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LEAN INVENTORY IMPROVEMENT FOR CARGO WAREHOUSE AT JOHOR PORT BERHAD

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Abstract

Lean manufacturing is almost involved in all industry around the world. It could be the achieving lean involves changes and continuous improvement. It is a concept of scientific and objective techniques that utilizes fewer inputs in order to create the same outputs than those created by traditional mass production system. In order to make changes and improvement, one must understand and recognize that the current state of the operation is not where one wants to be. The purpose of this project is to implement lean principle in cargo industry. For the research, the researcher has been used Value Stream Mapping (VSM), Kaizen and Kanban. Besides that, the researcher also has been used a few quality tools to find the cause and solution before used the lean tools. The objective is to identify the process of inventory management at Johor Port Container Freight Station. Then, to determine the value added and non-value-added activity at Johor Port Container Freight Station. Lastly, to improve inventory management at Johor Port Container Freight Terminal using Value Stream Mapping method. A new proposes layout for the company also had been suggested considering all the products involves. VSM was a magical tool that possibly wills reveals of all the data, problem, process, operation. This tool was developing a Lean thinking for the management for continuous improvement in time by time.

Keywords: Value Stream Mapping; Kaizen; Kanban; Kanban; Waste; Inventory Management

1.0 INTRODUCTION

Nowadays, cargo industry becoming a more competitive market and companies to increase their efficiency. In order to reduce cost and remain competitive with other manufacturers globally, companies use variety of different method. One of the main methods is lean manufacturing. The main principle of lean manufacturing is to reduce waste in operation such as delay, defects, waste in material and long lead times. But, there still many companies still not familiar with lean manufacturing concept. Stripped to its roots, focused on how to decrease waste while increasing value and efficiency to a process of continual improvement.

Johor Port Berhad is well known of multi-purpose port in Malaysia that caters to practically all types of cargo. "How to increase the efficiency in the inventory management line?". This is the question that needs to solve from this project. Most of the process in inventory management is manual work. The machine is semi- automated which is required manpower to handle and operate it. The purpose of this paper is the application and adaptation of VSM for cargo warehouse.

The significance of this research is:

i. For the company, the research may help the company to know the effective inventory management in order to avoid waste in the inventory.
ii. For the researcher, this research will give an opportunity for the research to expand the ability of the research in applying the knowledge on real situation and create inventory checklist that can be used in industry.
iii. For the institution, the research can be valuable reference for another researcher to make or use research on the efficient inventory in the future.

2.0 LITERATURE REVIEW

INVENTORY

As mentioned by Emmanuel (2016), terms of inventories include as stocks of good, although the accounting for the flow of the goods is usually considered important. In order to store the investment of stocks and equipment to reach at the optimum level, a proper management of inventory must be in the right and proper place. As in any manufacturing industry, inventory is the supply of raw materials, working in progress and finished goods that are conserved in order to keep that organization on the run and effective management for the inventories is important for the survival growth of an industry (S Angle, 2014). On the other hand, Gupta et al., (2012) results in excessive hoarding materials at each production or workstation point. Inventory is a dangerous thing, because there are many resources for rework or scrap.

INVENTORY MANAGEMENT

Inventory management is vital in controlling the materials and goods to be held (or stored) for subsequent use in the case of production or later exchange of services (Naliaka & Namusonge, 2015). Jonsson (2019) mentioned that inventory management is distinguished by the need to forecast demand in advance of customer orders as the lead time for inventory replenishment is usually longer than the lead time expected by customers. This means replenishment of stocks must be based on estimates.The rate of inventory in a system has a significant impact on its efficiency as it measures the price of under-stockage and overstocking and the resulting shortage and/or cost of keeping. Systems of stock or inventory can be divided into stochastic and deterministic systems (Inegbedion & Eze, 2019).

Type of Inventory

i. Raw Materials

Raw materials are the raw materials that the company uses in the manufacturing process to purchase them from manufacturers to turn and assemble them into the final product. Finished goods or materials are part of raw materials.

ii. Work-in-Progress (WIP)

Semi-finished goods are called work-in-progress. Work-in-progress stock is those part where part of the components is made before going into something else. The extent of the locked-up inventory as work in progress is the better the less. This is reasonable as the continuing inventory is of no use until it becomes the final product. It can be sold at a profit, but it cannot be sold to produce any profits for the core businessof the company.

iii. Finished Goods

Finished goods are indeed the final items produced after the raw materials and semi-finished goods have been added to the production processes. When the manufacturing process is done on the raw materials, it will call the finals product andthen the product will be sold in the market.

Waste

As stated by Minh et al. (2018), waste is unusable or unwanted substance or material. Waste is something that has little meaning or adds value. Waste is something that the consumer does not want to pay for. As part of Toyota Production System, there are seven forms of waste shown:

i. Over-Production

- Over-production happens thanks to increase rate of production than client desires.
- Over-production increase inventory house in addition as expenses thanks to over handlingof finished product.
- The issue of this waste is poor production coming up with, poor programming andpoor machine run time estimation.

ii. Inventory

- Inventory cost money in terms of its storageand maintenance.
- Inventory waste must be finished from on-hold finished product, which must be shipped to the customer, because of the availability of raw materials or products.
- Excess inventory tends to hide problems on the plant floor that need to be identified and resolved to improve the project's efficiency.
- The issue of inventory is avertible inventory engineered between completely different method, improper flow of fabric and incapable of predicting market demand.

iii. Waiting

- The loss of waiting happens when goods are not moved or stored.
- Waiting waste occurs due to one workstation's waiting time for another workstation to complete the job.
- This waste typically happens wherever synchronization between two workstations is poor and eventually results into man or machines idle or waste of your time.
- With correct equalization and synchronization of method in plant, minimizing overrun and transportation waste and standardization of method facilitate to scale back this waste.

iv. Motion

- Waste of motion is any movement of man that does not add value to the product or service such as walking, bending, lifting andetcetera.
- Disorganization of tools, non-standardized processes directions, poor layout plant and poor geographical point engineering are the issue that result in this waste.

v. Transportation
- Transport waste is material movement that is not directly associated with value adding process.
- Transportation happens because of moving of product with the plant between completely different producing processes.
- This led to further expenses in commutation product, decrease in potency of producing, non-value-added labor sweat and generally will cause harm.
- Inadequate plant layout, poor product handling over ways, poor managed area in plant and unbalanced material flow cause this kind of waste.

vi. Defect
- Waste of correction which is include additional work performed (rework).
- Defect happens due to production of product not in keeping with the client demand or needed specification.
- The factors lead of the waste are ambivalent processes and specification, lack of skills employees and operational errors.
- To decrease the defects needed specification and precise production technique ought to be used similarly a top-quality management or review may well be introduced within the method however it might increase the ultimate product price.

vii. Over Processing
- Putting more into the product than is valued by the customer.
- Over processing occur because of uncontrolled complication within the processes, engaged on the merchandise than actual required with excess tight tolerance.
- Finally, it might increase time needed in method yet as value related to it and this further work thought-about as waste.
- The issue result in this waste are non-standardization method directions and ambiguous concerning the acceptance of level of quality.

Gemba

Gemba is a 'Japanesse' word that refers to the actual place and means about same thing as genchi genbutsu (*Liker,* 2004). Sua et al., (2012) declared that "gemba" suggests that the place wherever an organization adds worth. That is why applying the Gemba approach needs a basic plan of the Japanese management system and the Kaizen or continuous improvement conception. it is as a result of kaizen activities are enforced through the identification and elimination of waste at each moment. John Shook (2011) mention that the possibility of Gemba is originating from Toyota chairman Fujio Cho which comprise of three stages that are currently getting to be noticeable common fundamental principle of lean. These three stages are "Go See", "Ask Why" and "Show Respect".

Value Stream Mapping

As indicated by Lacerda et al., (2016), VSM is a tools that allows the visualisation and understanding of the flow of material and data through the value chain. It also used to give a worldwide vision of the activities involved within the production process, so it allows the identification of wastes causes. When applying VSM, output that can be expected are lower cost production, faster response time to the customer and higher quality of product. A value stream may be a collection of all value-added actions yet as non-value added that are needed to bring a product or a brunch of product that use the identical resources through the main flow. Values stream mapping is an enterprise improvement tool to assists in visualizing the whole production process, representing each material and information flow (Parihar et al., 2012). VSM is a process of mapping materials and information flows that required to coordinate the activities that performed by manufacturers, suppliers and distributor to deliver products to customers (Irani & Zhou, 1996).

3.0 METHODOLOGY

Data Analysis

Researchers must distinguish between value-added and non-value-added activities and understand the issues that may arise using the methods of Value Stream Mapping (VSM). The following is the transition to the mapping of the value stream:

i. Define and Pick Product Family

Firstly, researcher need to decide what it is exactly that wish to map using Value Stream Mapping. Focus on the family is a key to successfully implementing the Value Stream Mapping (VSM). Basically, an organization manufactures various type of product with using various type of process.

Then, products and line that having critical issues such as quality or wastes will be selected. After that, by identifying product families, it is needed to prioritize them according to their size, contribution of profit, technology and resources requirements. Following these steps, the selected production line will be focussed to implement lean by using VSM.

ii. Define Current State Mapping

The next steps are to construct a ' current state

mapping ' after choosing the method which wants to change. Current state mapping is a graphical representation of how processes are operating. This provides data and material flows as a commodity goes through the production processes. The current state map shows the movement of products and data from the manufacturer to the seller, from the raw material to the customer's finished product.

After selected process is decided, list information will be made to collect all information at each process steps. List of information will be put in processbox. Cycle time, changeover time, number of operators, number of product variants and waiting time are some of the data needs to be collected.

iii. Develop Future State Mapping

After the process of making the current state mapping has been done, it is time to develop and create future state mapping. Future state mapping is more difficult task on creating it to become ideals state map. Ideal future state mapping is the goal of improvement process and will provide with an objective to work forward. In this stage, researcher will define what to improve and plan forimprovement process.

Along the process to create future state mapping, it is not only done by single trying. Researcher needto try a d try again to make changes and improvement action to get the best future state mapping.

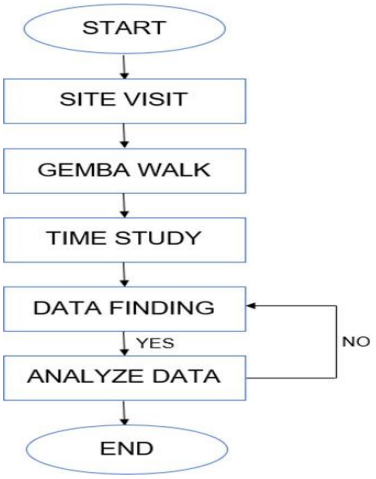
At the end of the project, this future state mapping will become the new current state mapping and then researcher can plan to next series of changes. It will keep on continuous improvement on it.

iv. Proposed Implementation Plan

To make an action, there is need an implementation, tools and methods of lean manufacturing will be applying. Implementation plan is the process where improvement action will be doing, and the results will be analysed to see if it becomes successful or not.

At this stage, all the implement plan that have been done during future state mapping stage, it will be monitor all the progress after the improvement act on the process.

4.0 RESULTS AND DISCUSSION



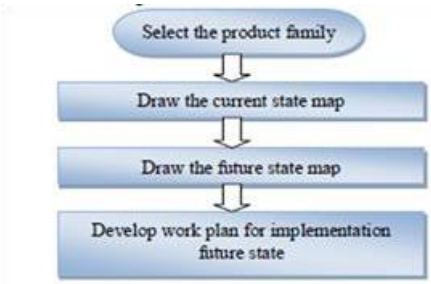


Table 4.1 Cargo Warehouse Process

PROCESS	CODE (VSM)	PROCESS NAME	DESCRIPTION
1	Requisition	Requisition to stuff container for export	Operation Assistant will receive cargo by conventional lorry. Receive Good Receipt from lorry driver, Container Movement Request to pick up container and Container Release Order from forwarding agent. Forwarding Agent will create container Export Pre-Advice.
2	Stuffing Plan	Receive info and plan stuffing activities	Operation Assistant will endorse and register the Container Movement Request and allocate a serial number. Record in excel file in Monthly Container Inventory. Operation Assistant will issue Work Order form to contractor. Operation Assistant will contact On Dock or JPCS to book empty container.
3	Receive Container	Receive empty container	Operation Assistant will receive information of empty container from housekeeping prime mover or haulier. Operation Assistant will record the arrival of container, container number, time and date for billing purpose. Tally Clerk will count and check container number with the submitted Container Movement Request and the information with Forwarding Agent.
4	Stuffing	Stuffing activities	Tally Clerk will ensure the condition of container before commencing stuffing activities. Stuffing is performed by Contractor according to Tally Clerk instruction.
5	Counting	Counting	Tally Clerk will count the number of products is correct based on the packing list. Tally Clerk will seal the container and submit the container packing list to Operation Assistant to confirm that the work is completed.
6	Container Move	Movement to Container Yard	Operation Assistant will instruct housekeeping to pick up container. Operation Assistant will ensure that the container has been released.

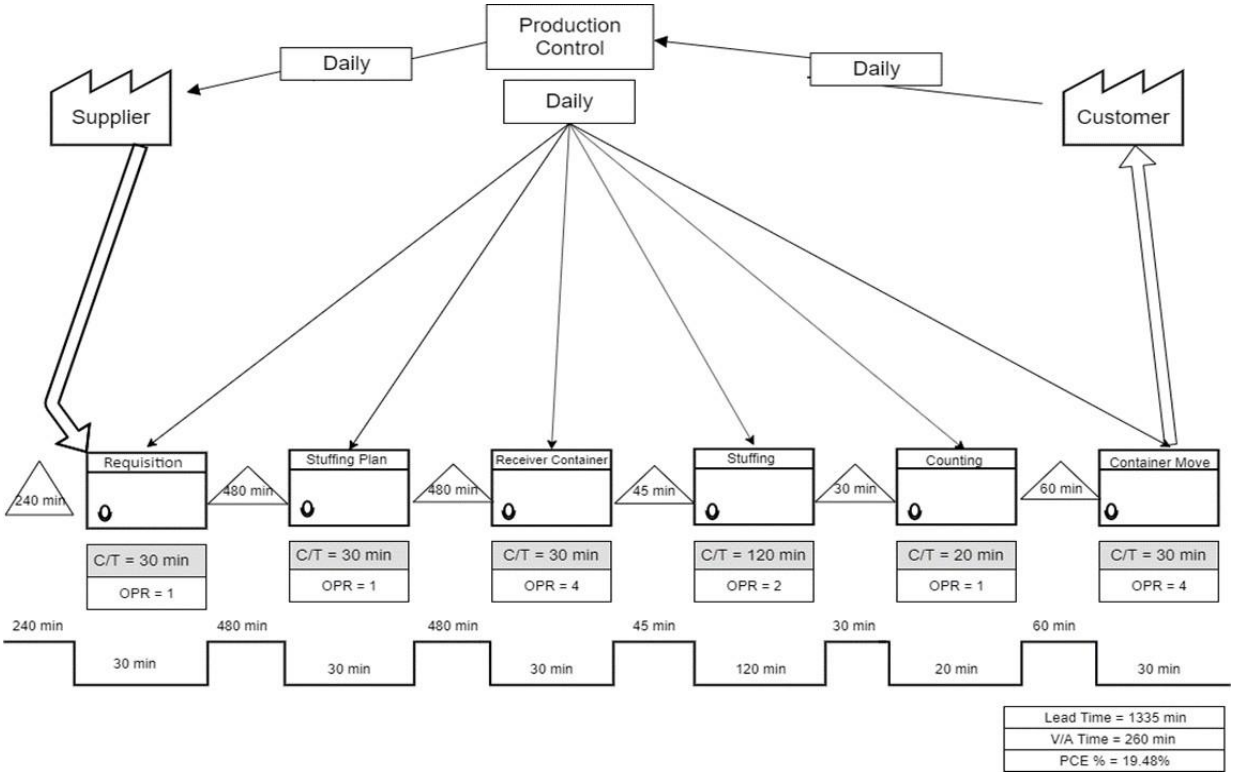


Figure 4.1: VSM Current State

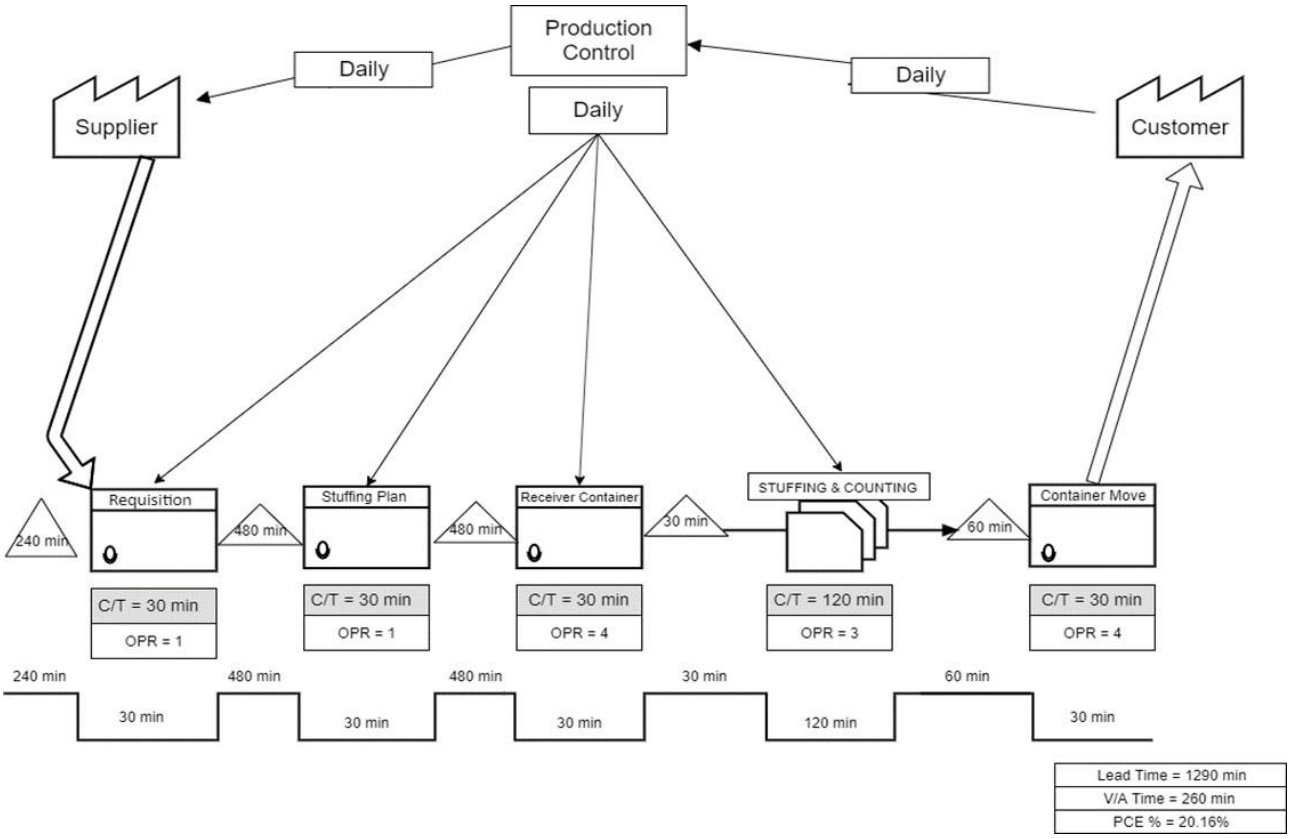


Figure 4.2: VSM Future State

Table 4.2: Comparison between Value Added activity and Non-Value-Added Activity

Value Added Activity	Non-Value-Added Activity
Requisition to stuff container for export	Waiting time for eachprocess
Receive empty container	Good receipt form
Stuffing activities	Packing list form
Counting activity	Export pre advise
Movement to Container Yard	Manpower motion

Inventory Management Improvement

i. Combine the Process

The proposed improvement is combining the counting process and stuffing process. The tally clerk should count the product first then manpower starts to arrange the product in the container. This improvement will help to eliminate lead time. By combining the process, tally clerk and operators will work in the same time.

ii. Addition of Forklift

The proposed improvement is provided new forklift to transfer the product. The forklift that have been proposed help to reduce lead time at the process. By using two forklifts, the operator can work faster and safer to the operator instead of lifting the product into the container. The result from this is operator will have better material handling to transferthe product into the container.

iii. Proposed Process Line Balancing

In order to reducing waiting time and lead time, the researcher comes out with some solution. The proposed solution is forklift need to be adding one more forklift. It means, in stuffing process, two forklifts are needed in reducing waiting time and lead time.

Table 4.3: PCE Comparison

Description	Before	After
Machine (units)	1	2
Process Lead Time (minutes)	75	30
Total PLT (days)	1335	1290
PCE %	19.47%	20.16%

5.0 CONCLUSION

As conclusion, the researcher brings out the results concluding from the finding and data obtained from cargo warehouse process. The purpose of the study is to identify the process of export cargo process. There are six process for export cargo occur in cargo warehouse. The researcher was able to identify value added activities which are requisition to stuff container for export, receive empty container, stuffing activities, counting activity and movement to container yard. While non-value- added activities are waiting time for each process, good receipt form, packing list form, export pre advise and manpower motion. By recognizing the process, researcher able to map VSM current state and future state for improvement.

This paper also proposes the recommendation based on the finding for management and employees. The recommendation is highlight for future research also has been stated in this research. From the research perspective, because of lack in term of implementation of solution, researcher not giving accurate result for improvement. Besides, researcher have limited place and service to do the project. It is recommended for the research do future study on implementation of proposes improvement.

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