APPLICATION OF VALUE STREAM MAPPING IN THE MANUFACTURING INDUSTRY

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This report submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Manufacturing Management) (Hons.)

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This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Manufacturing Management) (Hons.). The member of the supervisory is as follow:

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ABSTRAK

‘Value Stream Mapping’ (VSM) adalah satu gambaran tentang aliran maklumat dan bahan yang digunakan untuk pengeluaran sesuatu produk. Selain itu, VSM dapat mengenalpasti tujuh jenis pembaziran yang berlaku dalam sesuatu proses pengeluaran. Microsoft Office Visio 2007 digunakan untuk proses penghasilan ‘Current State Mapping’ Dan ‘Future State Mapping’. Projek ini hanya fokus pada satu sistem pengeluaran di sebuah kilang industri pembuatan yang terpilih. Selepas daripada proses pengumpulan data, ‘Current State Mapping’ akan disediakan. Selepas itu, data daripada ‘current state mapping akan dianalisis dan ‘Future State Mapping’ disediakan. Antara pembaziran yang dikenal pasti adalah masa pertukaran mata alat yang tinggi, pergerakan yang berlebihan, masa menunggu yang lama untuk mencapai ‘Takt Time’, dan tiada aturan cara kerja yang spesifik untuk operator. Selain dari itu juga, pelan penambahbaikkan akan dicadangkan untuk memastikan projek ini berjaya dan dapat memberi manfaat kepada orang ramai dan industri pembuatan. Selepas pelan penambahbaikkan dibuat, masalah-masalah pembaziran dapat dikurangkan. Antaranya, pengurangan masa pertukaran mata alat di ‘Cutting Process’ adalah 60% dan di ‘Crimping Process’ adalah 45%. Selain itu, masa menunggu untuk mencapai ‘Takt Time’ juga dapat dikurangkan.

ABSTRACT

Value Stream Mapping (VSM) is a visual way of representing the flow of the information and material in the production of the product. Besides that, VSM can identify the seven wastes that occur in the production line. On top of that, by using the Microsoft Office Visio 2007, the current state mapping and future state mapping have been created. The scope of this project focused on the one production line in the manufacturing industry. After collecting the data, the current state was created and continued with the analysis of that current state mapping. In addition, the wastes were identified in the current state. The wastes that identified were high changeover times and setup time in the cutting process, unnecessary motion in the crimping process, high lead time to achieve the Takt time, no work standardization and Changeover time were high at the cutting process. Then, to solve all that problems, the Lean Tools were applied such as Kaizen Improvement and Cellular Manufacturing. The analysis for applying those tools was done by doing the analysis from previous Case Study. Besides that, the analysis also done by using the Graph Based Method and From-To-Chart Method. Then, future state mapping has been created. Through the analysis done, the Future State Map can generate as the way to propose the related improvement to the company and can give the benefit to the other people and manufacturing industry. After applying the proposed improvements, the targeted results were reduced the changeover time and setup time in the cutting process. The percentage of reducing Changeover Time was 60% at Cutting Process and 45% at the Crimping Process. Then, the Lead Time also reduced.

DEDICATION

To my beloved parents and all my family

To all my friends

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In the name of Allah, the Most Merciful and the Most Beneficent. It is with the deepest senses gratitude of the almighty that gives strength and ability to complete my Final Year Project.

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LIST OF ABBREVIATIONS

C/T	-	Cycle Time
C/O	-	Changeover
DMAIC	-	Define, Measure, Analyze, Improve, Control
ERP	-	Enterprise Resource Planning
EDI	-	Electronic Data Interchange
FMEA	-	Failure Mode and Effect Analysis
FIFO	-	First In First Out
HST	-	Heat Shrink Tube
JIT	-	Just In Time
LPS	-	Lean Production System
LAN	-	Local Area Network
NVA	-	Non Value Added
NNVA	-	Necessary but Non Value Added
PSM	-	Projek Sarjana Muda
SMED	-	Single Minute Exchange Dies
TPM	-	Total Productive Maintenance
TPS	-	Toyota Production System
VSM	-	Value Stream Mapping
VA	-	Value Added
WAN	-	Wide Area Network

CHAPTER 1
INTRODUCTION

This chapter gives a brief overview about the whole project. This chapter explains about the background, problem statements and objectives of the project. Lastly, it describes about the scope and limitation of this project.

1.1 Background

Manufacturing industry becoming a more and more competitive market and many companies globally strive to increase their efficiency. To reduce the cost problem and remain competitive with manufacturers abroad, companies use a variety of different methods. One of the main methods is called lean manufacturing. Before this, Taiichi Ohno is regarded as the founder of Toyota production system. Lean manufacturing has various tool or technique such as 5S, Kanban, Kaizen, Total Productive Maintenance (TPM) and others. One of the important tools of lean manufacturing is Value Stream Mapping (VSM). VSM is an approach to reduce wastes existing in the manufacturing processes. Besides that, there are five basic principles of Lean as explained by Womack and Jones (1991) is value, value stream, flow, pull and continuously improvement.

The Value Stream Mapping method (VSM) is a visualization tool oriented to the Toyota version of Lean Manufacturing (Toyota Production System). It helps to understand and streamline work processes using the tools and techniques of Lean Manufacturing. The goal of VSM is to identify, demonstrate and decrease waste in the process. Waste being any activity that does not add value to the final product, often used to demonstrate and decrease the amount of waste in a manufacturing system. VSM can thus serve as a starting point to help management, engineers, production associates, schedulers, suppliers, and customers recognize waste and identify its causes. As a result, Value Stream Mapping is primarily a communication tool but is also used as a strategic planning tool and a change management tool.

Therefore, the main objectives of the project have been to evaluate how the VSM put into practice. Then, these projects also focus on collecting the data and analyze the current production flow. Next, the objective is to create the current state mapping and analyze that mapping. Thus, this project also focused on the proposing the improvement plan that can be done. The project is structured as follows: firstly there is the introduction of this project, secondly the literature review as the detail information about the VSM. The next is about the methodology that presented in creating the VSM process and finally the conclusion of the project are mentioned according to the activity that has been done in PSM I and for the PSM II.

1.2 Problem Statement

Company Wire Harness Manufacturing Sdn. Bhd is a wiring harness manufacturer at Terengganu. This company was established in 1999 and has various customers. Same goes with the other company, reduces the waste is very crucial in determining the quality and efficiency of the product to meet the customer demand. Besides that, VSM is a good tool to solve that problem. On top of that, to reduce the wastes, the improvement plan needs to be proposed or implemented.

1.3 Objectives

There are four objectives that need to be achieved in this project:

a) To collect the data and analyze the current production flow.
b) To create the current state mapping by using the VSM method.
c) To analyze the current state mapping for creating future state mapping
d) To propose the improvement plan.

1. 4 Scopes

This project specifically focused on the analysis of the production floor in the manufacturing industry. This case study will be carried out at the Company Wire Harness Manufacturing Sdn. Bhd which is located at Kawasan Perindustrian Chendering, Kuala Terengganu. In this factory, the production line for producing the wire harness will be selected and also for the analysis. The production line that will be selected is in the lead preparation for the wiring harness. The focus of this project is on creating the current and future value stream mapping. Then, all the information data like process flow, value added and non value added activities and cycle time will be gathered.

CHAPTER 2

LITERATURE REVIEW

This chapter of the report provides a brief background on the application of value stream mapping in order to complete this report. All the information was collected and sorts in order to make this project run properly.

2.1 Lean Manufacturing

Lean manufacturing has increasingly applied in the manufacturing industries throughout the world. It has proven to have the positive impact to the company which includes the concepts like to reduce cycle time, lead time, waste and increasing the productivity. Based on S. Vinodh, K. R. Arvind and M. Somanaathan (2009), lean is a manufacturing paradigm based on the fundamental of Toyota Production System (TPS) which is aimed at continuously minimizing waste to maximize flow.

Lean also is all about the increasing the awareness about waste at various levels of a production system and working to eliminate it. Research is carried out by S. Vinodh, K. R Arvind and M. Somanaathan (2009) in Ohno 1988, the seven common wastes according to the TPS are transported, inventory, motion, waiting time, overproduction, over processing, and defect. Besides that, there are various tools and technique to implement lean principles to an industry such as Total Production Management (TPM),

5S, Failure Mode and Effect Analysis (FMEA), Kanban, Total Productive Maintenance, Poka-Yoke and Kaizen are currently under implementation.

Besides that, in the books Lean Thinking, John Womack and Daniel Jones define the five principles of lean. There are:

a) Specify value. The customer is the definer of value and they are willing to pay for something. Then, if they are not willing to pay, it is called waste.
b) Identify the value stream. After the value is clearly defined, then the value stream is clearly defined. A value stream is the set of all action necessary to bring a product from the raw materials into the hand of the customers.
c) Make value flow. Within the value stream mapping, the one piece flow is applied where possible.
d) Let customer pull. A pull system is applied where the single piece flow is impossible.
e) Pursue perfection. After using the value stream mapping technique to create a plan to achieve this, process Kaizen is used to reduce waste and continuously improve.

2.2 VSM Based on Lean Production System (LPS)

The fundamental of lean manufacturing is to identify and eliminate wastes. Lean manufacturing tool which is value stream mapping used to identify the waste in the production line. Besides that, applying the value stream mapping (VSM) is more efficient to identify the overall value stream of the supply chain. On top of that, Lixia Chen *et. al*, (2010) claims that value stream mapping can decrease all waste of the whole process.