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Improve Productivity by Reduce Stock Amount Spare Part through Hybrid Method ABC Classification & Pull System (Just in Time) in Electronics Manufacturing Industry

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Abstract

To achieve this required a smooth production process supported by good spare part inventory management. The purpose of this study is to determine the effect of collaboration Hybrid Methods ABC Classification and pull system to reduce the cost of inventory spare parts in the electronics manufacturing industry. This article indicates that the positive effect of the combination of both methods, the inventory cost can be reduced by 5%; eventually, productivity can be increased due to waste inventory can be minimized.

Keywords – *ABC Classification, Inventory Management, Pull System, Productivity, Spare Part*

I. INTRODUCTION

Global economic growth rapidly increases, which are competitive business competition is so tight [1]. The company must be having a competitive advantage in order to survive and gain market position [2]. Inventory management affects all business functions, whereas inventory has a conflict of interest between business functions. The finance team's goal is a low level of inventory, while production and marketing need a high level of inventory for a smooth production process [3] to meet on-time delivery/ customer satisfaction.

Case studies in this research are private companies with global scales, whose main activity is to assemble and sell electronic equipment products as the current inventory store is not optimal because the number of parts is too much that the company has to prepare. Another problem, the budget for regular spending every month is limited. There are found many spare parts that inventory level stocks are below the minimum; for example, when the machine breakdown, the production stops and should wait for the part replacement [4]. On the contrary, much of the inventory is not used for an extended period, impact the high storage cost includes maintenance costs, and the damage cost/waste inventory [5]. The fundamental contribution of the paper is the analysis of the combined effects of ABC Classification and Just In Time/pull system in order to reduce the cost of inventory filtered at the company[6]. As the current condition, the company adjusts the inventory stock to the optimal stock set in system inventory [7]. Not all of the list of spare parts can be follow up 100% for the purchase process, which depends on the budget limitation by management decision based on profit analysis.

II. INVENTORY MANAGEMENT

Inventory definition is a stock of goods/ goods used to support the smooth production process or to meet customer demand, both internal customers (the related department within the company), as well as external customers [8]. Inventory management is an activity related to; inventory planning, Implementation, and supervision to manage inventory at the desired level turnover [9]. In manufacturing products, inventory control is emphasized on material controls [10]. In service products, service controls did not require inventory because, in the services sector, use often coincides with service.

Inventory management makes it easy for organizations to align the spending process [11]. Inventory management is the determination of the amount and type of stored goods to be adequately managed that the production of the company is not disturbed, and inventory should be kept efficient that the cost of the supply of investment part can be at least minimum as management order.

Inventory management based on Lean Manufacturing can be classified into two systems, push system and pull system; push system is an inventory activity to ensure continuity of expenditure from a risk deficit, need the availability of inventory to facilitate the production process [12]. The pull of the system is contrary to the repulsion system, where the system requires minimum inventory because it is seen as an operating expense charge that must be eliminated [13]. Lean manufacturing, first introduces by Taiichi Ono with the Toyota Production System (TPS) concept, which is the basic principle of TPS, is reducing "Muda"/waste, "Mura"/un-balance, and "Muri"/ overload [14]. TPS defined 7 waste that it was implemented in the company business system, which are: 1. Over Transportation/Long distance 2. Excess inventory: not effective inventory management. 3. Unnecessary Movement 4. Waiting for the previous process. 5. Over-processing: Using multiple steps to produce 1 product than expected. 6. Overproduction: Producing items more than the order required. 7. Defect: assembly defective product [15].

Just In Time (JIT) is a production system whose

main objective is to meet customer needs at the right time per customer satisfaction [16]. The objective is to avoid overproduction, excess inventory, and wasting in waiting time [17]. Many advantages of applying the JIT production system are: 1. low stock levels, thus reducing storage and related costs such as rental and insurance fees. 2. The raw material is obtained only when needed only, so it only requires low working capital. 3. With a low stock level, the possibility of waste due to expired and damaged or obsolete products will be reduced. 4. Avoid the accumulation of unsold products due to sudden changes in demand [18].

ABC analysis is a concept to control a small number of goods with high investment value[19]. The ABC analysis is based on a concept known as Pareto Law, which states that a group always has the smallest percentage (20%) valued or has the most significant impact (80%). In the 1940s, Ford Dickie of General Electric developed the concept of Pareto to create the ABC concept in the class of inventory [20]. Implementation ABC analysis will be beneficial, especially in the classification of parts with several very many, so we will be more focused on controlling the part with a large enough value [21].

III. METHODOLOGY

The collection of investigation data through technical documentation studies, and interviews, directly on the object of investigation is in the warehouse company. The amount of inventory contained in the warehouse is known as follows; 1. Inventory is done by guessing directly physically. 2. Holds shelves for each type of mutation in and out using computer help and barcode scanner—the required data; 1. The number of spaces is not. Partition 2434 section no. 2. total stock amount USD 979,497 (inventory data, May 2017).

Step by step transformation Push system inventory → Pull system inventory with the collaboration of hybrid methods ABC Classification based on dual system channel, which is for pull system is proceeding based on demand. The transformation can be described as follows:

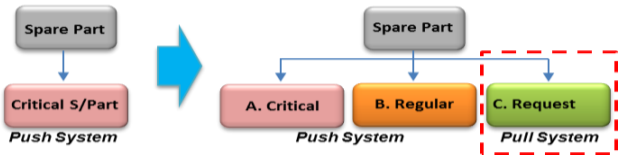

Fig.1:Implementation ABC classification pull system"

The steps of Implementation of hybrid method of ABC classification in a warehouse of company spare part; 1.define all part no Spare part in WH inventory. 2. Classification of Spare parts into 3 categories (A, B, C); to determine the value of an investment in the ABC analysis based on the investment, we calculate the optimal stock of each type of inventory multiplied by the cost unit [22].

A Category is a critical spare part, a group with a high inventory and high risk if there is no stock and downtime happened, possibly indent spare part [13]. Spare part type is only 9% of Spare part inventory but covers 75% of total financial value. For its inventory system to still adopt a **push system** because the price or amount of spare part is high enough, it needs approval from top management for the procurement process.

B Category is a regular spare part, a group with a moderate volume of inventory. This type of goods is 30% of Spare part inventory and covers 18% of the total annual financial value. Its inventory system still adopted a **push system** because of the difficulty level to get the spare part and regularly used by stakeholders [23].

C Category is the Request spare part, a group with a low volume of financial value, which has only about 7% of the total annual financial value but covers about 61% of the total spare part inventory. For its inventory system, the transformation of the **push system → pull system** [19].

IV. ANALYSIS & RESULT

The data used to calculate ABC analysis is based on download data of Master Spare part May of 2017 GMES system. After knowing the list of Spare parts of the data, then we can conduct an ABC analysis based on the investment of each type of spare part.

Table 1. Implementation ABC Classification

Row Labels	Sum of Present Stock	Sum of Volume Amount	% of Value	% of Qty
A Class	1,676	733,175	75%	9%
B Class	5,527	173,445	18%	30%
C Class	11,109	72,878	7%	61%
Grand Total	18,312	979,497	100%	100%

Inventory Data of May 2017.
Data Source: Analysis Data

Update a standard operating procedure (SOP) in the process of order and purchasing spare part;

Table 2. Management Policy after Implementation of ABC method

S/Part Classification	Stock Management	Planning Order	Proposal Order	Remark
Critical	Y	No Need	No Need	Push System
Regular	Y	Y	No Need	Push System
Just in Time	No Need	Y	Y	Pull System

Table 3.Pull systems at C category

Row Labels	Sum of Present Stock	Sum of Volume Amount	% of Value	% of Qty
A Class	1,591	718,221	77%	11%
B Class	5,019	166,679	18%	34%
C Class	8,245	50,945	5%	56%
Grand Total	14,855	935,844	100%	100%

Source: GMES System (13 July 2017)

Designing flowchart of order procedure and spare part purchase;

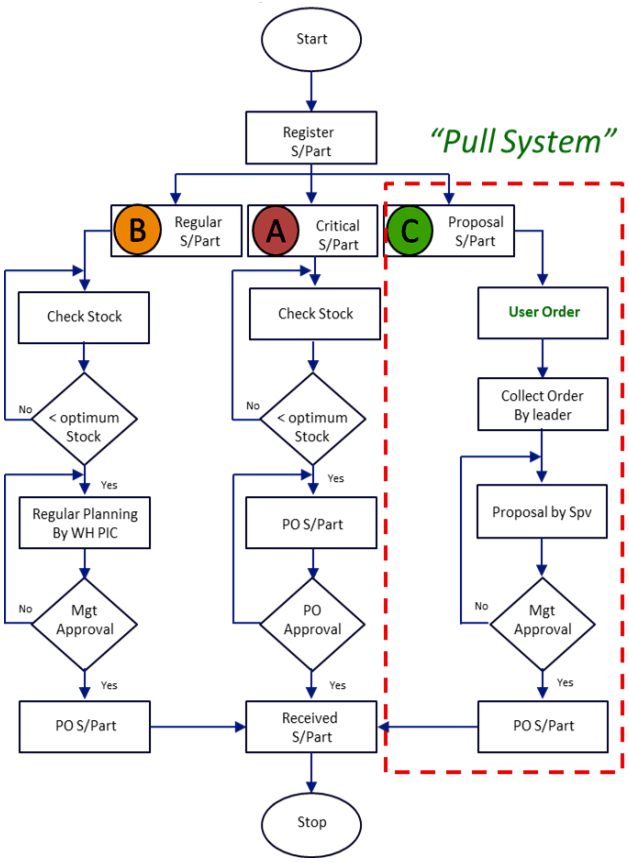

Fig.2: Flow chart ordering spare part procedure

The flowchart can be explained as follows;

A. Category: Critical Spare Part

The purchase is made based on stock status; if the stock is below optimum stock level, the warehouse manager will issue the purchase order and proceed approval process to the top management level (due to high category A amount); after approval has been obtained, then PO is sent to the supplier. Then the spare part is received from the supplier.

B. Category: Regular Spare Part

The purchase is made based on stock status; if the stock is below optimum stock level, the warehouse manager will make a spare part purchase plan, followed by the approval process until the purchase manager); after approval has been obtained, the PO can be issued and sent to the supplier. Then the spare part is received from the supplier.

C. Category: Request Spare part (Pull system)

Purchases are made on request from the user; if there is no demand, the warehouse manager does not need to prepare the spare part. The process flow is as follows; the user informs the list order spare part to the supervisor, then the supervisor will collect data from each member, followed by the approval process until the purchase manager after approval has been obtained before the PO can be issued and sent to the supplier. Then the spare part is received from the supplier and directly informed to the user in question.

Actual results after Implementation of the pull system in category C

The impact Implementation of the pull system in the C category spare parts, management does not need to provide stock anymore because of the procurement process of the spare part just in time according to an order from the user. Thus the amount of stock in the spare part category will reduce, and eventually, it will become zero stock.

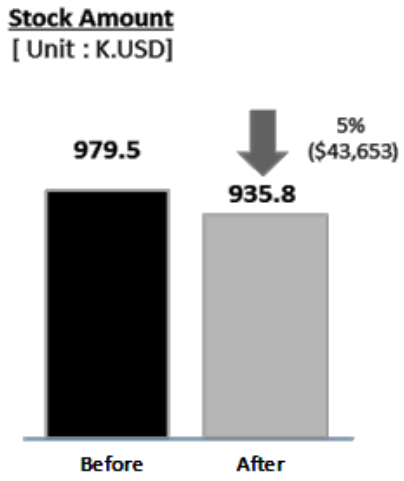

Fig.3: Impact Hybrid ABC dan Pull system implementation

Based on the data above, we can know the impact application of the Hybrid ABC and pull system can reduce the inventory cost of $ 43,653 or about 5% Cost Improvement.

V. CONCLUSION

Inventory management is a significant problem; one of the managerial functions in the operational warehouse spare part company is inventory control because the physical inventory policy will provide an impact on investment on the one hand and customer satisfaction levels on the other. Based on the results of this research, Implementation of the pull system inventory method with the collaboration of method ABC Classification in the spare part warehouse, which in the first two months of monitoring managed to reduce the amount inventory by 5% ($ 43,653). Thus we can reduce the garbage inventory, so the productivity of the company can be improved.

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