



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**APPLICATION OF WORK STUDY TO REDUCE
OPERATIONS TIME AT GLOVE INDUSTRY**

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

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ABSTRAK

Kecekapan dan keberkesanan kerja menjadi salah satu faktor utama dalam pelaksanaan syarikat perkilangan. Tujuan kajian ini adalah untuk mengurangkan masa operasi di sebuah jabatan pembungkusan yang boleh membawa kepada peningkatan produktiviti. Permohonan pengajian kerja telah dijalankan berdasarkan pemerhatian visual dan pengumpulan data yang telah dilakukan di jabatan. Tambahan pula, pemerhatian ialah tumpuan berdasarkan prosedur operasi semasa yang perlu dibayar kepada pekerja-pekerja di jabatan pembungkusan dan masa kitaran setiap elemen kerja diukur dan direkodkan dalam borang yang disediakan. Oleh itu, masa yang standard dikira berdasarkan kitaran masa mereka dengan mengambil kira faktor-faktor elaan termasuk keperluan peribadi, keletihan dan kelewatan yang tidak dapat dielakkan. Untuk mengenal pasti permintaan pengeluaran sehari, masa takt telah dibangunkan dan dibandingkan dengan masa standard yang dikira dengan pendekatan kajian masa. Pembangunan kerja yang seragam juga telah digunakan untuk mencadangkan satu prosedur kerja yang baru yang dapat mengurangkan masa kitaran semasa bagi setiap pekerja yang berkaitan. Ini diikuti dengan pengenalan peningkatan dalam prestasi pekerja di seluruh objektif projek. Tahap produktiviti sistem semasa telah mengenal pasti 54%. Prosedur kerja yang baru juga dicadangkan dengan meminimumkan nilai bukan menambah aktiviti antara proses. Hasil kajian ini menunjukkan prestasi pekerja telah meningkat 45%.

ABSTRACT

Work efficiency and effectiveness becomes one of the key factors in the performance of manufacturing company. The purpose of this research is to reduce the operation time in a packaging department in glove manufactured industry. An application of work study was applied in order to increase the efficiency. Data collections through observations have been done in the packaging department. The observations were focus on the current operations procedures on workers in packaging department and the cycle time of each job elements was measured and recorded in prepared forms. The standard time computed based on their cycle time with the consideration of factors allowance included such as personal needs, fatigue and unavoidable delays. In order to identify whether the capacity meet the demand, takt time was developed and compare to the standard time. A standardized work was developed and used to propose new working procedures which able to reduce the current cycle time for each related worker. The productivity level of current system was identified of 54%. New working procedures were also proposed by minimizing the non-value added activities among the process. The result for this research shows the performance of workers in packing process by comparing the current standard time which used 6.69 seconds/units of product and the improved standard time, 3.58 seconds/units of product of the operations, the operations time improved up to 45%.

DEDICATION

This final year project is dedicated for my beloved supervisor, family and friends who advice and support.

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First of all, I was very appreciate to my supervisor, Professor Adi Saptari for his helpfulness and kindness for the guidance throughout the period in completing the thesis.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURES

OEM	-	Original Equipment Manufacturer
GDP	-	Gross Domestic Product
TFP	-	Total Factor Productivity
TPS	-	Toyota Production System
JIT	-	Just In Time
WIP	-	Work in Progress
MAPD	-	Mean Absolute Percentage Deviation
SOP	-	Standard Operating Procedures

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Currently, manufacturing industries having a remarkable grow in Malaysia comparatively to previous decades. According to the Quarterly Bulletin (2014), state that manufacturing sector in Malaysia was sustained at 78% with the overall capacity utilisation rate. Hence, manufacturing industries continued to improve the productivity so that to increase the swell of both foreign and domestic investment in this new era globalisation. Furthermore, the growth productivity usually plays a main role as an important criterion in order to enhance Malaysia's economy to maintain a sustainable economic development.

Roger (1998) clarify that the productivity is well-defined as the relation of output to input for a specific production condition. The enhancement in the production technology might contribute to the improvement of productivity. According to Krugman (1994), states that "the productivity isn't everything, but in the long run it is almost everything". A country's capability toward enrich, its living standard across the time is influenced by almost fully on its capability to increase its yield over each of manpower. Moreover, productivity is basically the efficiency in an industry or companies which able to convert resources into goods or services. This is an added value progression that can increase the living standard efficiently.

Nowadays, any industries attempt hardly to explore a useful work approaches and techniques which able to help produce goods with better quality at reasonable costs. Work study is one of a suitable technique used in the industrial engineering system;

the main goal is to enhance the productivity and the overall efficiency at the particular organization (Lu *et al*, 2011). The two methods such as method study and time study which can achieve the purpose to improve production process, design on the production, operation simplification, and reducing the worker fatigue. Based on the research from Kulkarni *et al* (2014) stated that the meaning of work study is the organized methodology of developing different yet correlated activities such as to improve the efficient use of properties and to develop a standard of performance and quality for the events to be carried out.

Lean manufacturing concept is a new ways of thinking in order to improve the productivity in the manufacturing industries recently. It is a systematic approach for defining, eliminating wastes and increases the production capacity in minimum cost invested. Lean manufacturing technique is also a working methodology concentrated on attaining the shortest possible cycle time by eliminating or reducing waste with related works. In managing any company or industries, lean manufacturing concept is one of the approaches to effecting stream line of the productivity. The seven wastes in the lean manufacturing that highlighted such as inventory, motion, waiting time, processing, defect, overproduction and transportation. By eliminating the wastes will enhance the quality of the product and also reduce the lead time and cost of goods.

1.2 Company Profile

This study is conducted in a Company X which manufactures gloves, located at Klang, Selangor. The main purpose in this research is to improve the worker's performance and efficiency by reduce the operation time. The company was established in 1979, at that time this company offered a range of a cut less bearing that were frequently applied in the marine industry. With a market growth of demand, the company have continuous to process rapidly and were one of the biggest companies in Malaysia to endeavour glove manufacturing. Then the first gloves production line in August 1988 and today the company able to make 16 billion pieces of gloves per annum. The company's stellar performances and strong

reputation as a high quality latex OEM glove manufacturer has resulted in a business network that spreads to more than 100 countries around the world, including the USA, Canada, Europe, Asia Pacific, Latin America, Middle East and Australia. With a progressive management and dynamic outlook, Company X was continuously strive towards for better quality, thinking ahead and customer's satisfaction that always be the main concern in everything they do and produce. Company X also always ensures that "A Name You Can Trust" and aimed at building the name of the company for quality moulded and extruded articles.

1.3 Problem Statement

Company X is one of a largest glove manufactured industries in process of several type of gloves such as examiner glove, surgical glove and industries glove. Recently, the customers demand from the company was gradually increased 40% based on the discussion with the company's production manager, therefore, in order to meet the daily demand, the production department have to increase the product output per day. However, by increasing the daily production has an impact and burden to the packaging department. Since the packaging process was manually done by a group of workers, the packaging department was unable to meet the daily target that set from company which is 1100 cartons of product have to packed by each packaging line. During the brainstorming with the production manager, we were found out that in the packaging department unable to meet the target that set by top management of the company. Therefore, Company X is looking for a new ways to improve the productivity in the packaging department.

1.4 Objectives

The objectives in this research are:

- a) To determine the current productivity level at Packaging Department through time study technique.

- b) To improve the efficiency and performance of workers through analysing working procedures

1.5 Scope and Limitation

This research is performed in the packaging department. This study focuses on the workers in the packaging lines. Others workers such as cleaner, material handler and office's staffs are excluded.

Lean thinking approach such as eliminate and reduce the non-value added activities will be applied in the study. One of the methods is time study method is applied to improve the worker in packaging department. Furthermore, the process time studies is purposed for making analysis on the cycle time of the workers to finish the packaging in a pallet, whereas the transportation of the goods and the material handling time are not to be considered.

1.6 Organisation of the Report

For the ease to read and comprehension, the structure in the Final Year Project is written by following arrangement accordingly which has been defined.

- a) Chapter 1: Introduction

The chapter includes the background of study, company profile, problem statement, objectives and the scope and limitation of study.

- b) Chapter 2: Literature Review

This chapter reviews any of information related to the productivity and lean manufacturing that related to the project that supported by the information from past studies such as journal or books.

c) Chapter 3: Methodology

This chapter explain about the overview of the research method that to be used in the project, the flow of the research, how to conduct the methods mentioned and the procedure and work flow of the project in detail.

d) Chapter 4: Result and Discussion

The chapter includes the data collection about the process time studies and giving a detail discussion about how to implement the process improvement.

e) Chapter 5: Conclusion and Recommendation

This chapter is to summarize the whole project whether the objectives has been achieving or not. Besides, a several suggestion is included as a future reference.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction to Glove Industry

Low and Mohamed (2009), state that Malaysia is one of a largest exporter of gloves in the world. According to their research, Malaysia demanded more than 49.7% of the export value among the total gloves export of the world. Besides, Malaysia's dominance is more remarkable, constituting for 69.8% approximately 100 billion pieces rubber gloves of overall world export of gloves based on the quality tenure. Form the report of Market Watch 2012, the rubber product industry can be grouped into the latex, tire-related and industrial along with general rubber produces. In the rubber gloves industry was categorized under latex products with an average annual Gross Domestic Product (GDP) of RM6 billion since year 2000.

According to the Rubber Journal Asia (2011), state those glove industries in Malaysia still keep going stronger. Although Malaysia was no longer the biggest source of natural rubber latex since year 1990, however it has a good supply of nitrile latex. The demand of nitrile latex in the world has been on the upward trend in the previous five years. Boey (2013) clarify that the increased volume of the demand comes from hospital; hence it can conclude that the healthcare industry is one of an important sector for glove manufacturer.

Moreover, according to the report of Market Watch 2012, it state that the top three rubber manufacturing countries specifically Malaysia, Thailand and Indonesia at a standstill setting on the export limit quotas following a rise in prices in the second half of year 2009. Since the world wide spread of the influenza H1N1 has given rise

to the increased of demand particularly on examination rubber gloves from overseas customers. Therefore, the local supplier or producers have gradually increased their production up to maximum capacity to meet international market's requirement and satisfaction.

2.2 Productivity

The definition of productivity generally derives as the ratio of output over input. The productivity also expressed as the output like quantity of goods or services which have a close relationship with input such the amount of labor, capital, machine and other resources to be produced. According to the Maynard's Industrial Engineering Handbook, the understanding of productivity has been further complicated, it does not necessary mean that by producing effectively have the high productive but it should be by producing based on the market demand only when it is needed with a competitive worth. The productivity has to be involved the customer demand and expectation by excluding the wastes and error mean that whatever that has been produced that market need do not want will be not counted into the productivity derivation.

Tanase and Tidor (2012) state that in order to run a smooth activity and organization in an industry, productivity, efficiency and performance were play main roles and involve in various issues essential. Therefore, in the purpose to determine the performance with the expression of inputs and outputs within the organization, the analysis on the efficiency and productivity will be concerned and paid more attention since the optimum values of efficiency and productivity will show a greater level of performance. By keeping improve the productivity is one of a principle source of rising the living standards and more added value in the production, this can be leaded to an increase of disposable income.

2.3 Productivity Measurement

Productivity measurement is a requirement for improving productivity. As Drucker, who is widely related as the pioneer of modern management theory which stated as “Without productivity objectives, a business does not have direction. Without productivity measurement, a business does not have control.” Therefore, the measurement plays a significant role in the idea on the management of productivity which able to support the progress of organization in well condition. Figure 2.1 shows the framework impact the management system with the few phases.



Figure 2.1: Impact framework on management system (Adopted by publisher SPRING Singapore, 2011)

From the Figure 2.1 shows, the uses of measures in productivity management for the phase I by set an overall productivity goal for the organization and raise the awareness from the employees. While in the phase II was able to access the organization’s current performance and identify gaps and areas for improvement. Then, by proceeding to phase III is to set targets, formulate a strategies and implement the specific actions. After implementing the measurement system in phase

IV, monitor and emphasize the performance by monitor and review the plans, account to various stakeholder and link effort and reward to motivate employees.

Based on the research of Xiao and Dai (2011), stated that “it is certain that the emergence as key questions of the knowledge work and a knowledge worker’s productivity will bring the fundamental changes in the very structure and nature of the economic system. Work on the productivity of knowledge work and the knowledge worker has barely begun, but most important contribution and management need to make in the 21th century is to measure and increase the productivity of knowledge work and knowledge workers, also it is the most important management task in the new century.” According to Maxim, stated: “If we can’t measure it, we can’t manage it”. To enable an organization or a company to accomplish the set of goals and keeping the improvement, certain category of productivity measurements have to been monitored, evaluated and process improvement. In the previous study stated that knowledge work productivity is how to identify the productivity by whose responsibilities are not yet figured out, not at all standard production time, be charged by different of workers. Besides, the natures of knowledge work have high complexity, not easy to be observed and deliberated.

Adler (1987) stated that the approach that used in the research that desired a performance measure that could express the new role that accredited to manufacturing industry, that would be focused the overall efficiency of resource use rather than focus on direct labor. Next, enable more significant analysis from the department’s performance over the critical startup period, then permit to compare the several of department which producing the same mechanism. Overall with the method applied was able to establish a wise and useful system.

2.3.1 Labor Productivity

Labor productivity define as a measurement of economic growth of a country which are measure the quantities of goods produced and services by an hour of labor. There are three main factors that affect the growing of the labor productivity such as

the capital, new technology and human resource. Rebecca (2008) clarify that labor productivity is a revealing instruction of numerous economic pointers as offered a dynamic measure of growing in economic, competitiveness and standard of livings within an economy which able to describe the principle economic foundation that are essentially for both growing of economic and social expansion. Labor productivity was equal to the ratio between the volume measure of output and a measure of input use. Whereas the volume identified of output referred to quantities of products that produced by the worker while the input which is the most essential factor that influence the results of the productivity was emphasize on the time, effort and skills of the worker.

Wang *et al* (2011) states that by consuming the production quantities manufactured in a standard working time to calculate the labor productivity, the more goods produced per unit time, the greater the labor productivity will be. Besides, it also can use the spent working time to produce a unit of product to identify the level of labor productivity, the less working times needed per unit product, the higher the labor productivity. By judging the labor productivity that influence by these factors including year working days, daily working hours, utilization rate of man-hours, work load and man-hours according to the calculation formula below:

$$\text{Labor Productivity} = \frac{\text{Working hours} \times \text{Utilization rate} \times \text{Work load}}{\text{Unit part man hours}} \dots\dots\dots (1)$$

2.3.2 Machine Productivity

Currently, a more flexible and reliable production resolution is required even than before in the manufacturing sector. A shortened of lead time, an increased in the complication of part identification, decreased in budgets for tooling and a zero defect on quality are preferred that stated by Simpson (2003).

Machine plays an essential role in overall performance. As a matter of fact, the most of the factors that influencing the overall productivity of an organization are

classified as technology, machinery, personnel, management, rule and regulation and procedures. These factors were mainly focused with the condition of machine or a specific period status (Ebrahimipour and Nagasaka, 2003).

2.3.3 Total Factor Productivity (TFP)

Total factor productivity is productivity included all the factors of production, delivers a more reliable methodical framework of the most investigational research on productivity. Based on the research of Asgari and Wong (2010) were clarify that the improvement in Malaysian manufacturing TFP by stochastic frontier method throughout year from 1981 to 1984, and declined throughout year 1987 to 1996.

TFP measure able to present the relationship between the developments of output and input, formulated as a output ratio to input. From the research of Pratt *et al* (2008) show that a productivity growing without an increase in inputs is the best kind of development instead of achieving a certain level of output by rising the inputs. Nevertheless, it is both conceptual and empirical difficult in order to measure the total input and output.

Sumanth (1984) clarify that the measurement, evaluation, planning and improving were delivered continuous in measurement of Total Productivity Management Cycle. The purpose is to improve the total productivity, reflected in reducing of the units cost of products produced with a better quality. Total Productivity can be formulated as the overall measure of economic effectiveness on the source of output per unit of all resources developed.

$$Total\ Productivity = \frac{Total\ output}{Labor+Material+Capital+Energy+Others} \dots\dots\dots (2)$$

2.4 Lean Manufacturing

Lean manufacturing is an operational strategy involves never ending effort to identify and eliminate the wastages of the organization's activities that no added value. It is describing form Toyota Production System (TPS) with goals of achieving high quality, lowest price, shortest lead time, best safety and high morale. The technique used often to shorten the consuming time between the customer demands with shipment, besides it is practiced to improve profitability, customer satisfaction, throughput time and employee's morale.

The very first concept of Lean manufacturing was came from a book namely „The Machine That Changed the World“ published by Womack at year 1990 Through the book, the Lean was emphasis on the key words of reducing process variability, decreasing the system cycle times, removing the wastages in manufacturing cycle as mentioned by Womack and Jones (1990). Henry Ford had been mention of Lean thinking in year of 1926 with the quote: “One of the most noteworthy accomplishments in keeping the price of Ford products low is the gradual shortening of the production cycle. The longer of article is in the process of manufacture and the more it is moved about, the greater is its ultimate cost.”

2.5 Timeline of Lean Manufacturing

In the early development of Lean manufacturing or Just in Time Production has to go back to the concept of interchangeable parts by Eli Whitney since 1799 when he had a contract to produce 10000 muskets with an unbelievably low price. Later in year 1890's, Frederick W. Taylor started to seek at individual workers and technique of the work. The result as in Lean concept was the Time Study and Work Standardization. Later on a Motion Study was added by Frank Gilbreth to focus on all work components which included non-value added activities which normally happened between the values added elements.

Then, starting on year 1910, there was Henry Ford with his Ford system. They considered all the components such as the machine, people, tooling and product from the manufacturing system, and arranged all of the elements in a continuous system for manufacturing the automobile. Ford can be considered the first practitioner of Lean Manufacturing and JIT. Ford assembly lines. Moreover, Ishikawa, Edwards Deming and Joseph Juran were studied about American production methods with certain attention on Ford practices and the Statistical Quality Control practices. Furthermore, at Toyota Motor Company, Taichii Ohno and Shigeo Shingo started to integrate Ford production and other techniques into a method called Toyota Production System or JIT. Figure 2.2 briefly shows the timeline and several characters whose was contributed in Lean Manufacturing.

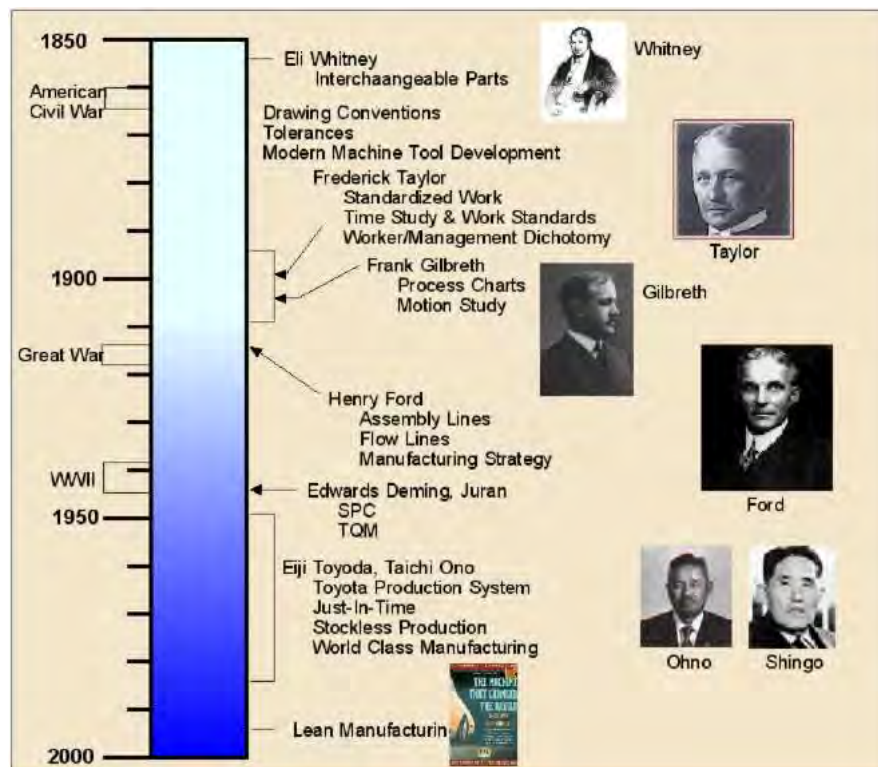


Figure 2.2: Timeline of Lean Concept

2.6 Lean Principles

From the current concept of Lean, it was guided and described into five key principles which are: