



**LINE BALANCING OF PRESSURE RELIEF VALVE (PRV)  
ASSEMBLY PROCESS FOR ENHANCING PRODUCTIVITY AND  
EFFICIENCY**

Submitted in accordance with the requirement of the Universiti Teknikal  
Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering

by

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**UNIVERSITI TEKNIKAL MALAYSIA MELAKA****BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA**

Tajuk: **LINE BALANCING OF PRESSURE RELIEF VALVE (PRV) ASSEMBLY  
PROCESS FOR ENHANCING PRODUCTIVITY AND EFFICIENCY**

Sesi Pengajian: **2018/2019 Semester 2**

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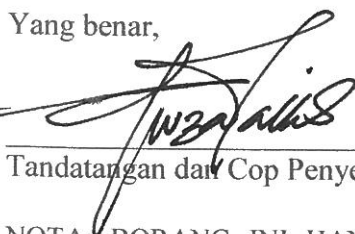
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## **APPROVAL**

This report is submitted to the Faculty of Manufacturing Engineering of Universiti Teknikal Malaysia Melaka as a partial fulfilment of the requirements for the degree of Bachelor of Manufacturing Engineering (Management) (Hons.). The members of the supervisory committee are as follow:

.....

(Principal Supervisor) – Signature & Stamp

.....

(Co-Supervisor) – Signature & Stamp

## DECLARATION

I hereby, declared this report entitled “Line Balancing on Line Assembly”  
is the results of my own research except as cited in the references.

Signature : .....

Author's Name : FATIN NURDIYANA BINTI MOHAMAD ISA

Date : 12 September 2018

## **ABSTRACT**

This study addresses the waste reduction that lead to lean manufacturing. The goal of this study is to identify the waste that exists in the process which can be reduced in order to achieve productivity enhancement. Through the observation of the problems that have in the manufacturing company and the improvements have been proposed. A part of that the main focusing is at the Pressure Relief Valve (PRV) production line. This study is used the line balancing method to enhance the productivity and efficiency of the production. Therefore, the problems are being identified which are the waste throughout the process, the imbalance assembly line and the current efficiency of the production. After problems are detected, objectives are need to be achieved were to investigate the major waste of the process, to propose the improvements for enhancing the efficiency in the line assembly and validate the proposed improvements on its impact to the line assembly performance. The findings of this study was the productivity and the efficiency increased when waste are reduced and increased the performance of the line assembly.

## **ABSTRAK**

Penyelidikan ini membincangkan pengurangan pembaziran untuk menuju kepada lean manufacturing. Tujuan penyelidikan ini adalah untuk mengenal pasti apakah pembaziran yang boleh dikurangkan untuk mencapai peningkatan produktiviti. Penilaian masalah yang ada di syarikat pembuatan dan tujuan penambahbaikan. Sebahagian daripada fokus utama adalah pada barisan pengeluaran tekanan injap (PRV). Penyelidikan ini cuba kaedah aliran sekata selepas mengurangkan pembaziran sepanjang proses. Oleh itu, objektif penyelidikan ini adalah untuk melaksanakan konsep lean manufacturing dengan menggunakan lean management tools di syarikat perkilangan, untuk menganalisa dan mengenal pasti pembaziran semasa proses, dan akhirnya, untuk meningkatkan garis produksi dengan mengaplikasikan kaedah aliran sekata.

## **DEDICATION**

Only

my beloved father, Mohamad Isa Bin Mostan

my appreciated mother, Rosmah Binti Hamzah

my lovely brother and sister, Nafiz and Adeeba

to the ones who always support me in everything I do, Mohamad Shahrulnizam Bin

Kamarudin

to the friends who helped me going through the hardships

for giving me moral supports and strengths to accomplish this study

Thank You So Much & I Love You



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# LIST OF ABBREVIATIONS, SYMBOLS, SPECIALIZED NOMENCLATURE

PRV	-	Pressure Relief Valve
PLV	-	Pressure Limiting Valve
UUM	-	Universiti Utara Malaysia
SME	-	Small and Medium Enterprise
ASB	-	Assembly Line Balancing
WIP	-	Work-In-Progress

# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 Background of Study**

In an ever-rising and competitive world, it is essential to constantly improve, either in a manufacturing or service industry. The close relationship between quality and quantity are the crucial part in ensuring that a company can remain competitive in the marketplace. This study is focusing on how to improve the assembly line in production enhancing the productivity of the industry and increase the efficiency. An improvement is a vital to the industry especially in manufacturing area. Monge and Cruz (2015) stated that a significant improvement is privilege to establish and develop an advanced developing countries and industries. An improvement to the manufacturing industries will lead to the various types of advantages that results in terms of prominent effects on operational efficiency like improved quality, lower costs, reduced lead time, reduction cycle times and the betterment on customer service (Monge & Cruz, 2015). Naveen and Dr T. Ramesh Babu (2011) stated that improvement of productivity is one of the strategies towards manufacturing excellence and to reach the good financial and operational performance which increase the customer satisfaction and reduce time and cost to develop and produce to the good service. They also highlighted the terms of efficiencies and effectiveness as these terms are often misinterpreted. Efficiencies indicates how good the resources are being utilized to give a result. Alternatively, effectiveness refers to the degree of accomplishing the objectives (B. Naveen & Dr. T. Ramesh Babu, 2011).

A study was conducted by IAI America Corporation proved that they succeed to reduce the running costs by \$262,700 over 3 years by changing the electric actuators in their production facilities. By implementing the significant improvement through motorization, this contributes to the better production efficiency in their industry. Other than that, a study was discovered that the human performance enhancement is one of the alternative to the quality improvement in manufacturing industry. In this study, it has been stated that humans who contribute to product need to be improved in terms of ergonomic issue of the man-powers (Govindaraju, Pennathur & Mital, 2001). Norhasni, Rushami and Sanuri (2013) from Universiti Utara Malaysia (UUM), a study has revealed that 5S activity is the main factor to improve the quality of the product, increase the efficiency of the workplace and productive. They also stated that there are 61 departments in UUM administration is involved in 5S practice assessment. The results of the study show the level implementation of 5S practiced in UUM exceeds the moderate level and leads to a level of good. 5S practices at UUM can be enhanced by emphasizing the category of culture and culture category of innovation & continuous improvement (Norhasni, Rushami & Sanuri, 2013).

This study is conducted at one well-known industrial area located at Cheng in Melaka. This company known as Dormakaba Production Malaysia Sdn Bhd which is a multinational manufacturing company with nationwide operations. This study is about to assess the improvement to the assembly line in the company and propose an alternative to enhance the efficiency and thus reduce the cycle time of the process in the assembly line.

## **1.2 Problem Statement**

At Dormakaba Production Malaysia Sdn Bhd, this project is being conducted. The study will focus on the assembly line improvement. The assembly process consisted of two working elements which are preassembly and pin inserting of the products. They type of the products to be focused are Pressure Relief Valve (PRV) and Pressure Limiting Valve (PLV).

After being made some observations in the assembly line, it was found that some issues need to be examined. Firstly, is the current efficiency of the outputs. Currently, the efficiency of the output is 90 % as this data is being recorded daily by the engineer. However, this company target the efficiency of the output to be 92%. There are several factors need to be considered to accomplish the efficiency improvement such as the material handling and the manpower performances.

The product is being assembled manually by the operators by using their both hands. Based on my observation during the assembly process of the part by the operators, they will take all the parts and mix together on the table. They do so is to make it easier for them to pick the parts up and assemble simultaneously. This can be said that this issue can lead to 5S activity issue and lead to waste in motion during the assembly process.

The cycle time of the process in one of the problem in this assembly line that need to be improved. Currently, the cycle time of the assembly line in the Standard Operating Procedure (SOP) of the process is 187 seconds for the preassembly and 2.7 seconds for pin inserting. However, this cycle time need to be improved to make sure that this cycle time can be reduce so that it can increase the efficiency of the output and the output can meet the demand of the customers.

A machine that are being used to insert the pin during pin insertion process had delaying due to the pin was frequently stucked in the machine. This issue is significantly affected the cycle time of the process which took 8 to 10 seconds. This issue need to be addressed because it will affect the productivity.

### **1.3 Objectives**

The objectives for this project are:

- a) To investigate the major waste throughout the process.
- b) To propose in improvement ideas for enhancing the productivity of the product in the line assembly.
- c) To validate the proposed procedures on its impact to the line assembly performance.

### **1.4 Scope**

This project will be covering :-

- a) The usage Lean Management tools to analyse the waste throughout the process.
- b) The line balancing process to balance the workload among operators and enhancing the productivity of the line assembly.

### **1.5 Important of study**

The important of this study is to determine the waste throughout the process in the line assembly. This study is important because by identifying the waste, waste can be reduced for the betterment of the line assembly. While implementation Line Balancing will help to improve the line assembly performance for optimum efficiency.

## 1.6 Organization of report

- Chapter 1

This chapter discusses the background of the study, where the study is conducted and what product they are manufactured. Problems are identified through the direct observations and interview in the company itself by using checklist. Then, the objectives that need to be achieved throughout the study and the project scope which focused in the area of study. The result of the study to the company is also exposed in this chapter.

- Chapter 2

This part of chapter covers the basic theories and understanding the theories part of the study. It is based on legal sources and previous study from articles, journals and books in the internet. The current equipment is explained. The tools being used in the manufacturing industry also comprised in this part. Lastly, the proposing alternative are described.

- Chapter 3

For this chapter, it focused the recipe of this study. It shows the step-by-step of this study specifically to obtain the data from the area of study. Primary and secondary sources will be discussed in this part. The process flow chart will be covered and the project framework of each objective stated will be specifically discussed too.

## **1.7 Summary**

To summarise this chapter, it gives the upper layer of understanding on what this study all about. This chapter gives the rough view to the study and get the point. The important of this study are the objectives that need to be achieved and the project scopes in order to success in the study.

## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

This part will be focused on the improvement that lead to Lean Manufacturing which are the current improvement implemented in the industry. Besides that, the types of improvements in manufacturing industry also will be explained in this section deeply.

#### **2.2 Current Improvement Implemented in Industry**

Improvement is one of the key of success in manufacturing industry. In these era, improvement in industry keep growing day by day to ensure the industry is always moving forward and uplifting in the global. Lean Manufacturing is an intellectual exposure comprising a measurement system and method that, when considered as a whole, is capable of enhancing and therefore, a competitive state, especially in an industry. The main areas of activity involved are product development, supply chain, store floor management and, to a lesser extent, after-sales service (Nenni, Giustiniano, & Pirolo, 2014).

In manufacturing industry, a continuous improvement need to be implemented in line with the development of the world. Continuous improvement is translated from Japanese