



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**PRODUCTIVITY PERFORMANCE IMPROVEMENT IN A  
MANUFACTURING COMPANY**

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

by

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# UNIVERSITI TEKNIKAL MALAYSIA MELAKA

## BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: DEVELOPING A METHODOLOGY FOR PRODUCTIVITY IMPROVEMENT IN A MANUFACTURING COMPANY

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## **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). The member of the supervisory committee is as follow:

.....

Supervisor

## ABSTRAK

Sebagai mahasiswa Tahun 4 Ijazah Sarjana Muda, syarat untuk memenuhi permintaan Ijazah Sarjana Muda Kejuruteraan Pembuatan adalah melaksanakan Projek Sarjana Muda dalam tempoh dua semester. Tujuan Proejct Sarjana Muda ini adalah untuk mendedahkan mahasiswa terhadap etika kejuruteraan, tingkah laku professionalism kejuruteraan, kecekapan komunikasi, membina sikap kepercayaan pada diri sendiri dan menanam sikap bekerja yang positif dalam diri mahasiswa supaya dapat membantu beliau mengaplikasikan teori and ilmu praktikal melalui Projek Sarjana Muda yang bertajuk “*Productivity Performance Improvement in A Manufacturing Company*”. Tujuan projek adalah memahami “production processes” dan analisis “production performance” menggunakan “work measurement” kajian masa pada industri tersebut. Pengarang sedang menjalani projek di salah satu “small and medium Industries” atau SME yang bernama Yew Lee Industrial Brush di mana syarikat tersebut menghasilkan pelbagai jenis berus seperti “*household brooms, cleaning brush, baby care brushes, toilet bowl brush, industrial brush, industrial brushes*” dan sebagainya. Salah satu “*assembly lines*” yang menghasilkan produk family E550 model mempunyai produktiviti output yang rendah disebabkan “*assembly lines*” tersebut mempunyai masa pemprosesan yang tinggi. Keadaan ini telah menyebabkan “*bottleneck*” pada sesetengah proses and aliran proses yang tidak sejajar. Dengan itu, teknik meningkatkan “productivity” seperti pengiraan “takt time”, “production capacity chart“, “standized work combination table”, “standardized work chart” dan “operator balance chart” akan dicadangkan dan diperlaksanakan pada “assembly line” tersebut. Kesimpulannya, penglibatan pengarang dalam Projek Sarjana Muda telah memberi peluang untuk berpengalaman dalam situasi bekerja yang sebenar, meningkatkan keyakinan dalam diri dan professional etika kejuruteraan dalam diri pengarang.

## **ABSTRACT**

As the 4<sup>th</sup> year Bachelor Degree student, the requirement is to conduct a final year project in within 2 semester period in order to fulfill the requirements of Bachelor of Manufacturing Engineering course. The purpose of the final year project is to expose the students to engineering practice, professionalism engineering behavior, communication skills, build self confidence and instill the right work attitude within the students in order apply theory and practical knowledge in for future used by the way of conducting a final year project which title “Productivity Performance Improvement in A Manufacturing Company”. The aim of the project is to understand production processes in case company and to analyze the production performance using work measurement by apply time study technique. The author is conducting the project in a Small and Medium Industries named Yew Lee Industrial Brush which manufactures various type of brushes such as household brooms, cleaning brush, baby care brushes, toilet bowl brush, industrial brush, industrial brushes and etc. One of the assembly lines which produce family product model E550 has low productivity output due to the main problem is high processing time regarding to the assembly process. This situation eventually creates the bottleneck on certain processes and causes the inconsistent process flow. Therefore, the productivity improvement techniques such as the takt time calculation, production capacity chart, standardized work combination table, standardized work chart and operator balance chart are proposed in the assembly line. In the nutshell, the involvement of author in conducting the final year project has given the author a great opportunity to experience the real working environment, enhance soft and technical skills, build up confidence level and lastly, the professional engineering ethics within the author.

## **ACKNOWLEDGEMENTS**

I would like to express my deep appreciation and sincere gratitude to Professor Madya Dr Chong Kuan Eng, my final year project supervisor, for his wisdom, invaluable guidance and professionalism from the beginning to the end of my industrial training. PM Chong is always there to listen and to give me the professionalism advice. He taught me how to express my ideas and show me different ways to approach to my final year project.

A special thanks goes to my case company supervisor, Miss KK, who is the most responsible for helping me complete the final year project. Miss KK has been an excellent mentor and has provided unfailing support throughout my visit period to the case company. She taught me how to visualize the problems exist in the working environment, had confidence in me when I doubted myself, and brought out the good ideas in me. (Mostly importantly, he taught me how to smile to reduce stress!) Without her encouragement and constant guidance, I could not have finished my final year project. She was always there to meet and talk to my ideas and to ask me good question to help me think through my problem.

Last but not least, I thanks my family and those who have giving me their helping hands.

## DEDICATION

*I would first like to express heartfelt thanks for warmth of love to My  
Father & My Mother, Siblings, Friends and my love one.*

*Thanks you for the endless support and loves to me....  
May God bless those who have been giving me their support to  
excellence further in my future undertakings.*



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## **LIST OF ABBREVIATIONS, SYMBOLS, NOMENCLATURES**

|       |   |                             |
|-------|---|-----------------------------|
| SME   | - | Small and Medium Enterprise |
| TFP   | - | Total Factor Productivity   |
| NT    | - | Normal Time                 |
| ST    | - | Standard Time               |
| SPC   | - | Statistical Process Control |
| BBB   | - | Baby Bottle Brush           |
| BNB   | - | Baby Nipple Brush           |
| VA    | - | Value Added                 |
| NVA   | - | Non-Value Added             |
| BOPP  | - | Bag of Polypropylene        |
| FYP 1 | - | Final Year Project 1        |
| FYP 2 | - | Final Year Project 2        |

# CHAPTER 1

## INTRODUCTION

### 1.1 Background of the Project

Productivity can be defined as the application of the various resources (inputs) of an organization, industry or country, in order to achieve certain planned and desired results (outputs). Productivity measurement entails a comparison of outputs to inputs are normally by calculation of the productivity index (output/input ratio). Thus, productivity improvement has becomes the establishment of approaches to improve this productivity index. Therefore, efforts to improve the productivity performance in organizations have been important since the start of the industrial era. The productivity improvement has been identified as an important role for any organization, especially for the manufacturing sector to gain more profit that leads to prosperity.

Productivity performance improvement is the only way that can ensure that an organization goes toward a long term perspective and achieve profitability of organization. The effective methods is highly important to reduce the cycle time to finish the product in order to improve the productivity as well as achieving the takt time and fulfill from the customer demands. In order to achieve this purpose, work study method is studied and used in this project, which the research is divided into the two main categories consist of method study and work measurement. The main finding for this project is the process cycle time data of the operators to finish the products. The other findings in this study also involve in proposing productivity improvement techniques to improve the production.

Work measurement has been around for many years but still can be extremely effective as measuring system of the working times, delays and different ways of



carrying out work. Work Measurement is also an application of techniques designed to establish the work content of a specified task and the time taken for a qualified worker to complete that task at a defined level of performance. One of the key uses of work measurement is to measure and monitor the performance of actual output to be compared with planned output. Work measurement also helps to determine to workforce level and compare between different working methods.

Stopwatch time study is one of the reliable work measurement techniques that recording the times and rate of working for the elements of a specified job, carried out under specified condition, and for analyzing the data so as to obtain the time necessary for carrying out the job at a defined level of performance. The basic procedures of the time study is analysis the job, specific measurement technique, and synthesis the various elemental of times. Time study is the oldest of the work measurement technique but it is flexible and cost effective for being applicable to any type of work carried out in any environment.

## **1.2 Project Background**

The case company was established in Malaysia in 1970 as Yew Lee Industrial Brush Sdn Bhd, located at Batu Berendam, Malacca. Yew Lee Industrial Brush is one of the Small and Medium Enterprise (SME) in Malaysia. Different agencies of SMEs have their own criteria based on the benchmarking of the company's annual sales turnover, number of full time employees or stakeholders' funds. Since then Yew Lee Industrial Brush has grown from strength to strength to become Malaysia's foremost and reputable manufacturer of household as well as industrial brooms and brushes. The Company mission is to sustain leadership in the industry while always providing customers with products and services in the highest quality attainable.

The type of products which manufacture by the company are household brooms, cleaning brush, baby care brushes, toilet bowl brush, industrial brush, industrial brushes, brush for steel mill industry, scrubbing brushes, cylinder brushes, road sweeper, road sweeper (side brooms), strip sealing brushes, strip brushes, twisted in-wire brushes and staple set brushes. Besides household and industrial brooms and brushes, the company also manufactures special brushes such as feng shui broom;

brings good luck, harmony, prosperity and happiness, indoor broom, and millennium Luban broom. Based on the company annual performance sales, the baby product model E550 has the highest demand of sales from the customers.

In the early 1990s, the company acquired the world's most advance European assembly technology to ensure output efficiency and high quality finished products. The company products are utilized extensively in varied industries ranging from electronic, rubber, plastics, food and beverage, wood and also textile. With its steadfast commitment and pride to manufacture products for worldwide customers with quality excellence and finish, Yew Lee Industrial Brush Sdn Bhd is always doing the best to keep abreast and succeed in the competitive economy.

### **1.3 Problem Statement**

The main problem of the assembly line is high processing time regarding to the assembly process. This situation eventually created the bottleneck on the certain processes and causes the process flow inconsistent. Thus, some of the processes are required extra working time to assemble and lead to the delay on lead time. Moreover, the problems of delay lead to the low productivity of the product and increase on production lead time. Therefore, the company could not meet the customer demand due the inconsistent of production throughput. In addition, there are no work measurement techniques and the productivity improvement techniques applied in the company. In order to improve the productivity performance of the assembly line, the bottleneck that acts as constrain of the capacity of output has to be eliminated. In simultaneously, assembly process time has to be reduced to achieve the demanded output of the company. Yew Lee Industrial Brush Sdn Bhd is also facing the poor workforce level of planning. This is due to the insufficient of manpower and delay on the production performance. In such a way, the appropriate measurement techniques and necessary improvement techniques are required to carry out in the company to improve the productivity performance of the company.

## **1.4 Objective of Project**

The objectives of the project are:

- I. To understand production processes in case company.
- II. To analyze the production performance using work measurement by apply time study technique.
- III. To propose the productivity improvement techniques to improve the company production.

## **1.5 Scope**

The project is covered on the productivity performance improvement of one of the assembly lines in Yew Lee Industrial Brush Sdn Bhd which located at Batu Berendam, Malacca. Since the company manufactures various types of product, the project would only select on one product family. The family consists of products which are the most profitable product and highest monthly demand. This project will focused primarily on the improvement of the productivity performance in term of the processing time of the assembly line in the company. The work study techniques will be used to analyze the processes. The processes time in assembly line will be recorded by using stopwatch time study technique. Thus, the productivity improvement tools such as time study sheet, flow process chart, production takt time calculation and etc. will be proposed into the project. Other aspects such as production planning, scheduling and quality performance will not be covered in the project.

## **1.6 Potential Benefit of Study**

The study is conducted by using real manufacturing processes data. The study shows the importance of the productivity performance improvement in industries. In the same time, it provided the company with knowledge on how to apply the productivity improvement techniques to improve the processing time. While

conducting the project, the author able to learn and propose the improvement techniques into the real industry.

## **CHAPTER 2**

### **LITERATURE REVIEW**

For chapter 2, it consists of the literature review on productivity, productivity performance, productivity improvement, work study, stopwatch time study technique and productivity improvement tools. The primary objective of this review is aim for searching the current status on productivity performance and productivity improvement in industry. Furthermore, this chapter will narrow the topics into the flow process chart, measurement technique using stopwatch time study method and productivity improvement techniques.

#### **2.1 Introduction**

The productivity movement has been around for over 50 years. In this time a number of techniques, methodologies and productivity strategies have been developed. However, the pursuit of improved productivity still seems an imperfect science even the term itself seems to be interpreted differently by different organizations. Therefore, an effective productivity measurement system is essential for the organization to formulate clear goals and targets with regard to productivity as well as identify problem or bottleneck of the processes. Work measurement is the measurement technique that establishing the time that a given task would take to complete. There are various ways in work can be measured and variety of techniques have been established. One of the techniques used is the stopwatch time study which consists of three stages; analysis phase, measurement phase and synthesis phase. This techniques used is directly observation on the work with a time standard for the work by converting the observed time through performance rating of the worker carrying

out the work. Thus, the bottleneck of the processes can be identified as well as the productivity improvement tools could be carried out.

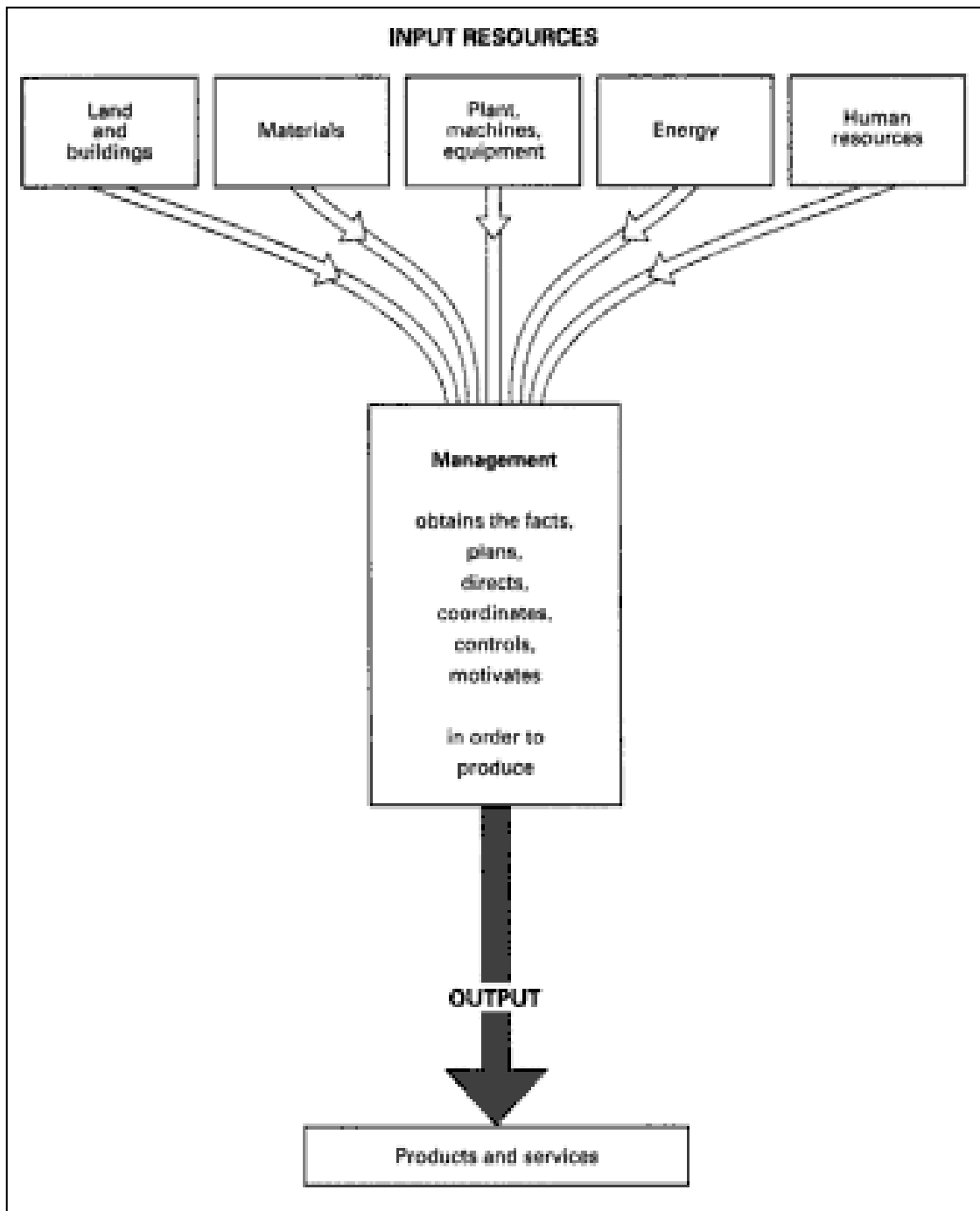
## 2.2 Productivity

The concept of productivity generally is defined as the relation between output and input, have been available for over two centuries and applied in many different type of industry. In figure 2.1 illustrate management function of an organization or industry. In industrial engineering, productivity is generally defined as the relation of output (i.e. produced goods) to input (i.e. consumed resources) in the manufacturing transformation process (Sumanth, 1994). Productivity is one of the most productivity is one of the basic variables governing economic production activities, perhaps the most important one. However, at the same time as productivity is seen as one of the most vital factors affecting a manufacturing company's competitiveness, researchers argue that productivity is often relegated to second rank, and neglected or ignored by those who influence production processes (Singh *et al.*, 2000).

For the verbal definitions which aim to explain what the concept of productivity means. They are useful since they can create a "norm", a shared view of what an organization is striving to achieve. They can also be used when specifying and explaining an organization's strategic objectives (Bjorkman, 1991). There are numerous variations on basic ratio of productivity term, which is very useful in practice. Productivity has several sub-concepts. There are total productivity, total factor productivity, partial productivity. Total productivity is the most comprehensive productivity concept and it is defined as the total output over total input used to produce the output. A more common productivity concept is total factor productivity. Total factor productivity is defined as the ratio of net output (excluding material from gross output) and sum of labor and capital inputs (Kendrick, 1961). Total Factor Productivity (TFP) is also the portion of output not explained by the amount of inputs used in production. As such, its level is determined by how efficiently and intensely the inputs are utilized in production. Partial productivity is the ratio of gross net output to single factor input (Sumanth, 1980). The partial productivity can be further classified by the type of input:

- Labor productivity
- Capital productivity
- Material productivity
- Energy productivity

Table 2.1 shows a number of these variations, created from examining the term from different perspectives (Thomas and Baron, 1994). According to Bernolak (1997) provides a useful verbal explanation of productivity is related to manufacturing. *Productivity means how much and how well we produce from the resources used. If we produce more or better goods from the same resources, we increase productivity. Or if we produce the same goods from lesser resources, we also increase productivity. By “resources”, we mean all human and physical resources, i.e. the people who produce the goods or provide the services, and the assets with which the people can produce the goods or provide the services. The resources that people use include the land and buildings, fixed and moving machines and equipment, tools, raw materials, inventories and other current asset.*



**Figure 2.1:** Role of management in coordinating the resources of an organization (George Kanawaty, 1992)