



**NATIONAL TECHNICAL UNIVERSITY COLLEGE OF
MALAYSIA**

Application of Lean Principles in Manufacturing Companies

Thesis submitted in accordance with the requirements of the
National Technical University College of Malaysia for the Degree of
Bachelor of Engineering (Honors) Manufacturing (Process)

By

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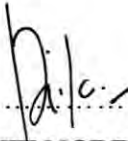
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APPROVAL

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ABSTRACT

“Lean Manufacturing” is a philosophy used in a lot of companies around the world today. This manufacturing concept, which was developed by Toyota, has been advocated as a means to achieve large improvements in the performance of various other industries. However through this philosophy, do Melaka Manufacturing companies are aware about this. Generally this awareness is not exposed widely referring to this philosophy. This study brings together a review of the literature of application of Lean Principles in manufacturing companies. Most of the attention, which has been given to this study, is about the awareness implementation of the Lean Principles in Melaka Manufacturing companies. Studies, reporting data of this information are raised from the questionnaires result. The questionnaires will be distributed to the manufacturing companies, which have been chosen in Melaka. Then it had been evaluated and analyzed from the feedback about their understanding of this philosophy and their implementation worked.

Keyword: Lean Principles, Lean Manufacturing, Manufacturing Industries in Melaka

ABSTRAK

“Lean Manufacturing” adalah salah satu falsafah yang digunakan oleh banyak industri pembuatan. Konsep ini diwujudkan oleh Toyota dan seterusnya dikatakan sebagai salah satu pencapaian kemajuan dalam sektor pembuatan kepada pelbagai industri. Walau bagaimanapun melalui falsafah ini, sejauh mana Industri perkilangan di Melaka sedar kewujudannya dan kepentingannya. Secara umumnya, dilihat kesedaran ini tidaklah begitu meluas mengenai falsafah Lean. Oleh itu kajian ini akan menyertakan tentang kajian-kajian yang terdahulu termasuklah aplikasi falsafah Lean dalam industri pembuatan. Fokus utama yang dapat dilihat dalam penggunaan falsafah ini adalah penghapusan pembaziran. Maklumat kajian ini akan diperolehi dari keputusan borang kaji selidik. Borang kaji selidik ini akan diedarkan kepada industri-industri pembuatan di sekitar negeri Melaka. Kemudian pengiraan dan analisis dibuat berdasarkan kepada maklum balas yang diterima mengenai sejauh mana pemahaman dan perlaksanaan mereka. Kriteria pemilihan industri adalah berdasarkan kepada sistem pengurusan yang baik. Ini adalah untuk menjelaskan lagi pemahaman pendekatan falsafah tersebut.

Keyword : Prinsip Pengurangan, Pengurangan Pembuatan, Industri Pembuatan di Melaka

DEDICATION

*Specially dedicated to;
My beloved Father, Nordin Bin Ismail
and My Mother, Asiah Binti Shaffie,
who are very concern, understanding, patient and supporting.
Thanks for everything.*

*To My Sister, Brothers and All My Family,
I also would like to say thanks.*

*A time to remember family and friends, too;
A time reminisces, and says;
Thank You...*

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LIST OF ABBREVIATIONS/ NOTATION/GLOSSARY OF TERMS

JIT	-	Just In Time
KUTKM	-	Kolej Universiti Kebangsaan Malaysia
M	-	Million
MITC	-	Melaka International Trade Centre
MoU	-	Memorandum of Understanding
QFD	-	Quality Functional Development
SMED	-	Single Minute Exchange of Die
SPSS	-	Statistical Process Statistic System
TPM	-	Total Preventive Maintenance
TQM	-	Total Quality Management
VSM	-	Value Stream Mapping

CHAPTER 1

INTRODUCTION

Lean Manufacturing is derived from the methods adopted by the successful Japanese automobile manufacturer, Toyota. Lean Manufacturing got international recognition after the release of the book “The Machine That Changed the World” by James Womack and Dan Jones, 1996. The focus at Toyota, according to Taichi Ohno, was "the absolute elimination of waste," where waste is anything that prevents the value-added flow of material from raw material to finished goods.

The Lean approach leads its practitioners to improve their organizations by focusing on the elimination of any and all the waste. Lean focuses on improvement and advocates techniques to control the flow of material on the shop floor. Lean manufacturing, which views continuous, one-piece flow as its ideal, and emphasizes optimizing and integrating systems of people, machines, materials, and facilities, can lead to significant improvements in quality, cost, on-time delivery, and performance. (Womack et al., 1990)

Womack et al., 1990 said that lean tools such as Value Stream Mapping, Quick Changeover/Setup Reduction, Single Minute Exchange of Dies (SMED), Kaizen, Cellular/Flow Manufacturing, Visual Workplace/5S Good Housekeeping, Total Productive Maintenance (TPM), and Pull/Kanban Systems are used to produce change. Companies and organizations employing these lean tools report significant gains in productivity and overall effectiveness within their specific entities.

Lean manufacturing "Uses less of everything compared with mass production - half of the human effort in the factory, half of the manufacturing floor space, half of the investment in tools, half of the engineering hours to develop a new product in half of the time. Also it requires keeping far less than half of the needed inventory on site (and) results in fewer defects this is accomplished through Teamwork, Communication, efficient use of resources & Continuous improvement. (Womack et al., 1990)

1.1 Problem Statement

In the Melaka Manufacturing Companies, the quality improvements management was important thing to produce the quality product by satisfying of the customer. Through lean philosophy, many improvement tools were used in these companies. However Lean principle is still can be said as the new approaches philosophy because of their awareness of Lean Principles itself which is can not be stated in clearly definition. I t is because Malaysian is a country on the move and to learn something new.

1.2 Importance of Study

This study was analyzed of the Lean Principles. This analyzed based on the feedback received from the questionnaire survey form. The questionnaire survey forms had been distributed to the Melaka Manufacturing companies. By doing this, their awareness and its applications of Lean principles had been asked. Besides this, their implementation and the major principles used were known. The strength of these approaches had been highlighted

1.3 Objectives of Study

This study specifically aims: -

- a) Examine what the manufacturing companies have awareness and understood about the Lean Principles.
- b) To know the situation of Lean Principles implementation in the manufacturing companies.
- c) Identify the major principles of Lean which are used in the manufacturing companies.

1.4 Scope of Study

This study had been focus on Melaka Manufacturing companies. Manufacturing plays a fundamental role in developing and sustaining customer satisfaction through the elements of quality, cost flexibility, reliability and innovation. They need to develop and adopt good management systems and practices such as Lean. The questionnaire had been given to the companies. This form indicates only to the Production manager to fill the questionnaire survey.

1.5 Limitation of Study

This study was restricted to Melaka Manufacturing companies. This study was undertaken by questionnaire survey. All the data was analyze using SPSS software and presented in this report.

1.6 Factory Background

Melaka Resources, with a land area of only 1,638 sq. meters practices a two-pronged development via industrialization and tourism. The state started inviting foreign investors in the early 70's and since then has met with commendable success. By the end of 1997, this state had registered a total investment of over RM16 billion leading to over 80,000 job opportunities. There are now 23 industrial estates with nearly 500 factories coming up from the United States, Germany, Japan, Taiwan and also Singapore.

Their products range from rubber gloves to sophisticated weaponry components and from footwear to computer parts. The state is also keen on the development of small-scale industries and to accommodate these, a number of estates have been earmarked for them. The Tanjung Kling and Batu Berendam areas are Free Trade Zones where imported materials used in manufacture are tax-free.

Current projections include developing Malacca into a manufacturing heaven to help Malaysia gain the status of a developed country by 2020. Over 140 acres in Alor Gajah have been earmarked for the automotive industry for the production of defense trucks by DRH-Hicom. This industry is expected to provide opportunities for supporting industries, like mould and die, metal stamping, plastic injection, alternators and many others. (Wee Hock Chye, 2001.)

In this study, the general type of the Melaka Manufacturing companies had been focused. There were electronic, engineering casting, iron & steel products, paper, printing, packaging & labeling, plastic, rubber industry, food and feedmill and medical devices. The Melaka Manufacturing companies have been selected and listed. Refer to the appendices to get in to its details.

CHAPTER 2

LITERATURE REVIEW

In this chapter, it will discuss on the literature review of the Lean Manufacturing. This chapter consists of the history of Lean, the evolution of Lean, definition of Lean, Lean principles, tool and techniques and application of Lean Manufacturing in industries and the strength in implementation of Lean.

2.1 The history of Lean

Lean Manufacturing started as the Toyota Production System (TPS), developed by the Toyoda (now Toyota) Motor Car Company. Toyoda started by manufacturing the looms for cloth manufacturing, and then branched into bicycles before WWII.

As the time passed on, Toyoda (now Toyota) started to manufacture engines, small delivery vehicles, trucks, and cars. Poor management decisions almost put the company into bankruptcy. Losing face, the Sr. Management resigned, and/or changed their ways. They changed the name of the company (Toyoda to Toyota), granted workers life-long employment, and went on an aggressive improvement program to try and work their way back from near oblivion. The motivations for TPS were now established. Soon the tools and techniques started to emerge that eased the frustrations with the old inefficient ways, and allowed Toyota to achieve its TPS goals.

Toyota's engineers looked to Henry Ford (inventor of the assembly line), Taylor (inventor of Modern Management techniques and Industrial Engineering), and Dr. W. Edwards Deming (Father of Modern Quality). In short, Americans and Europeans had assumed and accepted the mass production theory and honed it to perfection. Japan and Toyota had used mass production as a starting point and evolved it further to TPS. (Womack and Jones, 1996)

2.1.1 The evolution of Manufacturing

Manufacturing is the conversion of raw materials, by hand or machine, into goods. Craftsmen were the earliest manufacturers. Highly skilled craftsmen, even today, spend several years in apprenticeship learning their craft. They often made their own tools and sold their own finished goods. Craftsmen obtained and prepared their basic raw materials, moved the product through each of the stages of manufacture and ended with the finished product. Because of the time involved in producing the finished goods, craftsmen-manufactured products were and are costly.

The Industrial Revolution brought about the division of labor, a specialization of focused and more narrow skills applied to a single stage of the manufacturing process. Followed by several important inventions between 1733 and 1765, when the steam engine was perfected by James Watt and ultimately applied to the cotton milling industry in 1785, the replacement of human, animal, or water power by machine assisted motive power solidified the concept of mass production. (Smith R. and Hawkins B., 2004)

The introduction of machines into manufacturing soon brought about the manufacturers of goods with interchangeable parts. By the mid-to-late 1800s, the concepts of division of labor, machine assisted manufacture, and assembly of standardized parts to produce finished goods, were firmly established in Europe and the United States. “In these early stages, the methods used to organize labor and control the flow of work were less than scientific, based primarily on precedent and historical usage rather than on efficiency.

Through time-motion studies, this brought about a quantitative approach to the design of contemporary manufacturing systems and processes. This remarkable accomplishment was brought about by the most advanced manufacturing technology yet conceived the assembly line. The assembly line employed the precise timing of a constantly moving conveyance of parts, subassemblies and assemblies. Manufacturing technology had just had its first encounter with lean thinking. At first Henry Ford tried accumulating large inventories to prevent delays or stoppages of the assembly line, but he soon realized that stockpiling wasted capital. Instead, he took up the idea of extending movement to inventories as well as to production. Ford's primary objective remained building automobiles as inexpensively as possible.

While control of all the inputs to the automobile manufacturing process didn't guarantee low costs, it did guarantee that Ford could manage all those input processes by himself. He was all but obsessed with the elimination of waste. Wasted money, wasted material, wasted motion and wasted time all drove up the cost of his automobile, the cost per unit. Ford strove to purge waste from all levels in his vertically tiered manufacturing operation. To get clearer about the evolution of manufacturing see Figure 2.1 which is precisely by Smith R. and Hawkins B., 2004.