Problem Solutions of Increasing Inventory Level for Consignment Material at PT Schneider Electric Batam

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Abstract: The raw material used for the production process, 70% comes from outsourcing. This high percentage is the main challenge for PT SEMB to control and ensure raw material is ready when needed. The consignment model has a minimum limit and a maximum limit. The material will be kept at PT SEMB, while not being used these raw materials still owned by the suppliers, and the place to keep this material is not registered as PT SEMB in the system. This means consignment material should have a low inventory level because the ownership will change only when the material is used, but the problem is from January to March 2019 inventory level consignment material has increased. One of the main problems is outdated information for material limits (min-max). This problem solved by making tools that can adjust materials limit (min-max) with the production process and at the same time, it's adjusted with the manpower to do the replenishment process at Lot 15. Improvement also made by changing the person who doing open consignment from leader Lot 15 to warehouse leader Sensor plant. The results for this improvement are decreasing average inventory levels from $362,221 (January-March 2019) to $240,327 (May 2019). Decreasing is approximately 33%

Keywords: consignment model, inventory level.

Introduction

PT. Schneider Electric Manufacturing Batam (SEMB) is one branch of the leading companies from France, Schneider Electric. This company is located in Batamindo Industrial Park, Jalan Beringin Lot 1, Muka Kuning, Batam. PT SEMB has three plants, namely Sensors, Production Electromechanic (PEM), Production Electronic (PEL). PT SEMB is worked in assembling electronic equipment. Materials used for assembly are produced through outsourcing outside the manufacturer PT SEMB. About 70% of all products produced, the materials used are outsourced.

The high use of materials for outsourcing is a challenge for PT SEMB. The warehouse is a crucial part of the production process. If the material arrives from the supplier, but there is no place in the warehouse, the production process is threatened to be over the specified time limit. Similarly, if the supplier is late in sending material, it can affect the production system. Innovation has been done by PT SEMB, doing a warehouse enlargement, do new management planning for the warehousing system, doing digitization for each process including the warehouse system, and turn The system and turn the warehouse system into a consignment model.

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Figure 1 below is the inventory level trend for consignment material from January to March. The benefit of using consignment models is the material that is always available at any time, where suppliers send goods based on the quantity of material left in the warehouse at this time. The process of requesting goods to suppliers is also not done manually, because the system will automatically ask suppliers to send material when the material quantity is below a certain limit. The warehouse to store material is a warehouse of PT SEMB (BLP), but as long as the material has not been used, the system does not yet belong to PT SEMB, and the storage in the system is also not PT SEMB, so the inventory level of material consignment should not be high. Based on Figure 1 below the inventory material level consignment has increased from January to March.

Research Method

The research method used to solve the problem in this study used the DMAIC method (Define-Measure-Analyze-Improve-Control). According to Montgomery [1] DMAIC is a structured and thoroughly used problem-solving procedure for process improvement.

- Define
  It is the stage of identifying the problems to be discussed. The problems that occur not only occur once but which provide long-term effects or affect the production system.

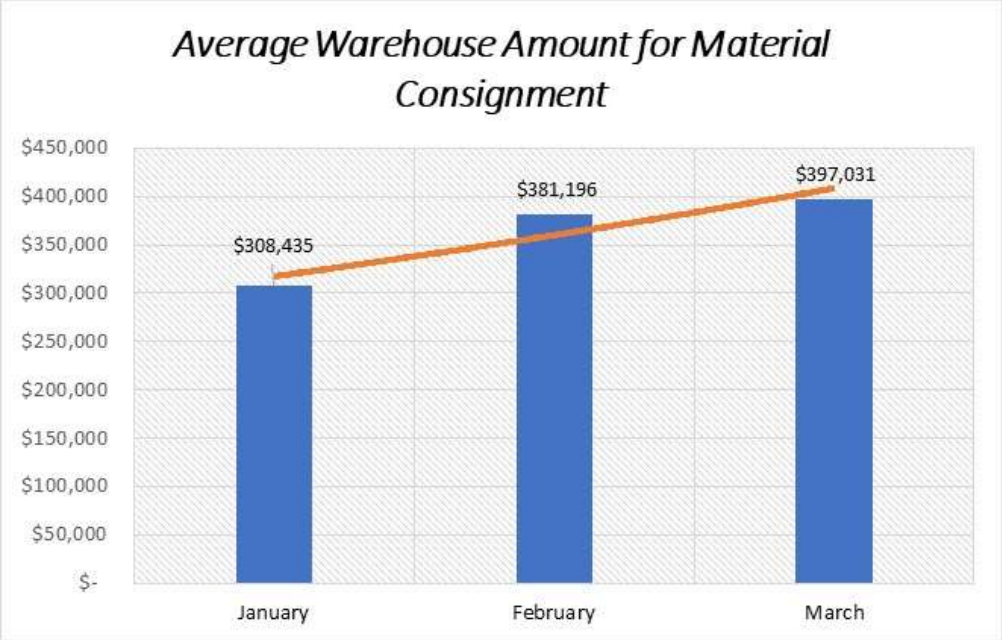

Figure 1. Average warehouse amount for consignment material

- Measure
  This stage is used to collect measurement and calculation data which is the basis for the subsequent analysis process. Collecting data is taken from the PT SEMB server.
- Analyze
  It is the stage to analyze the data that has been collected to be a consideration in making improvements in the next stage. This analysis process used the five's why technique and Pareto chart. The five's why technique is a variation form from a cause and effect analysis. The goal is to find out the potential causes that might occur, which in reality may only be symptoms (Rothwell, *et al.* [2]). Pareto chart is used as a priority scale by separating between several categories that affect results with "vital categories" and "normal categories". Pareto charts have the principle to focus on completing 20% problems, which impacts 80% of the final result (Barsalou, *et al.* [3]).
- Improve
  It is the stage to make a solution to answer the problems that are the main goal of the study. Solutions are made based on the results of the problem analysis.
- Control
  It is a stage where the results of the improve phase will be studied further, The aim is improvements can continue to run properly. The control phase is done by looking at the inventory level after the improvements are implemented.

Results and Discussion

Solving the problem in this study using the DMAIC method, as of the explanation of the results and discussion also using the DMAIC method.

Define

The material used for production by PT SEMB 70% is outsourced. Materials from suppliers can be sent directly to plant production, also called direct shipment, or through Batam Logistic Plant (BLP). Materials that have a high amount of use and come from the same supplier usually use a direct shipment system so that the material does not go through the BLP again, but the material that uses the direct shipment system is, of course, considering the cost and warehouse capacity. Materials from outside the city and abroad, or those that do not use the direct shipment system are sent to BLP. Storage in BLP for Sensors plant material combined with PEM plant is called Lot 15. Materials are treated differently, depending on the level of use, size, supplier, etc. Material is divided into two categories, namely consignment material and non-consignment material. This consignment and non-consignment material are further divided into kanban and OFO (order for order) material types. Figure 2 above is material type at PT SEMB. Kanban material is a material that has a high level of use and is usually small, for example, nut or spring steel. Kanban material has a limit of min and max. This min and max limit is for the quantity of material on the production line. Min limit is the minimum material

Figure 2. Material type at PT SEMB (January-May)

quantity limit. The goal is to avoid shortages during the production process. The max limit is used as a material capacity limit on the production line. Kanban material performs replenishment automatically by looking at the current material quantity.
OFO material is a type of material that processes material picking based on SPQ (standard pack quantity) or MOQ (minimum order quantity), and material taking is done manually according to the needs.

The material consignment is the same as the kanban type material, has a min and max limit. The difference is when the kanban material performs replenishments, the one doing it is from the warehouse, whereas if the consignment material that does the replenishment is the supplier. Consignment models require suppliers to deliver material when the remaining material is in a certain amount. A daily check is done for consignment material by the leader from Lot 15 (BLP). Non-consignment is a type of material storage that is commonly used. The required material will be ordered in advance by the plant to the supplier, then the supplier sends material to the BLP or directly sent to the plant. This problem occurs in the material consignment that sends material through the BLP, which is an increase in inventory level. The intended inventory level by considering the amount of material with the price of the materials can also be called the warehouse amount.

Measure

The measure phase in this project is the retrieval of data to be processed to do the simulation, to see the effect of the min limit and max on the inventory level. Simulation made using Microsoft Excel. The data taken is material master, to find out the material identity consists of a material number, material quantity at the warehouse, material usage, and material cost. Data is taken through the PT SEMB server. In addition to doing the simulation require time for BLP to do material replenishment. This time data is calculated manually for simulation purpose.

Analyze

The analysis is done by observation, and also analysis based on the simulation results that have been made. The increase in inventory level for material consignment is caused by several things, namely because of the contractual agreement between the supplier and PT SEMB. The increase is also caused by errors in the system and on workers.

- Contract agreement
  Contract agreements are needed as a form of commitment between suppliers and PT SEMB, were within a certain period if the material has been sent to PT SEMB but has not been used then PT SEMB still has to open a consignment as a form win-win solutions between PT SEMB and supplier. The supplier is safe because the material is still paid for by PT SEMB, and PT SEMB can certainly not experience shortages. Problems that often occur suppliers sometimes ask PT SEMB to make payments faster, even though it is still within the contract limit, this can occur because of problems from the suppliers themselves, perhaps because the consignment material has a high price so it requires high cash flow.
- System error
  System errors often occur called variance. Variance can occur due to a system error, also

due to worker error. System error is a dynamic rack with a high min-max limit, meaning a lack of resemblance between the mix-max limit and material use. For example a material with a high usage quantity, but the min-max limit is low so that the replenishment is done even more when it can be adjusted so that it can reduce the replenishment, and maximize it on materials with low usage quantity, but the min-max limit is high. This error is caused by workers and min-max limits that are not updated according to current production needs. Min-max limit is not updated because there are no tools that can do the adjustment for ideal min-max, that consider manpower and production consumption. Other than that, the system often experiences variance, which means there is a difference between the system and the actual. Errors most often occur in the amount of material, wherein the system material is available in the warehouse, but it turns out that the material is not in the warehouse. Errors also occur due to differences in material storage locations.

- Workers
  Workers can cause variances. The picker does not re-input when the material is taken or makes a mistake in taking the location of the material, usually when the material is in 2 different places. Dynamic rack with a high min-max limit also causes workers to do more replenishment, which eventually leaders often do replenish to suppliers. The leader does a daily check based only on the quantity of material in the warehouse, does not consider the production-consumption. This error causes the increasing amount of consignment material in the warehouse, even though the material is not necessarily used for production.

The simulation starts by changing the min-max limit based on replenishment days (RD). Replenishment days represent how many days the material is taken once. Changes are made only to the Sensor plant consignment material. The results of this simulation analysis are best using RD2, requires a total of 46 hours, with 27,133 replenishments in 1 month. The remaining quantity in the warehouse is 945,874 and the warehouse amount is $170,643. The results of using RD2 give a decrease in the warehouse amount from $ 362,221 to $170,463. The total decrease of $191,758. The simulation results can be maximized by changing the MOQ and SPQ value from OFO type material which still uses the consignment model. The purpose of the simulation by changing the MOQ and SPQ values to prove whether changing the MOQ and SPQ value can reduce the inventory level or not. OFO consignment material has 78 materials. From 78 materials, using a Pareto chart to determine the material needs to be changed for better results at the simulation.

Pareto chart calculation uses an average 3 months consumption multiplied by material cost, with the aim to find out the most used material with the highest price. The Pareto chart results from 78 materials, select 15 materials. This 15 materials will decrease MOQ and SPQ value. Decrease the value by considering SPQ. For example, for material W304242822 with SPQ is 81, wherein one layer there are 27 pcs. Changing SPQ becomes 41 so there is no need to change boxes, but enough by taking out 1.5 layers. This consideration is made for all materials. Changing the SPQ and MOQ values will certainly increase the number of replenishments, and with the current manpower limit, it is not possible to replace the entire SPQ and MOQ.

Table 1. Change SPQ and MOQ for OFO material

Material Number	Warehouse Amount ($)	Simulation Total Hours
W304242822	170,414	47
W313065250111	147,324	47
W314135260111	147,277	48
W314040550111	147,277	49

Table 1 above is the result of the SPQ and MOQ of the material is changed, and the impact on the warehouse amount for the Sensor plant consignment and the time needed to complete the replenishment. The results of the table above prove that only 3 materials can be replaced by SPQ and the MOQ remains in accordance with the amount of time available.

Tabel 2. Comparison of improvements

	Changing RD	Changing SPQ and MOQ
RD	2	2
Simulation Time	46	48
Total Replenishment	27133	28200
Warehouse Amount	$ 170,463	$147,277

Table 2 above is comparison between changing replenishment days, dan also change amterial SPQ and MOQ. The reduction in the warehouse amount is $23,186 by making a changing for SPQ and MOQ. Decreasing the MOQ and SPQ value is proven to reduce the remaining quantity in the warehouse, but to implement it requires cooperation with suppliers. Some suppliers may increase prices if they lower SPQ value because it requires more costs to do material packing. The further calculation needs to be done whether it is commensurate with lowering the remaining qty in the warehouse by decreasing the MOQ and SPQ.

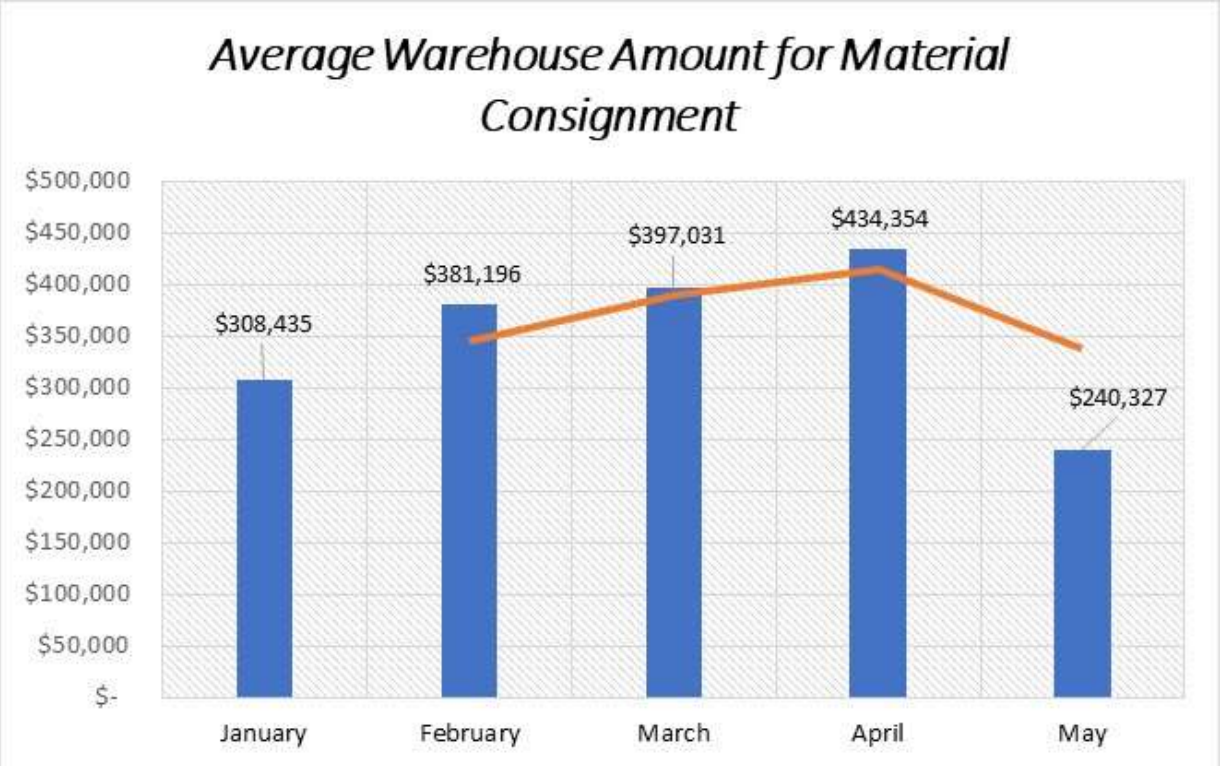

Figure 3. Monthly comparison for *average inventory level* (January-May)

Improvement

The improvement given is using the simulation results, which change it to RD2. Changing using RD2 requires a total time of 46 hours, with 27,133 replenishments in 1 month. The remaining quantity in the warehouse is 945,874 and the warehouse amount is $ 170,643. The results of using RD2 give a decrease in the warehouse amount from $ 362,221 to $ 170,643. This result can be maximized by changing the SPQ value and MOQ for material with the OFO strategy. Changing is done for 3 materials with a large quantity of usage and high prices. By changing the SPQ and MOQ value can decrease the warehouse amount to $ 147,277. By doing these two improvements, can reduce the warehouse amount total by $ 214,944.

Control

Improvements that have been implemented are by replacing the replenishment process for kanban material consignment. The daily check originally is done by leader Lot 15 is change by the Sensors plant, which is by warehouse leader. The replenishment of consignment material is tightened so that the replenishment of kanban material is done manually, meaning that the replenishment process is done one by one according to production requirements. The replenishment process changes begin in May

2019. The decline that occurred was quite significant from the January to March average of $ 362,221 to $ 240,327. Figure 3 above is the results after improvement is implemented. Declines occur at approximately 33%. This decrease indicates that material consignment is normal. Consignment material is not affected by usage, because even though the usage of the material is high, using a consignment system where it is replenishment when used, the inventory level of consignment material remains low.

Conclusion

PT SEMB has many material numbers used for the production process. This material comes from various suppliers. The high material number certainly impacts on the inventory level. PT SEMB uses a consignment system for several types of material, which is expected to reduce inventory levels and also ensure that goods are always available for use in the production process. The actual state of inventory level for material consignment has increased due to several things. Problems that have been resolved are there are no adjustments to the min-max limit with manpower and production. The solution is to provide tools

(Microsoft Excel) so that when changing the limit min-max can know the impact directly. Other resolved problems are a dynamic rack with a high min-max limit. The solution is to make a change for daily check consignment material, from leader Lot 15 to leader warehouse Sensors plant.

References

1. Montgomery, Douglas C. *Statistical Quality Control*. Jefferson: John Wiley & Sons, Inc., 2009.
2. Rothwell, William J, Carolyn K Hohne and Stephen B King. *Human Performance Improvement*. Oxford: Routledge, 2013.
3. Barsalou, Matthew A. *Root Cause Analysis: A Step-By-Step Guide to Using the Right Tool at the Right Time*. Florida: CRC Press, Taylor & Francis Group, 2014.