

Glucose Supply Control Using Silver Meal Heuristic Method at PT. XM Sidoarjo

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Abstract - Inefficient supply of glucose is a problem for PT XM Sidoarjo, where too much raw material inventory can result in high storage costs, or too little inventory causes the production process to stop. The research uses the Silver Meal Heuristic method which is based on future demand, so that the purchase of raw materials can be determined precisely. The company calculates the cost of raw materials and storage for a year using the Company's Real Method is around Rp. 16, 465, 582, 200. If using the Heuristic Silver Meal method, the number of

orders for glucose by predicting the optimal number of orders for raw materials to meet the inventory needs every month is 1,050.62 tons at a cost of Rp. 1,261,094,000. so the total cost from January to December 2020 will be Rp 15,133,128,000. Thus the savings that can be made from January to December 2020 is Rp. 1,332,454,200 with an efficiency of 8.09%.

Keywords: Inventory Control, Silver Meal Heuristic Method, Glucose Raw Material.

1. INTRODUCTION

The role of the compounding process in the production process creates dependency on the availability of glucose at PT. XM Sidoarjo which become an important aspect that needs to be considered by the company. The supply factor for glucose raw materials are often a problem and causes inefficiency, where sometimes the inventory is too excessive which results in high storage costs, sometimes the inventory is too small, causing the production process to stop and unable to meet production targets on time (Nasution, 2006). In order to ensure the smooth production process on time, a research was conducted using the Silver Meal Heuristic method.

According to Ariyani (2010), inventory control is a major concern for the company because it's large portion, which is around 40% of the total invested capital. According to Assauri (1999), the total cost in a certain period is the sum of the purchase cost, ordering cost and storage cost, where Total Cost = Purchase Cost + Ordering Cost + Storage Cost

The Silver Meal Heuristic method in its calculation is based more on the purchase period

variable and not based on the total demand during the planning period (Assauri, 1999).

The purpose of this study was to obtain the optimal total cost of supply and glucose requirements using the Silver Meal Heuristic method and to compare the efficiency using the company's Real method with the Silver Meal Heuristic method.

2. RESEARCH METHOD

2.1. Data collection

Data from PT. XM in Sidoarjo, was taken in 2019 through the company's internal data. The dependent variable in this study is the minimum total inventory cost. The independent variables in this study are the purchase cost, the need per period, the cost of ordering, the cost of storage and the cost of raw materials.

2.2. Data processing

Data processing for inventory control planning begins with performing calculations such as the following steps:

a. Calculating average inventory cost

Determination of the average cost per period is the number of periods in increasing orders, according to Riggs (1981) in Fuad (2011).

$$A \quad u \quad c = \frac{(O \quad F) + (T \quad .S \quad F \quad A \quad E \quad o \quad P \quad T)}{T}$$

Or :

Where :

 \underline{AC} = Average cost of raw materials

TU

 D_T = Demand during period T

O = Cost per ordering

H = Cost of holding per unit per period

T = Period

b. Calculating the level of cost efficiency

$$Eff = \frac{TCA - TCB}{TCA} \times 100\%$$

Where :

TCA = Total Cost of the company's inventory control policies

TCB = Total Cost Calculation of the Silver Meal Heuristic.

Eff = Cost efficiency rate

3. RESULTS AND DISCUSSION

The calculation of the remaining glucose raw materials for the period January 2019 to February 2019 is as follows:

a. Leftover January 2019 (ton) =

$$\text{Order} - \text{Requirement} + \text{Starting Balance} = 1.140,00 - 1.050,62 + 53,72 = 143,10 \text{ ton}$$

b. Leftover February 2019 (ton)

$$= 1.380,00 - 1.150,71 + 143,10 = 372,39 \text{ ton}$$

Furthermore, the calculation of the remaining glucose for the period March 2019 - December 2019 using the same formula as the above formula then the results are entered in Table 1.

Table 1. Order Data and Glucose Needs (tons)
Period : January 2019 – December 2019

| No | Month | Order (Ton) | Beginning Inventory(Ton) | Needs (Ton) | Ending Inventory(Ton) |
|----|----------|-------------|--------------------------|-------------|-----------------------|
| 1 | Jan'19 | 1.140,00 | 53,72 | 1.050,62 | 143,10 |
| 2 | Feb'19 | 1.380,00 | 143,10 | 1.150,71 | 372,39 |
| 3 | Mar '19 | 1.080,00 | 372,39 | 1.221,04 | 224,15 |
| 4 | Apr '19 | 1.110,00 | 224,15 | 1.111,35 | 222,80 |
| 5 | May '19 | 1.230,00 | 222,80 | 1.138,49 | 302,10 |
| 6 | Jun '19 | 1.020,00 | 302,10 | 1.153,98 | 168,11 |
| 7 | Jul '19 | 930,00 | 168,11 | 887,76 | 210,36 |
| 8 | Agust'19 | 1.290,00 | 210,36 | 1.175,29 | 379,64 |
| 9 | Sep'19 | 1.020,00 | 379,64 | 1.143,32 | 256,33 |
| 10 | Oct '19 | 1.200,00 | 256,33 | 1.155,55 | 252,59 |
| 11 | Nov '19 | 990,00 | 252,59 | 1.118,75 | 243,22 |
| 12 | Dec '19 | 1.170,00 | 243,22 | 1.050,62 | 362,60 |

Cost Data at PT. XM Sidoarjo

- Glucose price per ton = Rp. 1,200,000
- Glucose order fee is Rp. 350,000 per order, which includes transportation costs of Rp. 300,000 and administration fee of Rp. 50,000
- The cost of storing glucose Rp. 60,000 obtained from the company's policy of 5% of the price of Glucose per tonne Rp. 1,200,000

Data processing of raw material inventory control Glucose using the Company's Real Method (TCA), namely the calculation of storage costs, purchase costs, and the total cost of the company's real method (TCA) for the period January 2019 - February 2019 as follows:

a. January 2019

➤ Storage Cost January 2019 = 143,10 ton x Rp. 60.000 = Rp. 8.586.000.

➤ Purchasing Cost January 2019 = 1.140,00 ton x Rp. 1.200.000 = Rp. 1.368.000.000

➤ Total cost January 2019 = Rp. 350.000 + Rp. 8.586.000 + Rp. 1.368.000.000 = Rp. 1.376.936.000

b. February 2019

➤ Storage Cost February 2019 = 372,39 ton x Rp. 60.000 = Rp. 22.343.400

➤ Purchasing Cost February 2019 = 1.1380,00ton x Rp. 1.200.000 = Rp.1.656.000.000

➤ Total cost February 2019 = Rp. 350.000 + Rp. 22.343.400 + Rp. 1.656.000.000 = Rp. 1.678.693.400

For the calculation of storage costs, purchase costs, and the total cost of the company's real method (TCA) for the period March 2019 to December 2019 the same calculation is carried out and the results are in Table 2.

Table 2. Company Real Method Calculation Results

| No | Month | Storage Cost (Rp) | Purchase Cost (Rp) | Total (Rp) |
|-----------------|---------|-------------------|--------------------|----------------|
| 1 | Jan '19 | 8.586.000 | 1.380.000.000 | 1.376.936.000 |
| 2 | Feb '19 | 22.343.400 | 1.656.000.000 | 1.678.693.400 |
| 3 | Mar '19 | 13.449.000 | 1.296.000.000 | 1.309.779.000 |
| 4 | Apr '19 | 13.368.000 | 1.333.200.000 | 1.346.918.000 |
| 5 | Mei '19 | 18.126.000 | 1.476.000.000 | 1.494.476.000 |
| 6 | Jun '19 | 10.086.600 | 1.224.000.000 | 1.234.436.000 |
| 7 | Jul '19 | 12.621.000 | 1.116.000.000 | 1.128.971.000 |
| 8 | Ags '19 | 22.778.400 | 1.548.000.000 | 1.571.128.400 |
| 9 | Sep '19 | 15.379.800 | 1.224.000.000 | 1.239.729.800 |
| 10 | Okt '19 | 15.115.400 | 1.440.000.000 | 1.455.465.400 |
| 11 | Nov '19 | 14.593.200 | 1.188.000.000 | 1.202.943.200 |
| 12 | Des '19 | 21.756.000 | 1.404.000.000 | 1.426.106.000 |
| Total Cost (Rp) | | | | 16.465.582.200 |

From the calculation for a year in table 2, the results of the Company's Real Method are Rp. 16,465,582,200. The calculation of the average

cost of glucose raw materials using the Heuristic Silver Meal method is:

$$A u c_i = \frac{(O F) + (T . S F A E o P T)}{T}$$

Or :

$$\frac{AC}{TU} = \frac{0 + [1 - 1)D1 + (2 - 1)D2 + \dots + (T - 1) DT] (H)}{T}$$

a. January 2019 (T = 1)

$$\frac{AC}{TU} = \frac{350.000 + [(1 - 1)1.050,62]60.000}{1} = \text{Rp. } 350.000$$

$$\frac{AC}{TU} = \frac{350.000 + [(1 - 1)1.050,62 + (2 - 1)1.150,71]60.000}{2} = \text{Rp. } 34.696.300$$

For the months of March 2019 to December 2019 the same calculation is carried out with the above formula. Then from the results of all calculations are entered in Table 3

b. Februari 2019 (T = 2)

Table 3. Average cost calculation results for January – December 2019

| No. | Period | T | $\frac{AC}{TU}$ (rupiah) | Repurchasing 90 :1 |
|-----|---------------|----|--------------------------|-----------------------|
| 1 | January '19 | 1 | 350.000 | |
| 2 | February '19 | 2 | 34.696.300 | 1.150,71 |
| 3 | March '19 | 3 | 71.972.467 | 2.021,33 |
| 4 | April '19 | 4 | 103.990.100 | 3.442,28 |
| 5 | May '19 | 5 | 137.769.600 | 4.553,63 |
| 6 | June '19 | 6 | 172.565.333 | 5.672,12 |
| 7 | July '19 | 7 | 195.569.371 | 6.826,1 |
| 8 | August '19 | 8 | 231.071.725 | 7.713,86 |
| 9 | September '19 | 9 | 266.374.156 | 8.889,15 |
| 10 | October '19 | 10 | 302.136.440 | 10.032,47 |
| 11 | November '19 | 11 | 335.692.218 | 11.188,02 |
| 12 | December '19 | 12 | 365.501.967 | 12.306,77 |

From the glucose requirement data needed by the WinQSB Software were obtained as company for the January – December 2019 follows: Table 4. Pengolahan Data dengan period, the results of the Exponential Smoothing Software WinQSB Heuristic Silver Meal forecasting using the

Table 4. Pengolahan Data dengan Software WinQSB

| Month | Needs in Total (Ton) |
|----------|----------------------|
| Jan '20 | 1.050,62 |
| Feb '20 | 1.050,62 |
| Mar '20 | 1.050,62 |
| Apr '20 | 1.050,62 |
| Mei '20 | 1.050,62 |
| Juni '20 | 1.050,62 |
| Juli '20 | 1.050,62 |
| Agust'20 | 1.050,62 |
| Sep '20 | 1.050,62 |
| Okt '20 | 1.050,62 |
| Nov '20 | 1.050,62 |
| Des '20 | 1.050,62 |

Forecasting calculation results in table 4 ➤ January 2020 can be calculated the purchase cost and the total in Purchasing Cost : table 5. The cost of storage and the total cost of 1.050,62 ton x Rp 1.200.000 = Rp. 1.260.774.000 glucose inventory is as follows: Storage Cost :

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0 ton x Rp. 60.000 = Rp. 0

Rp 350.000 + Rp 1.260.774.000+ Rp0

= Rp. 1.261.094.000

1.050,62 tonx Rp.1.200.000=

Rp.1.260.774.000

Storage Cost:

0 ton x Rp. 60.000 = Rp. 0

Total cost :

Rp 350.000 + Rp 1.260.774.000 + Rp. 0

Total cost :

➤ February 2020

Purchasing Cost:

= Rp. 1.261.094.000

For the calculation of March 2020 - December 2020, the calculation is carried out the same as the calculation above, then the results can be seen in Table 5.

Table 5. Glucose Inventory Using the Silver Meal Heuristic Method

| Month | Needs (Ton) | Order Cost (Rp) | Purchasing Cost (Rp) | Total (Rp) |
|----------|-------------|-----------------|----------------------|----------------|
| Jan '20 | 1.050,62 | 350.000 | 1.260.744.000 | 1.261.094.000 |
| Feb '20 | 1.050,62 | 350.000 | 1.260.744.000 | 1.261.094.000 |
| Mar '20 | 1.050,62 | 350.000 | 1.260.744.000 | 1.261.094.000 |
| Apr '20 | 1.050,62 | 350.000 | 1.260.744.000 | 1.261.094.000 |
| Mei '20 | 1.050,62 | 350.000 | 1.260.744.000 | 1.261.094.000 |
| Juni '20 | 1.050,62 | 350.000 | 1.260.744.000 | 1.261.094.000 |
| Juli '20 | 1.050,62 | 350.000 | 1.260.744.000 | 1.261.094.000 |
| Agus'20 | 1.050,62 | 350.000 | 1.260.744.000 | 1.261.094.000 |
| Sep '20 | 1.050,62 | 350.000 | 1.260.744.000 | 1.261.094.000 |
| Okt '20 | 1.050,62 | 350.000 | 1.260.744.000 | 1.261.094.000 |
| Nov '20 | 1.050,62 | 350.000 | 1.260.744.000 | 1.261.094.000 |
| Des '20 | 1.050,62 | 350.000 | 1.260.744.000 | 1.261.094.000 |
| | | | | 15.133.128.000 |

In table 5, the calculation using the Silver Meal Heuristic Method obtained a total cost of Rp. 15,133,128,000. Meanwhile, with the real method or the method used by the company at this time, it was obtained Rp. 16,465,582,200 so that the difference was Rp. 1,332,454,200 which is the profit of the company

Data Processing Efficiency Level

The calculation of the efficiency level is as follows:

$$\text{Eff} = \frac{\text{TCA} - \text{TCB}}{\text{TCA}} \times 100\%$$

$$\text{Eff} = \frac{16.465.582.200 - 15.133.128.000}{16.465.582.200}$$

$$\times 100\% = 8.09\%$$

4. CONCLUSION

From the research results can be drawn a conclusion, namely:

- The total result from January 2019 to December 2019 using the Company's Real Method is Rp. 16,465,582,200.
- The optimal number of orders for glucose in order to meet the needs of production supplies every month is 1,050.62 with a total cost of Rp. 1,261,094,000. so the total cost from January to December 2020 will be 15,133,128,000
- By using the Silver Meal Heuristic method, the total cost of Glucose inventory (TCA) is Rp. 15,133,128,000. which turns out to be more minimum and efficient when compared to the company's total real inventory cost, namely Rp. 16,465,582,200.
- Thus the savings can be done in the next year is Rp. 1,332,454,200 with an efficiency of 8.09%

5.REFERENCES

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