UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPING A METHODOLOGY FOR PRODUCTIVITY 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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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:

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ABSTRAK

Produktiviti dalam sesebuah syarikat adalah penting untuk menentukan keseluruhan prestasi syarikat tersebut. Untuk menetapkan atau memperbaik produktiviti prestasi dalam keadaan yang memuaskan, sesetengah syarikat contohnya "*Multinational Companies (MNCs)*" mengadakan perbaikan produktiviti activiti untuk mengenali punca-punca yang menyumbang kepada keburukan produktiviti prestasi. Walau bagaimanupun, syarikat-syarikat tempatan (SMEs) tidak mempunyai kebolehan and peluang untuk memperbaik produktiviti syarikat-syarikatnya akibat daripada kekurangan sumber kepakaran and pengetahuan. Oleh itu, kajian ini member focus dalam membina metodologi yang betul untuk memperbaik produktiviti di dalam syarikat pembuatan. Tujuan kajian ini juga untuk membina prosedur langkah demi langkah mengenai penggunaan alat memperbaik produktiviti. Teras kajian ini juga untuk membina satu buku panduan mengenai cara penggunaan alat memperbaik produktiviti berdasar kepada alat memperbaik produktiviti yang telah dicadangkan. Kajian terhadap alat ini dijalankan berdasar kepada informasi diperoleh daripada "*journals*" dan laman web. Metodologi dalam laporan ini menunjukkan aliran integrasi alat memperbaik produktiviti yang akan digunakan oleh SMEs. Metodologi ini akan membantu SMEs dengan memberi pengetahuan kepada syarikat-syarikat tersebut mengenai cara-cara untuk memperbaik produktiviti sejak alat-alat ini telah berjaya memperbaik produktiviti syarikat-syarikat MNCs.

ABSTRACT

Productivity in a company is essential due to determine the overall performance of the company. In order to maintain or improve the performance of productivity at good condition, some companies such as Multinational Companies (MNCs) conducted productivity improvement activities to identify the root causes that contribute to the poor productivity performance. However, small and medium enterprises (SMEs) do not have the capabilities and chances to improve their productivity due to lack of expertise and knowledge. Hence, this study focuses on developing a proper methodology for productivity improvement in a manufacturing company. The aim of this study is to develop the step-by-step procedures on how to use the productivity improvement tools. The essence of this study is to develop a handbook or manual instruction of productivity improvement methodology using the proposed productivity improvement tools. The research on the tools will be carried out through findings from journals and websites. The methodology presented in the report shows the flow of integrated productivity improvement tools that will be used by the SMEs. The methodology will help the SMEs by giving them the knowledge on how to improve the productivity since the tools have successfully improved the productivity in MNCs.

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DEDICATION

I would like to convey my appreciation to my parents, siblings, and friends who have been giving me their moral supports continuously throughout my entire life.

Thank you for the undivided loves and supports.

May God bless them for their positive supports which give me motivation to excellence in my future undertakings.

TABLE OF CONTENT

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

2-D	-	2-Dimensional
APEC	-	Asia-Pacific Economic Cooperation
ASSY	-	Assembly
BF	-	Bush Fitting
BPS	-	Boeing Production System
BSW	-	Base Seam Welding
CT	-	Cycle Time
DFC	-	Damping Force Checking
FSW	-	Final Seam Welding
GUI	-	Graphical User Interface
HPC	-	High Pressure Cleaning
JES	-	Job Element Sheets
MNC	-	Multinational Company
MRS	-	Manufacturing-Related Services
NT	-	Normal Time
OEE	-	Overall Equipment Effectiveness
OSW	-	Outer Shell Welding
OT	-	Observed Time
PPE	-	Personal Protective Equipment
PRA	-	Piston Rod Assembly
QC	-	Quality Control
SA	-	Shock Absorber
SIPS	-	Standard In Process Stock
SME	-	Small and Medium Enterprises
SMED	-	Single Minute Exchange Die
SMI	-	Small and Medium Industries
SMIDEC	-	Small and Medium Industries Development Corporation
SMIDP	-	Small and Medium Industries Development Plan
SPC	-	Statistical Process Control
ST	-	Standard Time

TPM	-	Total Preventive Maintenance
TPM	-	Total Production Maintenance
TQC	-	Total Quality Control
TQM	-	Total Quality Management
WIP	-	Work-In-Process

CHAPTER 1
INTRODUCTION

Productivity is a measure of the ratio between the output of a process and the input of resources needed for it. It is usually expressed as output divided by input. The more productive each of those resources can be manufactured, the lower the final cost of the product because cost of any product or service is the sum of the costs of resources used in manufacturing it. In a free market, the lower the cost of a product, the higher the demand of products will generate and more profitable the enterprise will generate. There are four ways to improve productivity by maintaining input but increasing output, decreasing input but maintaining output, and decreasing input but increasing output.

Today, no organization or enterprise can bear the ignorance of constant need to improve productivity and no any employee can evade his/ her responsibility for playing their part in the work of productivity improvement. It is not difficult to do the productivity improvement once the basic of measurement, standard setting, and method improvement is known.

Productivity improvement is significant to manufacturing company in order to optimize the operations, use fewer resources and eliminate wastes. By optimizing the operations using fewer resources, it helps the company to reduce the cost of a product as well as eliminate wastes. It is imperative for any manufacturing company to optimize their operations to compete in an ever-increasing competitive economy.
In Multinational Corporations (MNCs) especially Japan, has been widely practicing the productivity improvement concept by manufacturing products according to number of orders rather than mass production. Although manufacture in a low

quantity, it able to fulfill the demand of the customers and successfully to build its brand name worldwide. According to Kikuchi (2006), Japan has developed a number of methods and approaches for improving the quality and productivity of industry such as Five S's (5S), Quality Control (QC) circle, Total Quality Control and Total Quality Management (TQC/ TQM), Kaizen, and Toyota's Production System (Just-In-Time system and Kanban system) have attracted the Western countries and developing countries.

The purpose of this project is about developing a methodology for productivity improvement in a manufacturing company. This project focuses on improving the productivity of an assembly line at a manufacturing company by using productivity improvement tools. A methodology comprises of systematic procedures on using the productivity improvement tools is developed as a reference for implementation in manufacturing companies.

The purpose of developing this methodology is to help the manufacturing companies to stay competitive and improve their productivity. This methodology will consist of productivity improvement procedures such as problem identification in an assembly line, methods for pilot study, and applying improvement tools to eliminate wastes, and increase the productivity and profits. The proposed methodology is the basic productivity improvement procedure which has been mostly applied by the Japanese Multinational Corporations.

1.1 Problem Statement

Many manufacturing companies in Malaysia comprise of small and medium enterprises (SMEs). For Malaysia's future development, these SMEs play an important role to contribute to the country's economy by providing the foundation for the growth of new industries while strengthening existing ones. To achieve sustainable growth, it is imperative for these SMEs to improve the quality and productivity to remain competitive in the global market. However, the small size and limited resources remain obstacles to productivity improvement in small and medium

sized enterprises in Malaysia. The companies may not have the expertise and knowledge to identify and implement suitable strategies, concepts and methods to improve their operations.

The development of a methodology will provide some guidelines for these companies to implement a systematic approach to improve their quality of their products and productivity of the operations.

1.2 Objectives

The objectives of this project are:

1. To understand various methods and tools used for productivity improvement.
2. Develop a productivity improvement methodology for a generic manufacturing company.
3. To test the proposed methodology with sample data.
4. To develop user instruction manual and software for the proposed methodology.

1.3 Scope

The scope of this project is to develop a productivity improvement methodology for a semi-automated or manual assembly line in a manufacturing company. In this project, several productivity improvement tools are employed and explained in detail using some examples. Application of the tools will be explained step-by-step and software for the tools will be developed using Microsoft Excel 2007. Other aspects such as production planning, scheduling, financial analysis, forecast, material flow, value stream, lean, simulation, and optimization will not be covered in this project.

CHAPTER 2

LITERATURE REVIEW

In Malaysia, an enterprise will be classified as a small and medium enterprise (SME) based on the number of employees or annual sales turnover (Secretariat to National SME Development Council, 2005). The definitions of SME can be applied for the following sectors such as Primary Agriculture, Manufacturing (including agro-based), Manufacturing-Related Services (MRS), and Services (including Information and Communications Technology). Based on the studies carried out by Saleh and Ndubisi (2006), Malaysian SMEs still face many domestic and global challenges in achieving economies of scale and competing internationally.

In this chapter, it will review about the Work Measurement, Standardized Work, and Statistical Process Control that contribute to the incremental of productivity level in a SME. Productivity improvement has become an essential aspect for a company to strive into international markets. Productivity improvement in a company is a function and a result of management efficiency, and is synonymous with good management. Productivity improvement recognizes interrelationship between the elements of the system and its environment. Thus, productivity improvement needs strategies in decisions and plans to achieve long-term productivity improvement goals. However, there are no productivity tools that are right. The tools may work for the one organization at a time but inappropriate for another organization. Lastly, this chapter will review the application of productivity improvement tools which have been applied in the MNCs and the challenges face by the SMEs in Malaysia.

2.1 Work Measurement

Work measurement is the use of accurate observation and recording to determine the time it would take for a qualified worker to complete a specific job to a required level of performance. These are also time studies. Times can be measured by synthetic timing; the time for each component of a job is measured, pre-determined motion time study; the times for different human motions required for the job are added up to arrive at an overall time, and analytical estimating; used when there are non-repetitive one-off jobs. Time measurement entails breaking a process into its procedures and measuring the instant each procedure starts and ends. The required steps are:

- Familiar with the process area and environments.
- Draft the process area layout.
- Show the work sequence.
- Write the work procedures.
- Measure the total cycle time (at least ten times).
- Measure the time for each work procedure (at least ten times).
- Identify and measure irregular work (unusual task occurrence).
- Write the Standardized Work Analysis Chart and Standardized Work Combination Table.

The times are calculated from knowledge of the operations and skills required.

2.1.1 Stopwatch Time Study

According to Fred E. Mayers (1992), time study was developed by Frederick W. Taylor in about 1880 which he is the first person to use a stopwatch to study and measure work content with his purpose to define “a fair day’s work”. Stopwatch time study is the work measurement to determine the baseline for future improvement and used to analyze a specific process by qualified workers in an effort to find the most efficient ways in terms of time. The equipment used is stopwatch due to accuracy in developing data of time.

Time Study has been widely used to determine the productivity levels and production job schedules. In Time Study, performance rating is needed for equitably determining the time required to perform a task by the normal operator after the observed values of the operation under study have been recorded. Allowance factor in Time Study is calculated as an addition of an allowance to take care of the many interruptions, delays, and slowdowns brought on by fatigue which enters into every work assignment.

A normal operator's Time Study is recorded due to as a qualified, thoroughly experienced operator who is working under conditions as they customarily prevail at the workstation, at a pace that is neither fast nor slow, but representative of average. The basic steps for Stopwatch Time Study are define the task to be studied and inform the worker who will be studied, determine the number of cycles to observe, time the job and rate the worker's performance, and compute the standard time. The Figure 2.1 shows the example of Time Study sheet.

Line / Process: _____ Date / Time: ___/___/___/_____:_____

Observed by: _____

#	Step	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Best Time	Observations (changeover time)
1		0																
2																		
3																		
4																		
5																		
6																		
7																		
8																		
9																		
10																		
11																		
12																		
13																		
14																		
15																		
Complete Cycle Time																		

Figure 2.1: One of the examples of Time Study sheet (Krichbaum, 2008)