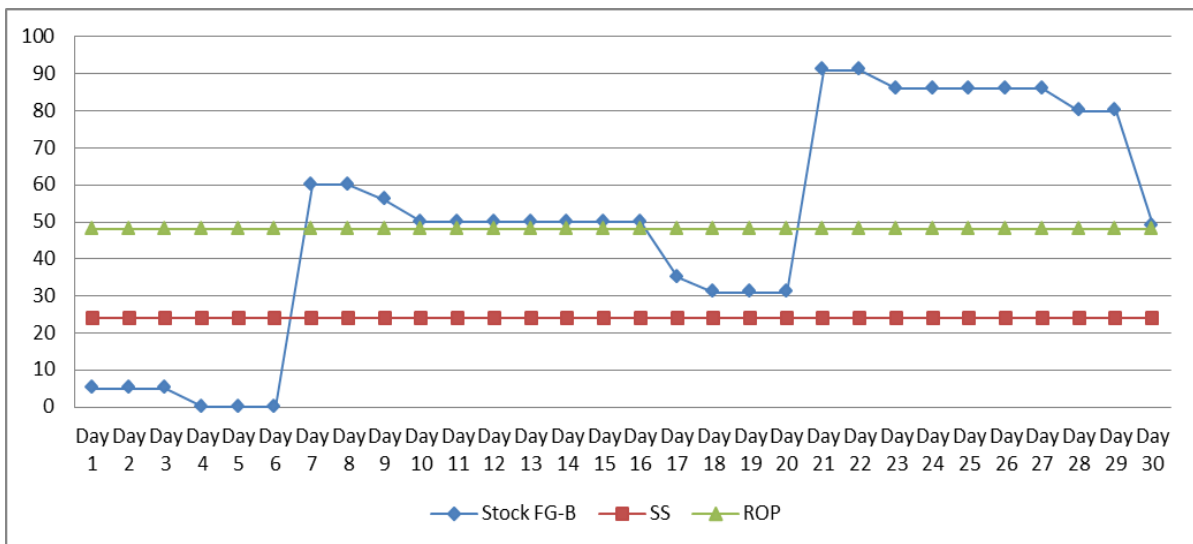


Fig 2:- Grafik class B

- Calculate SS &ROP productClass C if implemented into daily:SS: 28 & ROP 35

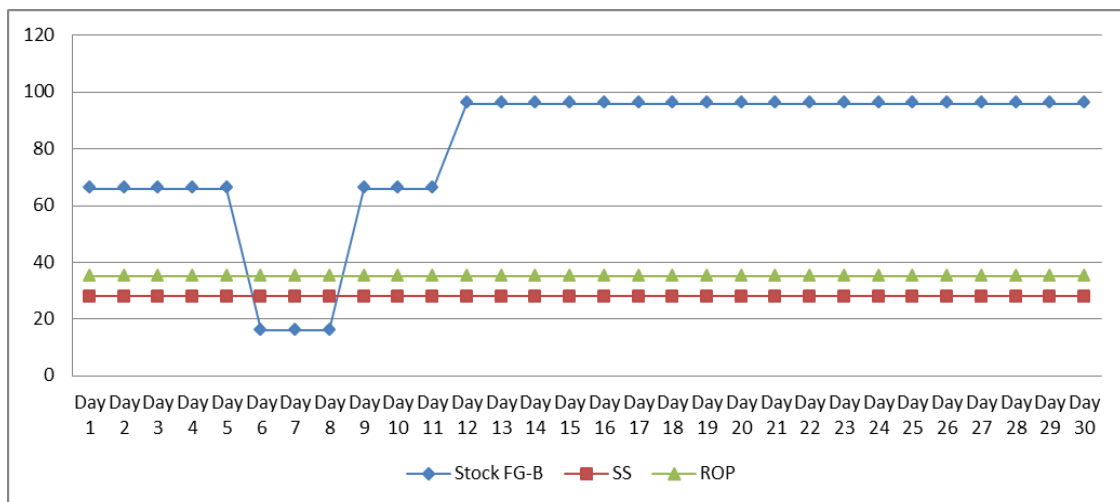


Fig 3:- Grafik Class C

➤ *Calculate Days of Inventory*

Based on the data that has been obtained and processed based on the ABC concept, safety stock, and the

ROP obtained by the DOI as follows from the monthly period:

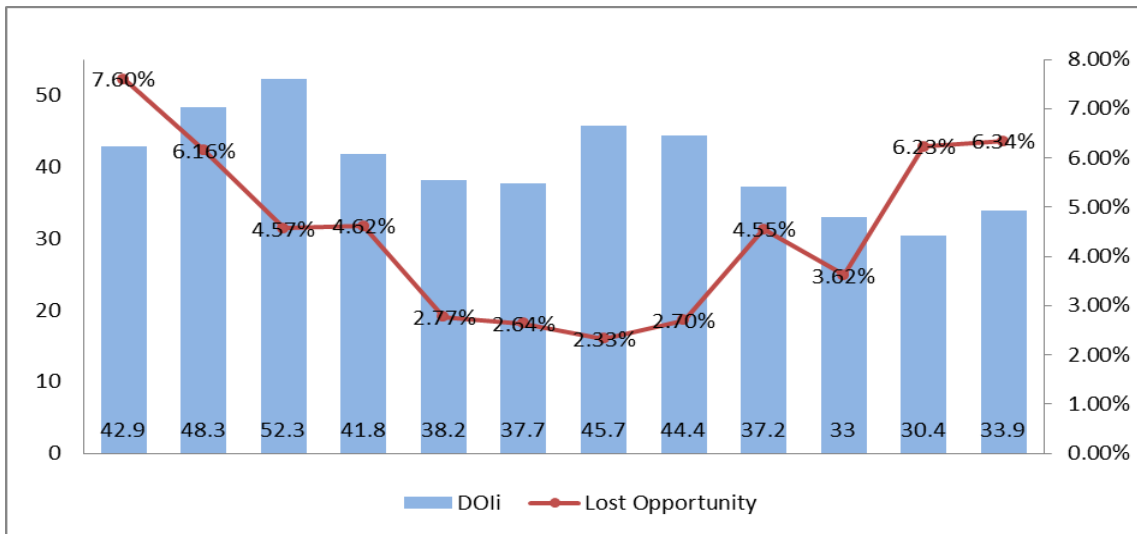


Fig 4:- Grafik DOI

V. ANALYSIS AND DISCUSSION

The DOI calculated using SS and ROP after grouping based on the ABC concept as seen in Figure 4 shows a positive trend, from the month of the month it shows an improving trend if we compare it to the lost opportunity obtained from the month. This is because the products are distributed evenly throughout the branches. The ROP concept is carried out to give a warning (*poka-yoke*) to everyone if the item will run out and must be refilled. If it is compared to the performance or sales achievement of the month, it can be concluded that there will be a positive trend also because the lost opportunity has decreased.

VI. CONCLUSION

Based on data processing and analysis, it can be concluded that the ROP analysis preceded by grouping data using the ABC concept, the safety stock analysis gives a positive impact on the DOI, this is characterized by a lost opportunity that decreases from each month and DOI is maintained from month to month. As a result this ROP analysis is very helpful for operational manager in maintaining the stock of goods in the field can apply this ROP concept to a policy so that it can be applied to all product groups in the warehouse.

SUGGESTION

ROP research writer still uses excel sheet. If it will be implemented, it requires software to speed up calculations and facilitate managers in the field in making decisions. This ROP concept can be implemented to other product groups so that it will lower the DOI more positively and provide greater profits for the company.