



PRODUCTIVITY IMPROVEMENT THROUGH TPM ADOPTION ON PRINTING MACHINE

This report is submitted in accordance with requirement of the University Teknikal Malaysia Melaka (UTeM) for Bachelor Degree of Manufacturing Engineering

by

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I hereby, declared this report entitled “Productivity Improvement Through TPM Adoption On Printing Machine” is the results of my own research expect as cited in the references.

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Date : 24 May 2018

APPROVAL

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

.....
Prof Madya Dr Mohd Rizal Bin Salleh

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ABSTRAK

Evert Malaysia Sdn Bhd ialah industri pembuatan belon di Ayer Keroh, Melaka yang mengeluarkan dan membekalkan produk mereka di pasaran antarabangsa. Salah satu jabatan yang penting dalam syarikat ini adalah jabatan pengeluaran, dimana tempat produk dihasilkan. Kajian ini adalah untuk mengkaji masalah yang sedang dihadapi di proses cetakan di Evert Malaysia di jabatan pengeluaran. Pihak kejuruteraan telah mengadukan masalah kerana ianya telah memberi kesan yang negatif kepada produktiviti syarikat. Menurut pihak kejuruteraan, sebanyak 55% dari masalah yang berlaku di jabatan pengeluaran ialah masalah berkaitan percetakan diikuti dengan proses mencelup 27%, proses pembungkusan 12%, proses umum 2%, Proses pembekasan 1% dan gudang sebanyak 1%. Selain itu, kajian ini juga dilakukan untuk mencadangkan satu teknik Total Productive Maintenance untuk meningkatkan keberkesanan dan kecekapan mesin dan peralatan. Bukan itu sahaja, kajian ini juga bertujuan untuk mengukur tahap Overall Equipment Effectiveness (OEE). Pemerhatian semasa proses cetakan adalah dilakukan dengan rakaman video keseluruhan proses. Beberapa data tentang masalah yang berlaku dan isu-isu yang timbul diperolehi dengan menemu ramah pengendali mesin dan jurutera yang terlibat dalam proses percetakan. Setelah mengenal pasti semua masalah yang mengganggu proses percetakan belon, Teknik (TPM) akan diaplikasikan dengan menggunakan dua kaedah daripada 8 iaitu Autonomous Maintenance dan Planned Maintenance. Kesemua kaedah ini akan dibincangkan bersama jurutera yang bertugas di Everts serta mendapat peretujuan dari pihak atasan. Setelah selesai mengaplikasikan konsep TPM, pengiraan OEE akan dilakukan untuk mengetahui keberkesanan teknik TPM terhadap Evert Malaysia.

ABSTRACT

Evert Malaysia Sdn Bhd is a balloon manufacturing industry in Ayer Keroh, Melaka which produces and supplies their products in the international market. One of the important departments in the company is the production department. This study is to examine the problems faced in the printing process at Evert Malaysia in the production department. The engineering side has highlight the problem as it had a negative impact on productivity. According to the engineering department in 2017, 55% problems is came from printing process followed by the dipping process 27%, packing process 12%, general proses 2%, former process 1% and warehouse 1%. In addition, this study was also to propose a Total Productive Maintenance technique to improve the effectiveness and efficiency of machines and equipment. Other than that, this study also measure the Overall Equipment Effectiveness (OEE). Direct observation during the printing process is performed with the entire video recording of the process. Some data are obtained by interviewing technician and engineers involved in the printing process. After identifying all the problems that interfere with the balloon printing process, the Technique (TPM) will be applied using two from eight pillar of TPM which is Autonomous Maintenance and Planned Maintenance. All of these methods will be discussed with the engineers on duty at Everts and get approval from the superior. After completing the TPM concept, OEE calculation will be done to determine the effectiveness of TPM techniques against Evert Malaysia and do comparison with the World Standard OEE.

DEDICATION

First of all, this thesis is dedicated to myself, I work so hard. I've put away my joy, my dizzy and my laziness, I give all my effort in 1 year to compete this thesis. The dedication is also for my parents, Abdul Rahim Hussin and Saliza Zakaria who always inspired me whenever I felt give up. Not to forget too for my friends, they always been a constant source of support and encouragement during the challenge of all my college life. This thesis is also dedicated to my supervisor, Prof Madya Dr Rizal Bin Salleh for always helping and taught me to work hard to achieve the thing that I inspire.

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LIST OF ABBREVIATION

TPM	-	Total Productive Maintenance
TPS	-	Toyota Production System
OEE	-	Overall Equipment Effectiveness
OPL		One Point Lesson

CHAPTER 1

INTRODUCTION

1.1 Introduction

Productivity is a core issue in manufacturing sector which every company wants it to be growing at higher rate than the past. Productivity is the rates of output that comes from the unit of input. One of the way to achieve the growth of productivity by getting closer with the of time of a process, the cost effective, effective use of available area to reduce the cost and increase the profit. Error that occur during production run is one of the cause of lower productivity. Error can come from man power, machine (breakdown) or from the part manufactured by supplier. Manufacturing industries highlights on dealing with this mistakes especially human mistake.

Apart of mistakes, reducing the waste can also help to increase productivity greatly. Too many types of waste happen in the manufacturing without realisation, the Toyota Production System (TPS) has discovered the 7 types of waste which are transport, inventory, motion, waiting, over-production, over-processing and defect. Waste in a manufacturing is something that add no value to manufacturer in fact, sometimes it cost more to the company. Essentially, to reduce cost and improve profit, the waste need to be eliminated as much as possible. Efficiency and reliability of machines also can be the factor of waste to a production. The waste is measured by the performance and efficiency of the machine or through Overall Equipment

Effectiveness (OEE). The waste possibly come from breakdowns, setup and adjustment losses idling and minor stoppages, reduced speed and etc. To overcome this waste, one of the lean manufacturing tools which is Total Productive Maintenance(TPM) can be implemented in order to maximize the OEE.

The development of Lean Manufacturing nowadays helps the industry to improve their productivity prevailing. As indicated by Womack & Jones (1996), the term 'Lean' signify a group of activities or solution to eliminate waste, reduce non-value added operation, improve value added process and maximize performance.

1.2 Problem Statement

In manufacturing, it is hard to avoid mistakes in the process when it is involved with the human. As a human, an operator will undergo a fatigue after a long time of working. Operator has no consistency and precise as how machine works. However, machine also has their own harm if it is handled without maintenance and the correct method of handling. As time passes, the performance of the machine will get lower and might affect its efficiency, as it can reduce the quality of product as well as productivity of the company. Evert (Malaysia) has highlight the issue in their printing process. The printing machine having many issue and it is happened several times per day and these issue have a great impact on their productivity and quality of the printing. The main problem of the printing process is still not clear but definitely cause the disturbance of production performance and increase the lead time. Waiting for a maintenance to repair machine breakdown is also one of the problem. When the printing machine is breakdown, production might be stopped or they might close the machine that breakdown and lead bottleneck to other printing machine. Furthermore, the desired ouput also will not achievable.

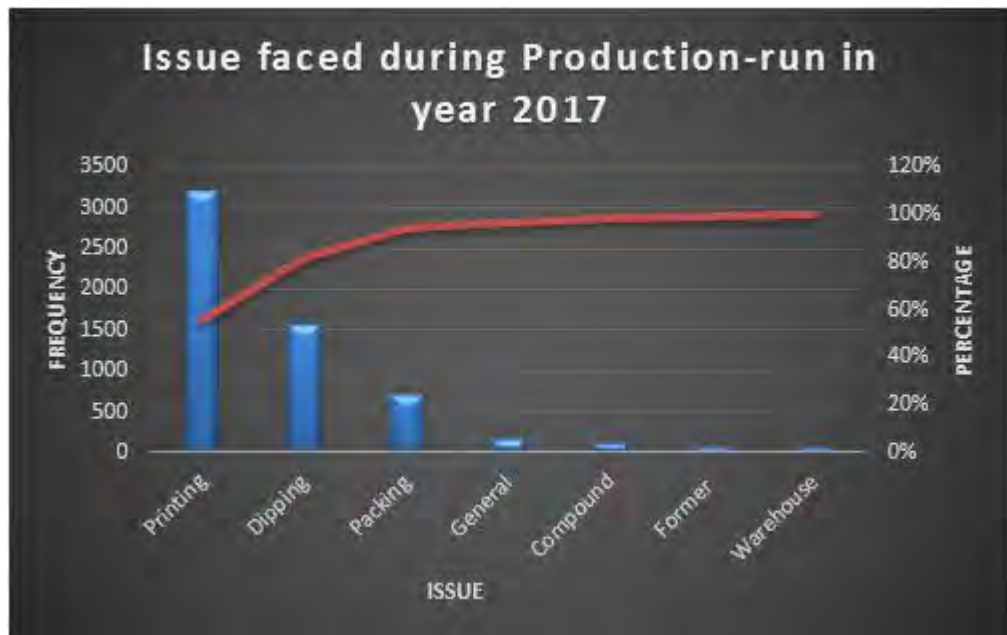


Figure 1.1 Pareto Chart of process in Evert

Based on Figure 1.1, The Pareto chart shows that the printing process that has the highest frequency what of machine breakdown among the 7 process. It is occurs more than 3000 times in a year of 2017 compared to Dipping which is 1500, Packing 600, general 48, Compound process 52 issues, Former 38 issues and Warehouse 20 issues.

1.3 Objectives of Study

The objectives of this study are:

- I. To investigate the problems at the printing process due to inefficient of equipment.
- II. To propose the appropriate Total Productive Maintenance (TPM) plan.
- III. To measure the of OEE effectiveness.

1.4 Scope of Study

The scope and limitation of this study are focusing on the productivity of the Everts (Malaysia) Sdn, Bhd, Ayer Keroh, Melaka. This study will also be implementing the Lean manufacturing tools such as Total Productive Maintenance (TPM) and Poka Yoke to reduce the time waste during breakdown. Data and analysis will collected at Evert Company.

CHAPTER 2

LITERATURE REVIEW

2.1 Company Background



Figure 2.1 Company Logo

Everts was founded in 1924 by Will Everts as a balloon printing company and distributor of novelties. At first, Everts was only produce the balls in 1954 but in 1965, it is started to produce its own balloon in Datteln, Germany. Time passes over the years, further printing operation were build in UK and in 1987 a second manufacturing plant was established in Melaka, Malaysia.

The company grown rapidly in 1997 Everts was acquired by C. Riethmuller GMBH, a family owned group of companies that was formed in 1855 before being eventually sold to Amscan Inc, the world largest Party Good Group, New York in 2011. Amscan has endemic 900 stores retail chain, Party City, distribution in UK, Germany, Australia as well as offices/showroom across US and Hong Kong.

In this day, Evert now is part of the manufacturing division of Amscan, producing natural latex balloons that consummation the other in hose manufactured party products, with operation in Poland, United States and Mexico.

Today, Everts (Malaysia) Sdn. Bhd is operating in modern purpose built plant in Malacca at address 103 – 107 Jalan Usaha 6, Kawasan MIEL Phase II Ayer Keroh, Industrial Estate 75450 Melaka, Malaysia. The area of capacity is about 1500 sq. This company is running 24 hours production, 7 days per week at 3 Shift of work has been scheduled which is morning, (7.00am-3.00pm), afternoon (3.00pm-11.00pm) and night (11.00pm-7.00am). On average, it has more than 300 workers and most of them are foreigners from Indonesia and Nepal. This factory is considered as world class factory as it has other branches in Germany, United Kingdom, Mexico, China, Hong Kong.

This company consist of 6 different department, which is tools (Foam), material (Latex), Maintenance production, quality control, printing, and packing. Each department was assigned one manager to manage the worker and the department. The entire product of Everts are made from latex, the rubber material to make the balloon. Its raw physical properties is a liquid before it's undergoes the process.

2.2 Lean

The term lean was introduced by Massachusetts Institute of Technology (MIT) professor to translate the Toyota's new production for mass production system (Ross et al., 1990). The concept was originally comes from the Japanese automaker that has been on the highest worldwide competition that leads by Toyota Kiichiro ,Shigeo Shingo and Taiichi Ohno who are invented. Lean term describes the highly and professionally well organized production system that use less input such as time, man power, human effort, tools, and material to produce the more amount of output (product) that high quality and low cost. Behrozi et al., (2011). Lean manufacturing is also can be define a a set of technique that guide to operational excellence and continuous improvement by the process of elimination of non value added activities Dickson et al.,(2009). The existence of lean manufacturing also lead to a new management which can be used by many small and medium size manufactures,

mainly old firms that organised and managed by traditional push systems Garre, Nikhil Bharadwaj, Shiva Shashank, Harish, & Sai Dheeraj, (2017). The improvement of quality, cycle times and customer responsiveness can be dramatic achieved with the sets of tools and techniques which universally adopted by many production company. According to the Alefari et al., (2017) the term lean can be found almost everywhere nowadays, including lean software development, lean service, lean entrepreneurship, lean accounting and many more. Although there is many different types of industries that used the lean term, but the underlying concept is still the same, which is maximize the customer value with the minimum waste or in the simplest sentences, delivering more with less.

According to Deshmukh et al. (2017), Lean is one of the effective and tested method of reducing operation cost and diminishing waste from manufacturing operation. Lean principles are described for the growth and survival of the industries for both production and also to a service sector. Applying lean production principle, engaging Kaizen events and reducing unnecessary activities will help to keep the business remain competitive. To produce high quality of work, process of the human working procedure should be defined properly. Lean helps to single out non value added services and removes the waste from the process. A continuous use of the lean implementation helps to expand the potential of industry and waste can be seen clearly and visibly in a process. The Implementation of Lean Manufacturing can be complex at initial stage, but result will be appreciated. It is just need commitment and period base of time.

Lean techniques are proposed and applied in almost every industry. It is are methodically applied lean concept and leading successes to their respective industries. IT, air travel and ship design industries are eliminating wastes and thus their profitability is enhancing. TFV model (explained by Koskela) views the lean as a concept in which process is assumed as system of value added actions, transformations and flows. Egan report (also known as Rethinking Construction) mentions that construction industry is produced by the lessons of manufacturing revolution.

According to Akhramovich et al. (2017) the definition of lean is a concept of organization to strategize for minimization of various cost and meet customer satisfaction. This system consist a variation of tools such as Just In Time (JIT), 5S and Kanban System

which allow sharing of realization the philosophy of Lean Manufacturing. Akhramovich et al. (2017) also stated that the Russian companies face some challenge when implement this concept. The problem was an improper interpretation of approaches of Lean Manufacturing, internal barriers represented by the peculiarity of managing approaches in domestic leadership, and the loss of support by the government. Thus, it is important to have a good planning in order to implement Lean tool and technique and how it can be sustain in the company. Apparently by have a good planning and strategy can drive the company for a better future. The result will build up the enterprise's competitiveness on the world stage.

Generally, Lean is a tools and technique that assist to eliminate waste or 7 Muda's which that lead to the non value added of customer perspective. The waste elimination will improve the good of product quality, shorter lead time, reduce the production cost and the most important its increase the productivity continuously. It's the solution to solve the problem of waste.

2.3 Waste

Toyota executive, Taichii Ohno who was the first who identified the initial 7 types of muda as written by Womack and Jones (2010). The definition of muda in Japanese word is waste, specially any human activity that absorb time, require excessive of human effort, or anything that have added no value to a process before proceed to next activity. Stated by Alukal et al.,(2006) stated that the definition of waste can be many and some of them includes any activities that create excessive cost and time but does not add value in return. According to Puvanasvaran et al.,(2014) there are seven types of waste in manufacturing industries are, any activity that bring cost but does not add value of the product or using extra resources than needed to produce the goods, or services that ordered by the customer.

According to S. Mostafa et al.,(2015) waste is a term that used to define the process that add cost and time but no value to service/product from customer's perspective. There are 3 types of value associated in production activities are, Value Adding (VA), Necessary but Non Value adding (NNVA) and Non Value Adding (NVA). VA is activity which develop or process raw material towards customer's requirement such as cycle time. Next is