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Reduce Inventory Cost with Rop Evaluation: A Case Study at Dies Making Company

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Abstract- Global economy in this era is depend on how company doing efficiency cost and operation. Manufacturing with lean and efficient process will be a key factor of how product will be success in the market. Low cost operation will be effected to lowest price of product. So that company will produce more profit. In manufacturing industry, seven wastes are something to be reduced. The purpose of improvement is how to eliminate one or more from seven wastes. In this paper, one of seven wastes to be study is inventory in dies molding maker company. Inventory in die maker is fluctuated depending on production loading. When delivery of tool making dies is so long, it is have implication that inventory value is increasing. Re-Order Point (ROP) to be evaluated so that inventory can be reduced. Result of research shows that inventory value can be reduced until 60 ~ 65 %. This means ROP calculation can help company to reduce inventory.

Keywords- *Manufacturing, Seven Wastes, Inventory, ROP*

I. INTRODUCTION

In automotive industry, dies have an important function to support production. With the use of dies product can be produce with large batch, same dimension and same shape. Die / mold use in high pressure injection casting, low pressure casting. Same example of dies product is motor engine, piston, and crankcase. Press Dies example body of car, fuel tank and other high tensile part of automotive.

In manufacturing dies (making dies), start with raw material tool steel H13 / SKD 61. First process is milling, heat treatment, EDM (Electric Discharge Machine), polishing, assay and injection. Machining proses done by cutting process of raw material with CNC milling machine. It is CAM program to be pattern of shape that must create with this machine. This cutting process needs very powerful tools with more hard than the steel. The price of cutting tool is very expensive and has a long time to delivery, because the tools must be imported from other country. Some tools delivered from Japan, Taiwan, and Europe.

Supply Chain Inventory Management (SCIM) offers a dynamic and effective way of monitoring company's day-to-day inventories and allowing an organization to take immediate action to address any potential inventory problems. With SCIM, the company can gain an in-depth, real-time visibility into key supplier, inventory, and procurement indicators. The company will be able to better manage inventory levels and costs, and better meet fulfillment expectations, thus improving customer service.

Other benefits include: Eliminates manual inventory management processes and improve vendor satisfaction with a seamless procure-to-pay process; Slashes inventory costs by tightening control of stock levels while increasing operational efficiencies; and gains control over inventory replenishment and ensures that inventories have enough on-hand to fill anticipated orders, while keeping excess stock to a minimum. (Siali et al, 2013)

II. LEAN MANUFACTURING

In manufacturing operation, seven wastes to be avoided and reduced are: 1. Overproduction (doing production over than request), 2. Waiting (time to wait next process), 3.Transport (moving from line production to other line), 4. Inappropriate processing (unnecessary process), 5. Unnecessary inventory (stock raw material, finish good), 6. Unnecessary motion , 7. Defects (rejection). Taichi Ohno explains that Toyota manufacturing strategy is how to eliminate waste. So that company will be lean. And one of strategy is Just In Time, zero inventory. Supplier Toyota will send the product when there is request from Toyota. They call the request signal as Kanban. When inventory is so big value, it is potential to defect, rust, and missing. (Liker, 2004)

The impact of JIT on both competitive and financial performances of the firm. In company the relationship between JIT and other operational activity was to be special attention. These operational included total quality management, total preventive maintenance, human resource management, supply chain management, information systems, technology and others activity. Nissan and Toyota manufacturing have high productivity which stress and focus on lean production. Similar is the philosophy of General Motors and such like other automobiles companies. In Japan emphasis is on developing men and technology to utilize available resources; quality is high but cost is commensurate. (Singh and Garg, 2011)

JIT is define as a philosophy which coordinate all aspects of the operation manufacturing processes start from incoming material and raw material until actual manufacturing to deliveries. The operation of a just-in-time (JIT) production control system mainly depends on the performance and availability of the resources of manufacturing. It also implemented a system called as Pull System, where the products are produced and delivered according to the orders from the customer and the products produced are pulled out of assembly manufacturing process. The final assembly line then pulls or withdraws parts in the necessary quantity at the necessary time. The whole process is coordinated through the use of Kanban .The benefit of this technique is to reduce production costs through increased efficiency within the production process as it reduces waste of materials, time and effort, than the JIT system of production control has high ability to compete with the others in the same business. (Rajesh et al, 2013)

III. INVENTORY

Inventory or stock is very important to manage materials for manufacturing industry. The inventory turnover ratio (ITR) is a barometer of performance materials management. This mean that how many inventory using to production line. In the generally inventory defined a physical stock of goods kept in line production or warehouse to meet the anticipated demand, and also work in process material at production floor. When inventory not manage with well, production line can be stopped. (Vrat, 2014)

According Assauri (2004), inventory starts from raw material, semi finish good, until finish good. Inventory is used to: (1) Eliminate risk of late delivery to customer. (2) Eliminate risk raw material rejection because of failure (3) Saving finish good if there is some fluctuation demand and price (4) Operation stability process (5) Optimal machine cycle time because no pending material (6) Giving best service to customer when unpredictable demand happen (7) Production on the schedule condition.

Inventory management is link to supply chain management. A supply chain is defined as a network of facilities and distribution options between start and end points that include the functions of procurement of raw materials. This relationship is very important to excellent manufacturing process (Singh and Singh, 2013)

Vendor Managed Inventory (VMI) is one of conclusion to managed inventory so that can effectively support production line. In a VMI relationship, the supplier holds inventory on site or near the customer, allowing the customer's instant access to the inventory. When customer call for need, vendor with fast delivered the product. This VMI system allows the customer to pull inventory as needed in production line and only pay for that which is consumed. Company not saving the inventory in production line. This mean productivity and efficiency increased. (Cynthia and Amuhaya, 2015)

According to Lambert (2006), supplier relationship management is the process that defines how a company interacts with its suppliers. Just as a company needs to develop relationships with its customers, it also needs to faster relationships with its suppliers, as in the case of customer relationship management. (Mukopi, 2015)

According to Fangruo Chen, the ROP quantity reflects the level of inventory that triggers the placement of an order for additional units. Whereas, the quantity associated with safety stock protects the company from stock outs or backorders. ROP = D x LT (Stevenson, 2002). Where: d = Demand rate (unit per day or week), LT = lead time in days or weeks. Demand and lead time must have the same time unit.

IV. CASE STUDY

According Robson (2002) case study is a strategy for doing research which involves an empirical investigation of contemporary phenomenon or problem with its real life using multi sources of evidence and data. The researcher must know need of sources of data and evidence. All data and evidence some use to the case study researcher. Data and evidence will evaluate and to be processed according the purpose of study. This case study can show about the problem and conclusion to solve the problem. This not mean must talk to all different people and company, but need to looking for the evidence and data: what people say about theme, what they are doing, what they are produce, what documents is using to the process. Case study helps research to share their development to other people. (Kumar, 2003)

Research conducted at XYZ factory of dies. This factory made dies to support automotive industry. Die casting dies/mold especially engine aluminum is manufacturing with CNC Milling machine. Figure 1 shows example of die/mold. Milling process is most important process, because profile of dies is made by milling process. Raw material steel (H13/SK61) removed by cutting tools in CNC machine at Figure 2. So many cutting tools needed in the milling process. The cost is expensive, because it must have high toughness to remove steel material. Many brand using for this process can be seen at Figure 3. In this paper, researcher will recalculate how many quantity of ROP, so that achieve minimum inventory. Production begins with raw material removal by milling machine, EDM, and assay dies. Milling process need a lot of cutting tools.

Figure 1. Example of die/mold

Figure 2. Raw material steel (H13/SK61) removed by cutting tools in CNC machine

Figure 3. cutting tools

This is view of sampling data of cutting tools before improvement, it is show that the average using is under the inventory value. The value inventory (maximum inventory) 18 pcs / month. But the average using not more than 10 pcs/ month can be seen at Figure 4.

This condition mean inventory not optimal, so many waste in inventory. There is 12 pcs to be waste / not used. With this condition, ROP and max value must be evaluated.

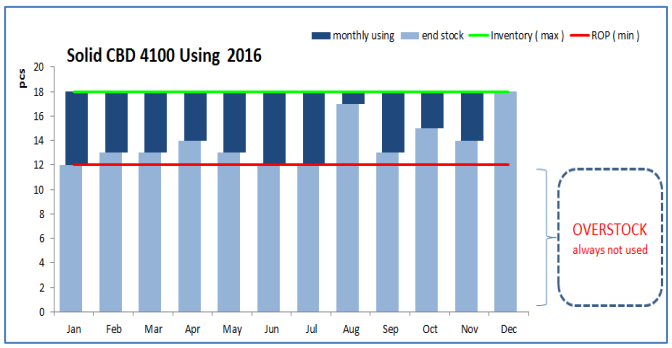

Figure 4. Inventory data 2016

According new calculation of ROP, it is seem that value can be decreased. So that cost inventory can be reduced. ROP at 3 pcs/month. And after calculation, maximum inventory at 6 pcs. When tools need more than 6, system will buy until maximum value. So that the purchase process can by cycle for the fluctuation and shown at Figure 5. This condition shows only 2 pcs to be optimal stock. When using more than 3 pcs, system will regenerate order 2 times, and stock still optimal condition

The result shown with graphic below:

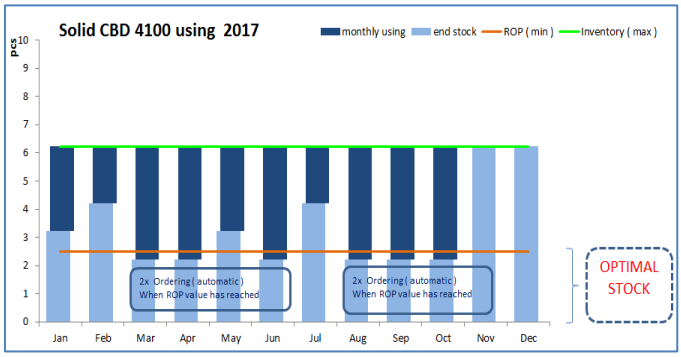

Figure 5. Calculation data of first tool

V. CONCLUSION

With new calculation, ROP point reduces from 12 pcs/month to 2 pcs (for first tool) and 3 pcs (for second tool). And after calculation, maximum quantity reduces from 18 pcs/ month to be 5 pcs (for first tool) and 6 pcs (for second tool). This mean that can be reduce until 62% value (for fist tool) and 65% (for second tool). The inventory value can be shown with Figure 6.

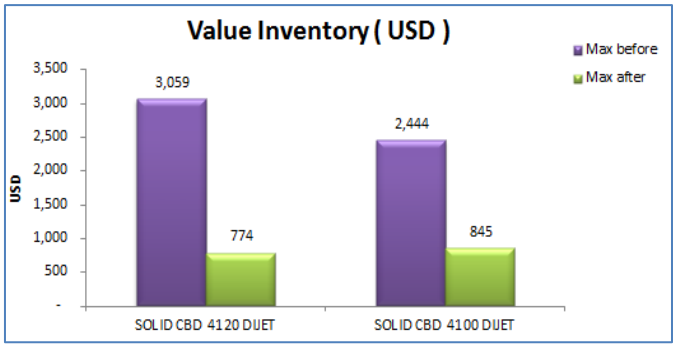

Figure 6. Value Inventory before and after evaluation

Cost inventory of tool cutting for milling proses can be reduce with evaluation of Re-Order Point. First tool Solid CBD 4120 DIJET reduce from USD 3.059 to be USD 744. And for cutting tool type SOLID CBD 4100 DIJET reduce from USD 2.444 to be USD 845. The conclusion is new calculation of ROP can reduce inventory value until more than 50% in XYZ factory. This mean that cost of production to be more efficient and seven wastes can be reduced.

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