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TAJUK: **Development of General Value Stream Mapping For Productivity Improvement And Kaizen Implementation At An Aerospace Industry**

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF GENERAL VALUE STREAM MAPPING FOR PRODUCTIVITY IMPROVEMENT AND KAIZEN IMPLEMENTATION AT AN AEROSPACE INDUSTRY

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

By

AL AMIN BIN MOHAMED SULTAN

FACULTY OF MANUFACTURING ENGINEERING

2009

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DECLARATION

I hereby, declared this report entitled

"Development of General Value Stream Mapping for Productivity Improvement and Kaizen Implementation at an Aerospace Industry"

is the results of my own research except as cited in the references.

Signature : …….

Author's Name : **Al Amin Bin Mohamed Sultan**

Date : ……**09 April 2009**……

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APPROVAL

This report 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) with Honours. The member of the supervisory committee is as follow:

…….

Pn Rohana bt Abdullah

Project Supervisor

(Official Stamp & Date)

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ABSTRACT

Productivity has being the highest focus or concentration in nowadays business entity especially in manufacturing sector. The improvement in productivity means the profits are growth and unneeded activities are denied or eliminated. Among the problems that occur in the selected aerospace company production line are the difficulty to visualize the overall process flow, not able to identify the waste and also issued with ownership causing late delivery or defects. The reasons for the lateness and defect are also difficult to identify. This study focuses on the development of General Value Stream Mapping that will enable the detail process flow to be clearly understood. Next, by analyzing the VSM, the bottleneck process can be identified and Statistical Process Control using Pareto charts are can be used to identify improvement opportunities. The result of this study includes the current and future state VSM, Value added activity, bottleneck identification and kaizen proposals. This vital information can help the company to improve their productivity and be successful in the lean journey.

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ABSTRAK

Produktiviti menjadi tumpuan tertinggi dalam entiti perniagaan dewasa ini terutama sekali dalam sektor pembuatan. Peningkatan dalam produktiviti membawa maksud keuntungan dan aktiviti-aktiviti yang tidak diperlukan adalah dinafikan atau disingkirkan. Antara masalah yang timbul di kilang aeroangkasa yang terpilih ialah talian pengeluaran syarikat untuk melihat keseluruhan aliran proses, tidak berupaya mengenalpasti sisa dan juga permasalahan pemilikan yang menyebabkan penyerahan lewat atau kecacatan produk. Punca kelewatan dan kecacatan ini juga sukar untuk dikenalpasti. Kajian ini menumpukan pada pembangunan General Value Stream Mapping yang akan membolehkan perincian aliran proses dapat dilihat dengan jelas dan difahami. Seterusnya dengan menganalisa VSM, proses cerutan akan dikenalpastu dan dengan menggunakan *Statistical Process Control* yang mengaplikasikan carta-carta Pareto akan mewujudkan ruang dan peluang untuk perubahan dan pembaikan. Hasil kajian ini termasuk *Current State* dan *Future State VSM*, aktiviti berfaedah, pengenalpastian cerutan dan cadangan-cadangan untuk kaizen. Maklumat yang amat penting ini akan dapat membantu syarikat bagi meningkatkan produktiviti mereka dan berjaya dalam perjalanan *lean* mereka.

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DEDICATION

This study is dedicated to my beloved Mum and Dad who have supported me all the way since the beginning of my studies;

Meharunnisa Bt Sultanul Ariffin

Mohamed Sultan Bin Oli Mohamed

.

Also, this study is dedicated to my brothers who have been a great source of motivation and inspiration.

Al Amir Bin Mohamed Sultan

Mohamed Sediq Bin Mohamed Sultan

Mohamed Aiman Bin Mohamed Sultan

All of the family members and relatives

&

Pn Rohana Bt Abdullah

Project Supervisor

Thanks for your encouragement, support and motivation

Al Amin Bin Mohamed Sultan

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- En Effendi bin Abdullah, Academic Supervisor
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LIST OF ABBREVIATIONS

ABS	-	AB steel
AC	-	Aero-Composite
AFSO21	-	Air Force Smart Operations for the 21st Century
A2A	-	Area to Area
B2	-	Building 2
CO	-	Changeover
CTs/CT	-	Process Cycle Times
CTRM	-	Composites Technology Research Malaysia
E.P.E	-	Every Product Every
GRAI	-	Graphes a` Re´sultants et Activite´s Inter relies
IDEF0	-	Icam DEFinition Zero
IMVP	-	International Motor Vehicle Program
JIT	-	Just-In-Time
LEA	-	Lean Enterprise Architecture
MIT	-	Massachusetts Institute of Technology
MPM	-	Minutes Per Million
MRO	-	Military Aerospace
NEPA	-	North East Productivity Alliance
NIST	-	National Institute of Standards and Technology
NNVA	-	Necessary but non-value adding
NVA	-	Non-value added
OECD	-	Economic Co-operation and Development
RIE	-	Rapid Improvement Events
SOPs	-	Standard Operating Procedures
TPM	-	Total productive maintenance
TPS	-	Toyota Production System
UK	-	United Kingdom
UOS	-	Unit of Measurement
US	-	United States
VA	-	Value added

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VSM	-	Value Stream Mapping
WIP	-	Work-In-Process

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CHAPTER 1
INTRODUCTION

1.1 Background

In nowadays industrial era, the productivity is being the highest concern by the business entity in any field to compete either locally or globally. Malaysia's total productivity grew by 4.2% to a level of RM 48,133 in year 2007 which growth was higher than selected Organization for Economic Co-operation and Development (OECD) and Asian countries (Productivity report, 2007).Manufacturing sector is one of the important portions to the growth of the Malaysian economy. There are various types of manufacturing fields such as pharmaceutical, aerospace, foods, and others.

The manufacturing key productivity indicator generated is most useful and serve as an easy and quick reference for companies to review on the current status of productivity performance. Propelled by vibrant domestic consumption and sustained exports, the Manufacturing sector registered 3.1% growth. Productivity level in manufacturing sector in year 2006 was RM 54,110 which jumped to RM 55,544 after a year. The growth in the economy was broad based with impressive performance by the services and manufacturing sectors (Productivity report, 2007).

Knowing the importance of the productivity's issue is always the critical point the management team in the organization need to put emphasis on. The output have to meet the target as per scheduled and at the same time try to improve the productivity and reduce or eliminate the waste.

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There are so many philosophies, techniques and also the tools that can be used to identify the problem in the effort to improve the productivity. However, the selected tools and techniques should be suitable to be applied to the targeted industries such as Aerospace industry because of the difference flow of process and productions.

Among the popular philosophy that has been used nowadays is Lean Manufacturing. There are many types of approach in Lean such as 5S Implementation, Kaizen Implementation, Value Stream Mapping, Jidoka and others. Recently in the Aerospace industry, where the case study will be done, the Value Stream Mapping is introduced as a tool to promote visualization beyond the single-process level and continuous improvements to achieve the optimum productivity rate.

VSM is a tool commonly used in lean continuous improvement programs to help understand and improve the material and information flow within organizations. Value Stream Mapping borne out of lean ideology captures and presents the whole process from end to end in a method that is easy to understand by those working the process - it captures the current issues and presents a realistic picture.

1.2 Problem Statement

In the manufacturing sector, the management team from all level in the organization is always trying their best to run the company without any or minor waste, and optimized until high level of efficiency and productivity. The selected aerospace company for this study which is Composites Technology Research Malaysia (CTRM) Aero Composites is having the difficulty to visualize the overall process flow of their Building no 2 (B2) production line. The industry's new project team is not able to identify, demonstrate and reduce the waste occurring at the production line.

Besides that, they also have difficulties to identify the person that will be responsible when problems occur such as defect and lateness of shipment. There is no method to trace which process and section that contributed to the problem such as bottleneck and high percentage of waste. Therefore, this study is focused to identify the method

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to recognize various types of waste utilizing the Lean Manufacturing method of Value Stream Mapping where once defined, opportunity for improvement can be identified.

1.3 Objectives

The objectives of this study are:

1. To develop the General Value Stream Mapping (VSM)
2. To identify and analyze the bottleneck and opportunity to reduce the waste
3. To propose Kaizen project implementation

1.4 Scope of Study

This study is focused on the development of General Value Stream Mapping for Panel Spoiler and data gathering activities will be at the mainly under control of Program Building No 2 (B2) CTRM AC. The VSM will be used to identify the bottleneck problem in order to come up with the recommendation for Kaizen opportunities.

1.5 Research Methodology

The study was started with the identification of problem statement. Then, the objectives are presented in order to clearly define the deliverables of the study. Next, the literature review was conducted to identify the method to be used for the study. The data collection was done at the first step to collect information about this study. Then, Gantt chart will be used to manage the project. Data collection and information gathering can be divided into two (2) sources, which are primary source and the secondary source. The findings will then be interpreted by analyzing the data to get the result before final report writing take place.

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1.6 Importance of study

The importances of this study are:

1. To provides the tools that can identify the overall process flow in details in the industry.
2. To demonstrates and visualize the activity that does and does not add value to the final product.
3. To established the general value stream mapping for the selected area and product.
4. To identify the process and the section those contributed to the bottleneck and looking for opportunity decrease the waste in the panel Flap manufacturing process.
5. To provides the correct data and time study compilation to the aerospace industry.
6. To be the reference for future benchmarking process.

1.7 Report Outline

This report will be segmented into five (5) chapters. Chapter 1 generally discusses about the introduction which consists of problem statements, objectives, scope of study, importance of the study and the study outlines. Chapter 2 is the literature review. Based on the information gathered and data collected, this chapter discusses the definition, various techniques of lean tools and the benefits of lean tools and the implementation techniques to be used in industries. Next, chapter 3 discusses the methodology adopted in the study, divided into two (2) sources which are primary and secondary source. This chapter will discuss the study methodologies that will be used to collect the relevant data to support the development and analysis of the study. Chapter 4 is background of company, Chapter 5 is results and Chapter 6 is the analysis and discussion. Lastly, Chapter 7 is a conclusion and recommendation for this study.

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CHAPTER 2
LITERATURE REVIEW

This chapter briefly goes through and discusses about the Productivity and the Lean journey which were implemented in various industries especially in manufacturing sector. Beside that, it also discusses about the lean tools and techniques which are used in industries in terms of the basic information itself to understand the reasonable and applicable tool to be used in this study. In addition, this chapter also includes the actual case studies on VSM implementation in order to have better information on the studies on the method to developing VSM for this study.

2.1 Productivity

One of the primary responsibilities of a management team is to achieve productive use of an organization's resources. The term productivity is used to describe this. Productivity is an index that measures output (goods and services) relative to the input (labor, materials, energy, and other resources) used to produce them (Stevenson, 2005).

Productivity measures are useful on a number of levels. For an individual department or organization, productivity measures can be used to track performance over time. This allows managers to judge performance and to decide where improvements are needed.

Productivity levels are also important for industries and companies. For companies, a higher productivity relative to their competitors gives them a competitive advantage over their competitors in the marketplace. With higher productivity, they can afford out perform competitors' process at the same time realize greater profits. For an

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industry, higher relative productivity means it is less likely to be supplanted by foreign industry.

Consumer demands for a high degree of manufacturing responsiveness and reduced lead-times, unpredictability in the marketplace, resulting difficulties in forecasting, and pressures for reduced inventories are placing an increasing focus on the design efficiency of manufacturing systems and their supply chains (Matson and McFarlane, 1998).

2.2 Lean Management

The concept of lean management can be traced to the Toyota production system (TPS), a manufacturing philosophy pioneered by the Japanese engineers Taiichi Ohno and Shigeo Shingo (Inman, 1999).

The Toyota production system is a technology of comprehensive production management. The basic idea of this system is to maintain a continuous flow of products in factories in order to flexibly adapt to demand changes. The realization of such production flow is called Just-in-time production, which means producing only necessary units in a necessary quantity at a necessary time. As a result, the excess inventories and the excess work force will be naturally diminished, thereby achieving the purposes of increased productivity and cost reduction.

It is well known, however, that Henry Ford achieved high throughput and low inventories, and practiced short-cycle manufacturing as early as the late 1910s. Ohno greatly admired and studied Ford because of his accomplishments and the overall reduction of waste at early Ford assembly plants (Hopp and Spearman, 2001).

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