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INVENTORY MANAGEMENT AT PT. ABC USING ALGORITHM WAGNER-WITHIN METHOD

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Abstract

The purpose of this study was to determine the efficiency of inventory management of raw material using an algorithm Wagner-Within the PT ABC. This study uses a descriptive qualitative approach. The analysis technique used in this study is to calculate how the number and frequency of purchases, as well as inventory costs (Ordering Cost, Ordering Cost and Total Inventory Cost) according to the actual concept of the company and according to the calculation of the Wagner-Within (AWW) Algorithm method. The results of this study are F ordering of raw materials according to the calculation of the Wagner-Within Algorithm method (AWW), ordering raw materials carried out 5 times in 1 year, while according to the calculation of the existing conditions of the company, ordering raw materials made 7 times in 1 year. Wagner-Within (AWW) Algorithm Method this still results in a more efficient and optimal ordering fee than the order cost according to existing conditions company. For storage costs according to existing conditions, the company is still more efficient than the storage costs of the Wagner-Within (AWW) Algorithm method. For the total cost of raw material inventory, the Wagner-Within (AWW) Algorithm method is a method that produces the optimal and efficient total cost of raw material inventory.

Keywords: Wagner-Within Algorithm (AWW), Lot Sizing, Inventory, Inventory management.

Introduction

1. Preliminary

1.1 Background

Growing development of technology and the world of manufacturing industry is currently spurring the growth of the manufacturing industry, which has led to increased competition between manufacturing companies to fight over consumers, resulting in increased consumer demands for good quality and quantity of a product. To be able to create an efficient production system it is necessary a good production plan.

In an effort to improve competitiveness and profitability, such as those Rangkuti (2007) stated that the benefits are the maximum one can be achieved by minimizing the costs related to inventory, it is very important that inventory planning is needed good, effective, and efficient especially for the supply of raw materials or materials standard, given that raw materials in manufacturing companies are factors that are very influential on business smoothness.

During thistime manufacturing companies generally do planning and control is not based on standard methods, but only based on previous experiences. This often causes excess or buildup raw materials and their shortcomings that cause cost overruns, besides being shortcomings that can disrupt or inhibit the production process in meeting consumer demand.

To overcome problems in a company's inventory, there are several methods that can be applied in order to improve inventory management efficiency. One of them is lot sizing method where the size of the number of goods ordered will be related to the set-up fee. Lot sizing according to Rangkuti (2007) is a technique in minimizing the number of goods to be ordered, so as to minimize total inventory costs. One of the most appropriate lots sizing approaches that can minimize total inventory costs is the Wagner Within (AWW) Algorithm. This algorithm was developed by Wagner and Within in 1958 to provide an optimum solution to the deterministic order size problem at a certain time period where the needs of the entire period must be met. According to the research journal (Rajhans and Kulkarnia, 2013), Wagner Within algorithm is an accurate

met 4n hod to determine the optimal size for a product with dynamic demand with one-stage production without considering capacity constraints. The Wagner-Whitin Algorithm Model produces optimal costs even though the fixed costs vary from one period to another.

1.2 Formulation of the problem

Based on what has been written in the background above, the author can identify problems in the planning of raw material inventory that are directly related to the production of the company: What is the Wagner-Within (AWW) Algorithm Method in the analysis of raw material inventory can run efficiently based on the benchmark of total raw material inventory costs compared to the existing conditions applied by PT ABC?

Theoretical basis

2. Theoretical basis

2.1 Inventories

Inventories are defined as goods stored for use for sale in the coming period (Hendra, 2009). Inventories can be stored in the form of raw materials to be processed, the components are processed, goods in process at manufacture process, and finished goods to be sold is stored pan. Basically, inventory is a very important thing for companies, especially manufacturing companies that carry out production processes every day, both producing goods and services to support the smooth production process.

2.2 Inventory Management

In running the company's operations, especially manufacturing companies, it will not be separated from important activities in carrying out inventory, namely inventory management. According to Assauri (2004) suggests that companies must be able to maintain an optimum amount of inventory that can guarantee the need for the smooth running of company activities in the right quantity and quality and at the lowest possible cost. Based on the statement Baroto (2002) asserts that the optimum criteria are to minimize the total costs associated with inventory, namely storage costs and ordering. The optimum level of inventory can be regulated by meeting the needs of the ingredients in the right quantity, quality, and time and the low amount of costs.

2.3 Lot Sizing

Lot Sizing is a technique for determining the size of the stack or the number of goods or materials ordered for each order (Pardede, 2004). According to Rangkuti (2007), lot sizing is a technique in minimizing the number of goods to be ordered so as to minimize the total cost of inventory. According to Herjanto (1999) the lower the lot size, which means that the more often ordering goods will reduce storage costs, but increase the cost of ordering. Conversely, the higher the size of the lot size will reduce the frequency of ordering, which means reducing the cost of ordering, but resulting in increased storage costs. For this reason, it is necessary to find the right lot size that can minimize the total inventory costs.

2.4 Wagner-Within algorithm

This algorithm was developed by Wagner and Within in 1958 to provide an optimum solution to the deterministic order size problem at a certain time period where the needs of the entire period must be met. Wagner Within algorithm is an accurate method for determining the optimal size for a product with dynamic demand with one-stage production without considering capacity constraints (Rajhans and Kulkarnia, 2013). The Wagner-Whitin Algorithm method produces the optimal total raw material inventory costs even though the fixed costs vary from one period to another. This method minimizes the combination of the total inventory cost of raw materials from the setup cost and the holding cost with the results close to the same value for the number of orders made. Wagner and Within (2004) describe the steps of AWW as follows:

Step 1

Calculate total inventory costs (message costs and storage costs), then define O en. Formulation O en is expressed as follows.

$$\boldsymbol{Oen}=\mathbf{A}+\boldsymbol{h}\Sigma(\mathbf{qen}-\mathbf{qet})\boldsymbol{nt}=\boldsymbol{e}$$

for $1 \leq e \leq n \leq N$

Description :

Oen : Total inventory cost (Rp)

A : Ordering cost (Rp / message)

h : Holding cost per unit per period (IDR / unit / period)

qet : $\Sigma = D_t$

Dt : Demand on period t

e : The initial limit of the period covered by the *qet* order

n : The maximum period of time covered by the *qet* order

Step 2

The *fn* value is the value of the optimal total and order costs calculated using the following formula:

$$\boldsymbol{fn=Min\ [Oen+fe-1]}$$

for e = 1, 2,., n and n = 1, 2,., N

Step 3

Optimal solution *fT* obtained from the recursive calculation backwards as follows:

- fN = Oen + f e-1

The last order is carried out in period *e* to fulfill demand from period *e* to period *N*

- fe-1 = Ove-1 + fv-1

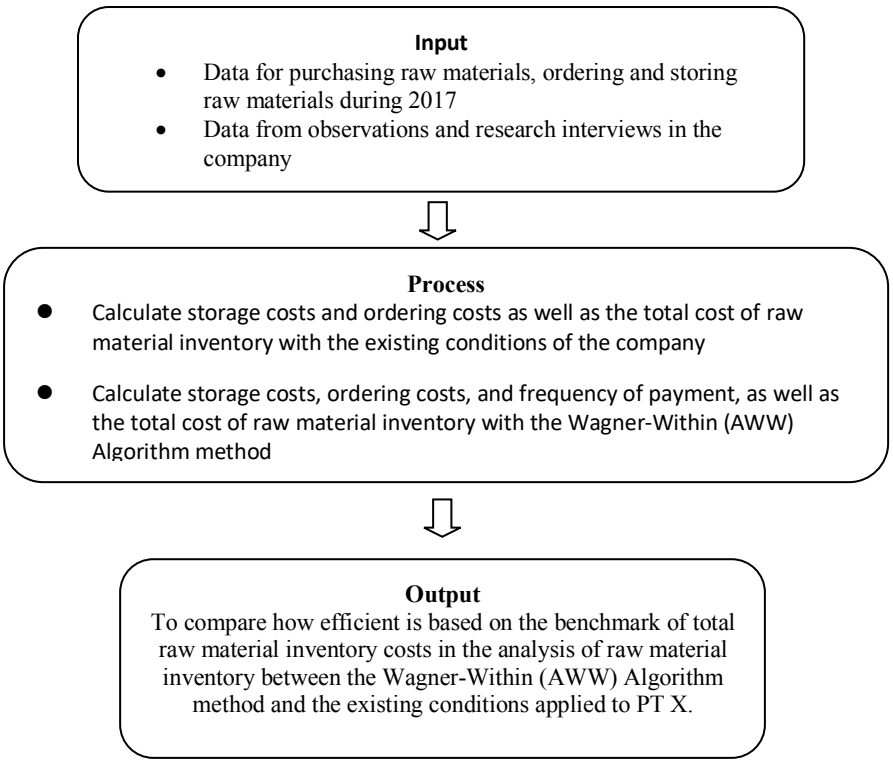
Last-order pre-orders must be made in period *v* to fulfill demand from period *v* to period *e-1*

- fu-1 = Ou-1 + f0

The first order must be made in period 1 to fulfill the demand from period 1 to period u- 1.

The reason for using this technique is because this technique produces the least total cost because it uses dynamic programs and a very detailed mathematical approach. The purpose of this technique is to obtain an optimal ordering strategy for all schedules of clean needs by minimizing the total cost of procurement and storage costs (Maulana and Setyorini, 2012).

Research Methods



The approach used in this study is a qualitative approach with Descriptive Case Study method. According to Sugiyono (2010), qualitative research methods are research methods based on the philosophy of postpositivism, used to the object of a natural object, (as opposed to an experiment) where the researcher is a key instrument, data source sampling is done *purposively* and *snowbaal* , a collection technique with triangulation (combined).

3.1 Data Collection Procedure

There is data collected in this study based on the type and source. Data sources are in the form of primary and secondary data, primary data is obtained while in the field through direct observation/observation conducted by observing the conditions that occur in the company and knowing firsthand about the process of raw material inventory and interviews/interviews directly at PT ABC. For secondary data using some secondary data as literature books, journals, and research that has been done before. In addition, secondary data in this study are raw material inventory data for 2017, including the amount of inventory, initial, total usage, number of orders or purchase of raw materials, as well as the components of ordering costs and storage costs.

3.2 Technical Analysis

In the analysis technique used in this study is to calculate how the number and frequency of purchases, as well as inventory costs (Ordering Cost, Ordering Cost and Total Inventory Cost) according to the actual concept of the company and according to the calculation of the Wagner-Within (AWW) Algorithm method , and to compare the cost of raw material inventory according to the actual concept in the company and the cost of raw material inventory using the Wagner-Within(AWW) Algorithm method .

Research Results and Discussion

4.1. Description of Research Results

4.1.1 According to the calculation of *Existing* conditions Company

Recording the amount of raw material inventory that comes and is used is done every working day in PT. ABC. For the cost of ordering raw materials is the cost incurred by the company PT. ABC, regarding the purchase of raw materials that are not affected by the number of raw materials ordered. PT ABC's raw materials are imported directly from several countries outside Indonesia.

The total annual cost of raw material inventory with the actual concept applied by the company is the sum of the total annual ordering costs and total storage costs per year. The total order cost is obtained from the calculation of total transportation costs/transportation costs, administrative costs and communication costs. Then, the total storage cost per year is obtained from the total cost of storage facilities (electricity, etc.), inventory insurance costs, inventory handling costs.

4.1.2 Calculations according to Wagner-Within (AWW) Algorithm Method

The results for the ordering frequency using the Wagner Within Algorithm (AWW) method for each raw material are the same, in 5 times per year. From these calculations, it can be concluded that the ordering frequency of each raw material by using the Wagner Within Algorithm (AWW) method is smaller than the actual concept that has been applied by the company that is 7 times a year.

4.1.3 Comparison of Raw Material Inventory Costs

The results of the calculation of the total cost of raw material inventory using the Wagner-Within (AWW) Algorithm method then compared total inventory costs generated by the actual concept applied by the company.

Based on the results of the calculation of raw material inventory costs between the *existing* conditions that have been applied companies with the Wagner-Within Algorithm (AWW) method, there are differences in each aspect in the table above. Order frequency according to the current concept applied by the company is 12 times, while based on the Wagner-Within (AWW) algorithm method, the order frequency is 6 times the order, the frequency of this order should be done in order to reduce the order cost as much as possible. As previously explained, there are many ordering frequencies and followed by the increasing number of order quantities, the ordering costs are also increasing.

It can also be concluded that the calculation of the *lot sizing* method with the Wagner-Within (AWW) Algorithm method approach resulting in lower total raw material inventory costs than the actual concept that had been applied by the company.

4.2 Discussion

4.2.1 Efficiency of Raw Material Inventory Costs with Wagner-Within (AWW) Algorithm Method

From the results of the calculation of the cost of raw material inventory with the Wagner-Within (AWW) Algorithm method before, it is known that the *lot sizing* method with the Wagner-Within (AWW) Algorithm approach can minimize the cost of raw material inventory compared to the actual concept that has been applied by the company. The following presentation of raw material inventory cost savings using Wagner-Within Algorithm (AWW) at PT. ABC.

Based on the calculation of the percentage that has been done, there is a difference in the total cost of raw material inventory between the existing conditions of the company with the Wagner-Within (AWW)

Algorithm method. Where there is a saving 14.8% if the Wagner-Within (AWW) algorithm is applied compared to the existing conditions applied to PT. ABC.

In the existing condition of the company, the company makes an order every time there is a production to be carried out or in this case 12 times in 1 year. Whereas by using the Wagner-Within Algorithm (AWW) method, the ordering of raw materials carried out varies (order frequency) according to the algorithm calculation that has been carried out which is 8 times in 1 year.

Wagner-Within Algorithm Method (AWW) provides raw material inventory planning which results in a smaller total inventory cost when compared to raw material inventory planning which is only based on the actual concept applied by the company. So the company should start implementing the Wagner-Within (AWW) Algorithm method in order to minimize the total cost of raw material inventory that is very influential on the business process of PT ABC.

Conclusions and recommendations

From the research that has been done on the planning of PT. ABC's raw material inventory, using the Wagner-Within Algorithm (AWW) method can be concluded as follows:

a. The Frequency of ordering raw materials according to the calculation of the Wagner-Within Algorithm (AWW) method, ordering raw materials carried out 5 times in 1 year, while according to the calculation of the existing condition of the company, ordering raw materials is done 7 times in 1 year. With a smaller order frequency (5 times / year) will result in a more efficient and optimal ordering fee compared to more order frequency (7 times / year).

b. The Wagner-Within (AWW) Algorithm method still results in more efficient and optimal ordering costs than ordering costs according to the existing conditions of the company. For the total cost of raw material inventory, the Wagner-Within (AWW) Algorithm method is a method that produces the optimal and efficient total cost of raw material inventory.

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