PRODUCTIVITY ENHANCEMENT BY OVERALL EQUIPMENT EFFECTIVENESS (OEE) IMPROVEMENT IN HABERDASHERY INDUSTRY: A CASE STUDY

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

by

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BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

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I hereby, declared this report entitled "Productivity Enhancement by Overall Equipment Effectiveness (OEE) Improvement in Haberdashery Industry" is the results of my own research except as cited in references.

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Date	:	……

APPROVAL

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:

……

(Dr. Effendi Bin Mohamad)

ABSTRAK

Pada awal tahun 1990-an, Keberkesanan Peralatan Keseluruhan (OEE) telah dibatasi hanya sebagai alat pengukuran bagi Jumlah Penyelenggaraan Produktif (TPM), tetapi kini ia dilihat sebagai alat yang berasingan untuk mengukur prestasi sebenar pengeluaran di mana-mana jabatan atau organisasi. OEE adalah Metrik kuat pembuatan ukuran prestasi mengintegrasikan daripada penggunaan, hasil dan kecekapan proses, mesin pengeluaran garis yang diberi. Apabila dikaitkan dengan sebab-sebab bagi kehilangan prestasi, OEE menyediakan cara untuk membandingkan dan mengutamakan usaha penambahbaikan. Tujuan kajian penyelidikan ini adalah untuk membangunkan kaedah untuk meningkatkan OEE untuk Mesin Pointing di Jabatan Haberdashery dengan menggunakan Alat Lean. Berdasarkan analisis, faktor kehilangan Ketersediaan dikenalpasti dengan aktiviti yang tidak menambah nilai yang tinggi, dan dengan itu penambahbaikan dicadangkan. Peningkatan ini hanya memberi tumpuan kepada kerugian Ketersediaan dan tidak termasuk Prestasi dan Kualiti kerugian. Kaizen telah dilaksanakan untuk mengurangkan kerugian mesin tidak produktif berkenaan dengan masalah penetapan mesin. Set bulanan lengkap tali rata dibuat untuk mengatasi kekurangan peralatan di Jabatan Pointing. Selain itu, Prosedur Operasi Standard (SOP) bagi proses pencantuman tali rata cadangan untuk menyeragamkan kaedah yang betul. Peningkatan pada OEE dinilai berdasarkan keputusan pengurangan mesin downtime. Penambahbaikan membawa peningkatan dalam Ketersediaan dan OEE peratusan 13.63% dan 18.51%. Pengeluaran pada mesin meningkat apabila mesin berhenti dapat dikurangkan, sekaligus peningkatan pada produktiviti dapat dicapai.

ABSTRACT

In the early 1990s, Overall Equipment Effectiveness (OEE) was regarded only as measurement tool for Total Productive Maintenance (TPM), but now it is viewed as a separate tool for measuring true production performance in a department or organization. OEE is a powerful metric of manufacturing performance integrating measures of the utilisation, yield and efficiency of a given process, machine or manufacturing line. When associated with the reasons for performance loss, OEE provides the means to compare and prioritise improvement efforts. The purpose of this research study is to develop the methodology to improve the OEE for the Pointing Machine at Haberdashery Department by using the Lean Manufacturing Tools. The productivity losses based on previous OEE were studied to identify factors contributing to the unfavourable performance of the machine. Based on the analysis, the Availability loss factor is identified with the highest non-value added activities and thus improvements are proposed. The improvement only focuses on Availability loss and not including Performance and Quality losses. Kaizen was implemented to reduce the machine downtime losses with regard to the machine setting problem. The monthly complete set of belt is made to overcome the lack of equipment at Pointing Department. Besides, the Standard Operating Procedure (SOP) for joining process of belt proposed to standardize the proper method. Improvement on the OEE is evaluated based on the results of machine downtime reduction. The improvements bring out an increase in the Availability and OEE percentages of 13.63% and18.51% respectively. The output of the machine increases when the machine downtime is reduced, therefore an enhancement of productivity can be achieved.

DEDICATION

This project is dedicated to my parents who have never failed to give me financial and moral support, for teaching me that even the largest task can be accomplished if it is done one step at a time.

ACKNOWLEDGEMENT

Firstly, I would like to express my gratefulness to Allah S.W.T for giving me strength and wisdom to finish my final year project. I also would like to express my gratitude to the following individuals for providing me the inspiration and help.

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Here, I thank my parents for helping me throughout the project and providing a financial support until I successfully completed this study. Their undivided love and support are the beacons that have continued to motivate me through the harshest of situations.

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Last but not least, I wish to acknowledge to all persons who give supporting, advice, and assistance that are directly or indirectly involved to the success of my study. Thank you so much.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATION, SYMBOLS AND NOMENCLATURE

MIDA	-	Malaysian Industrial Development Authority
TPM	-	Total Preventive Maintenance
OEE	-	Overall Equipment Effectiveness
VSM	-	Value Stream Mapping
WIP	-	Work in Process
AMO	-	Autonomous Maintenance Program
SPC	-	Process Control
SMED	-	Single Minute Exchange of Die
MIDA	-	Malaysian Industrial Development Authority
TPM	-	Total Preventive Maintenance
OEE	-	Overall Equipment Effectiveness
FMEA	-	Failure Mode Effects Analysis
SOP	-	Standard Operation Procedure
QC	-	Quality Control
PM	-	Preventive Maintenances

CHAPTER 1
INTRODUCTION

Chapter 1 of this report will give a concise introduction on the study conducted that contains the background of the problem statement, the objectives to be achieved throughout the project and the scope of the study which clearly defined the boundaries or limit of this study. This chapter also provides a structure of the report which generally describes about chapter division and related contents to that particular chapter. All in all, it summarizes the progress of the whole project, including how the whole project has been carried out.

1.1 Background of Study

Malaysian Industrial Development Authority (MIDA, 2012) state that the largest economic in Malaysia is manufacturing by contributing 32% of overall economic and specifically 79% of the total export compared to other sectors. For the better economic achievement courses in Malaysia, more focuses and attention should be given for the industry to further improve the development.

The elimination of seven most critical wastes is frequently related to lean manufacturing. It is intricate the effects of changeability in demand, supply or processing time. Nakajima (1988) had launched Total Preventive Maintenance (TPM) concept and had offered the measureable metric of Overall Equipment Effectiveness (OEE) to determine the productivity of particular machine.

The study is carried out in a Haberdashery Industry. The Research Company is one of the manufacturing industries which have implemented TPM in their operation system. Since it was launched in April 2014, the Research Company still has to face of many challenges in order to maintain the TPM programme. This company is still looking for the best way to improve the implementation of TPM in order to achieve their objective to be successful company that implements this programme.

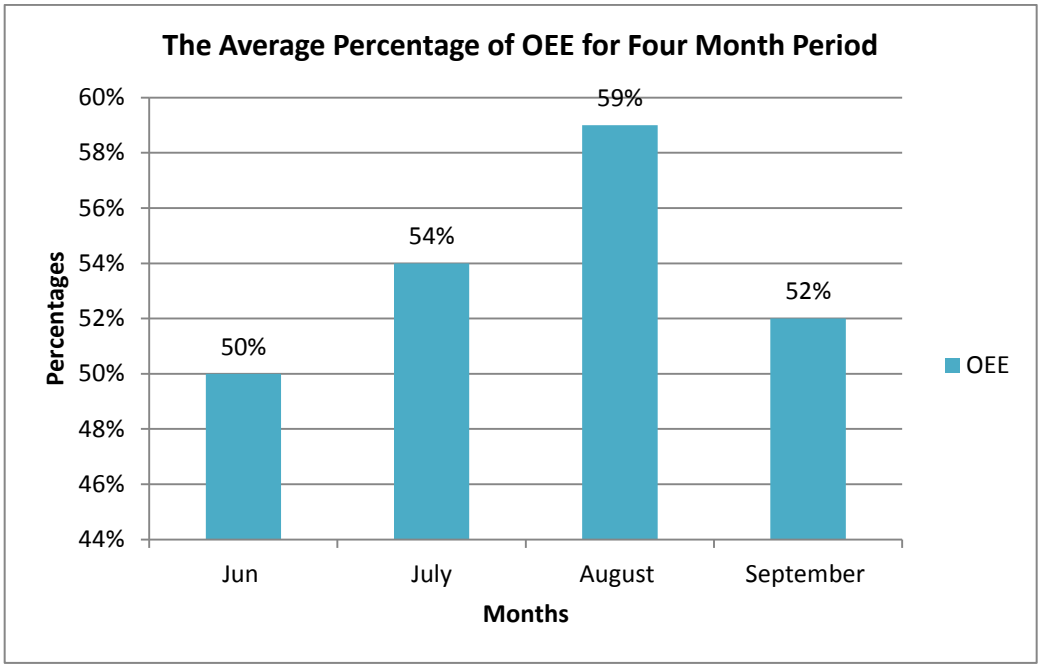

Figure 1.1: The Average Percentage of OEE for Four Month Period

Figure above shows the average of OEE percentage (%) for four months period from Jun to September. The graph indicated unprogressive OEE% of Pointing Machine for Line G, H, I and J. Lean manufacturing is the techniques and process being implemented by companies around the world that intent to reduce unneeded and unproductive tasks, activities and attitude in the work environment. In additional, lean manufacturing is a complete procedure in order to reduce waste and improve the organization production and morale. There are many tools and techniques in lean manufacturing that can be implemented but we need to select the effective lean tool and technique to achieve success.

1.2 Problem Statement

The prior data of OEE of Research Company is unsatisfactory compared to the general manufacturing framework. The OEE stands at an average of 50% to 60% where else benchmark of world class OEE rating is at least 85%. The table below is the example of the OEE% for Pointing Machine for previous five months.

Table 1.1: Comparison of World Class OEE Factor and Pointing Process Factor for Four Month Period

OEE Factors	World Class	Average of Pointing Process for previous four months
Availability	90.0%	66%
Performance	95.0%	84%
Quality	99.9%	96%
OEE	85.0%	54%

According to the comparison of world class factor and average of pointing process factor for previous for four months, availability is 66%, performance is 84% and quality is 96%. The achieved result shows distance between both factors. The major reason for the distance is availability factor level in this process. In other to improve the OEE for pointing process, we need to enhance the availability of factor level.

The OEE tools are used to evaluate performance and productivity of the machine. Figure 1.1 shows the OEE of pointing process with 54%. There are three main time losses which are downtime loss (availability), speed loss (performance) and quality loss (quality) with 66%, 84% and 96% respectively. There are the several possible causes of this condition:

a. The time lost due to key equipment breaking down which causes the production to be stopped for more than 10 minutes
b. The 6 big losses of OEE are not defined and measured accurately

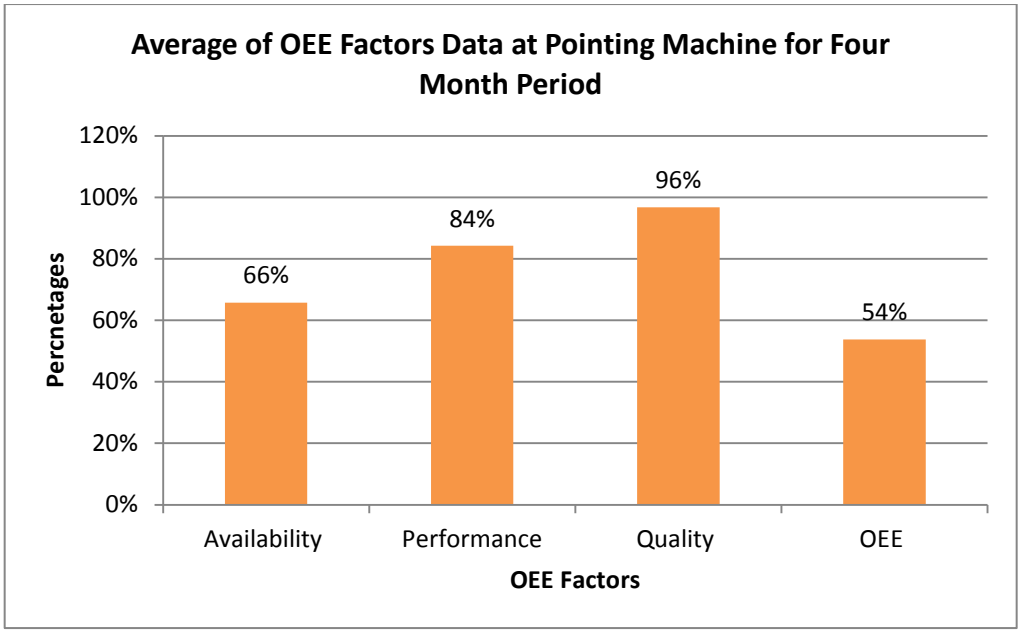

Figure 1.2: Average of OEE Factors Data for Four Month Period

OEE is fundamentally a tool that helps manufacturing companies improve their core by reduction of costs, enhancing quality, and enhancing productivity Moreover, OEE is part of a continuous improvement approach that supports of the manufacturing process through employee involvement and authorization. Nakajima (1988) stated that, OEE measurement is a powerful way of analyzing the efficiency of the individual machine. It is an operation of availability rate, performance rate and quality rate where to measure of the equipment losses.

1.3 Objectives of Study

The objectives of this study are:

1. To identify the productivity losses based on the previous OEE in Haberdashery Industry at Pointing Machine Line.
2. To maximize the availability of equipment by minimizing breakdowns and setup time through Lean Tools.
3. To evaluate percentage of OEE improvement based on the operating time to enhance productivity.

1.4 Scope of Study

This study mainly focuses on the improvement of OEE of the pointing machine in Research Company through Lean Tools. The prosecution of this study only covers on pointing machine in Research Company. The scope of this study starts from the validation the productivity losses based on the current Overall Equipment Effectiveness at the Pointing Machine Line. Next, the OEE data on machine performance is an initial key point to identify the equipment losses and establish improvement to eliminate them. The study also includes the conduct of future state analysis for the purpose of evaluating the percentage of OEE improvement based on the operating time to enhance productivity. Improvement of performance and quality is not in the scope of this study.

1.5 Project Summary

For ease to read and comprehension, this report is written by following and according the arrangement of chapter which have been decided. This report is divided into five major parts, which is each of them consist different explanation according to the chapter.

Chapter 1: Introduction

This chapter clarifies about the background of study, problem statement, objectives and the scope of the study which acts as the core to the entire research and study.

Chapter 2: Literature Review

This chapter covers on the literature review conducted to ease the understanding of relevant topics for this study through research of all types of published work.

Chapter 3: Methodology

It describes the basic study method and describes the method chosen to carry out this study. It consists of fundamental approach to be taken to achieve the objectives.