UTeM

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

# LEAN TOOLS ADOPTION FOR ENHANCING MANUFACTURING PERFORMANCE

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

by

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# UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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Sesi Pengajian: **2020/2021 Semester 2**

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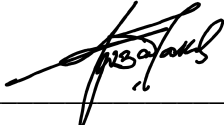4. *Sila tandakan (√)

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I hereby, declared this report entitled "Lean Tools Adoption for Enhancing Manufacturing Performance" is the result of my own research except as cited in references.

Signature          : ...................................................

Author's Name   : MUHD SHIDDIQ BIN SABUDDIN

Date                 : 13 SEPTEMBER 2021

# APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of Universiti Teknikal Malaysia Melaka as a partial fulfilment of the requirement for Degree of Manufacturing Engineering (Hons). The member of the supervisory committee is as follow:

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# ABSTRACT

Lean tools adoption is a structured approach to diverse management approaches that may impact the job content of individuals and also the quality of jobs. This lean tools is needed because of the fast changing environment and also the manufacturing industries is going in advance direction at the moment. The major problem in the industry was the lack of cutter tools such as end mill and insert on the production line which slow down the production line. The aim of this study is to investigate the problems that affect the production performance at Elite Industries Sdn. Bhd. and to identify the appropriate method using the lean tools for enhancing the performance of production line. Interview session is conducted to get information from the workers and the CEO about problems related to the manufacturing process in the industry and data given were collected over a three months period. The method used are 5S and Kaizen in order to solve the problem in the production line. The results showed that lean manufacturing tools can dramatically increase the efficiency of production performance and reduce the searching time from 9.22 minutes to 1.51 minutes.

# ABSTRAK

Penggunaan *Lean* adalah pendekatan berstruktur untuk pendekatan pengurusan yang pelbagai yang boleh mempengaruhi skop kerja individu dan kualiti pekerjaan. *Lean* diperlukan kerana suasana yang sentiasa berubah dengan drastik dan juga dengan perubahan industri pembuatan yang bergerak maju pada masa kini. Masalah utama dalam industri ini ialah kekurangan mata alat seperti *end mills* dan *inserts* pada barisan pengeluaran dan impikasinya akan menyebabkan kelewatan dalam proses pengeluaran produk. Tujuan kajian ini adalah untuk mengkaji masalah yang mempengaruhi prestasi pengeluaran di Elite Industries Sdn. Bhd. dan juga untuk mengenal pasti teknik yang sesuai menggunakan kaedah *Lean* untuk meningkatkan prestasi pengeluaran. Sesi temu ramah telah dilakukan untuk mendapatkan maklumat dari pekerja dan CEO mengenai masalah yang dihadapi berkaitan dengan proses pembuatan di industri dan data untuk tempoh selama tiga bulan telah dikumpulkan. Kaedah yang digunakan adalah 5S dan Kaizen untuk menyelesaikan masalah di barisan pengeluaran. Hasil kajian menunjukkan bahawa pembuatan *Lean* dapat meningkatkan kecekapan prestasi pengeluaran secara dramatik dan mengurangkan masa pencarian dari 9.22 minit ke 1.51 minit.

# DEDICATION

Only

My beloved father, Sabuddin Abdullah,
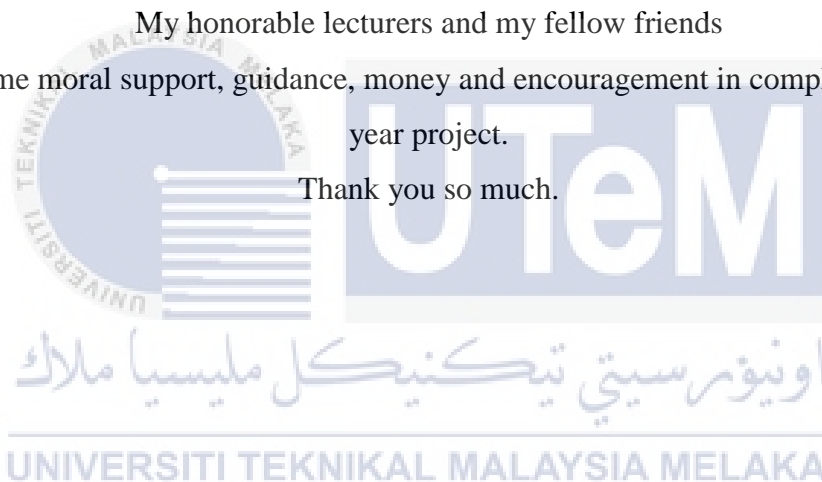
My beloved mother, Seniah Binti Dolah,

My lovely siblings Muhd Shahrull, Nur Elya Fatin, Nur Farahin and Nur Farhana,

To my supervisor. Profesor Dr. Mohd Rizal bin Salleh,

My honorable lecturers and my fellow friends

For giving me moral support, guidance, money and encouragement in completing my final

year project.

Thank you so much.

# ACKNOWLEDGEMENTS

In the name of Allah S.W.T., the most merciful, the most gracious with the highest praise to Allah that without difficulty, I manage to complete this final year project in time with great manner even with this rough time with online learning because of Covid-19 situation. Without His blessing, this project would not has been possible.

I would like to thanks to my esteemed supervisor, Professor Dr. Mohd Rizal Bin Salleh for guiding and monitoring me during the final year project. All of his advices encourage me in finishing the final year project and without his guidance, I would not be able to finish this. I am grateful for having him as my supervisor.

Moreover, I would express my gratitude to Elite Industries Sdn. Bhd. for having me as their trainee student during my industrial training and give a case study for my final year project. Thank you for their support and helps during my time conducting the case study.

Last but not least, I would like to appreciate my family, lecturers and my fellow friends for giving their precious time and cooperation which help me to finish this final year project on time and successfully.

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# LIST OF ABBREVIATIONS

| Sdn. Bhd | - | Sendirian Berhad |
|---|---|---|
| CEO | - | Chief Executive Officer |
| CNC | - | Computer Numerical Control |
| CAM | - | Computer Aided Manufacturing |
| VSM | - | Value Stream Mapping |
| PDCA | - | Plan Do Check Action |
| TPM | - | Total Quality Management |
| WRM | - | Waste Relationship Matrix |
| WAQ | - | Waste Assessment Questionnaire |
| SOP | - | Standard Operation Procedure |

# LIST OF SYMBOLS

%          -          Percentage

mm         -          Millimeter

# CHAPTER 1

## INTRODUCTION

For this section, this study is divided into five subtopics which are research background, problem statement, the objectives of the study, research scope and significance of the study.

## 1.1 Research Background

In industry, lean manufacturing tools is one of the most importance tools to enhance the manufacturing performance. This tools can improve the productivity, the efficiency and also it can reduce waste for the industrial manufacturing. This study is conducted in Elite Industries Sdn. Bhd. in Kuching, Sarawak. The industry is a manufacturing industry, which manufacture custom – made parts according to the customer's requirement. This study is about on how to find and solve the problems using lean tools for enhancing the manufacturing performance for the industry.

Lean manufacturing is a very important because it has a lot of benefits such as improved the management knowledge (Melton, 2005). This is crucial because to have a good company performance, the company should have a proper method or tools to manage their business. To maintain the competitiveness, the company should implement the lean tools to reduce the waste, to minimize the cost and also to increase the productivity, which will benefit the company in the long term and also in the short term (Esa et al., 2015).

The modern, rapid changing situation in the industry has challenged the industry to develop strategies to improve their business in order to stay reliable in the current state, especially in this pandemic situation which can make the company to loss profit and make their business going bad to worst (Ahuja & Khamba, 2008). The lockdown contributes 20% of gross domestic product (GDP) which has a lot of effect on the manufacturing industry.

This effect can make small organization because of small profitability, such as the company that I conducted for my research (Kapparashetty et al., 2020).

There are a lot of types of wastes that can be found in manufacturing industries such as the transportation of materials, the operations that is not necessary to be done, poor step of processing and also surplus of tool inventory (Rathilall & Singh, 2018). This type of waste can make a company profit to decrease and also impact to the economy of the company in the long term.

For this case study, the lean tools are implemented to solve the problem based on the problem occur in the industry. There are a lot of lean tools available such as 5S, Kaizen, Kanban and Value Stream Mapping.

## 1.2    Problem Statement

In the industry, by considering the current method of managing tools, cutter such as end mills and inserts, it is known to create problems for the industrial production because of insufficient tools needed. The absence of suitable inventory management for cutter slow down the production and also affect the quality control. This problem will also lead to delays in handing the product to the customer which will affect the profit and time consuming of the company. Based on input given by Elite Industries Sdn. Bhd. through interview that has been done with the CEO of the company, the idle time for machine down due to lack of tools is around 10 – 15 per cent of working hours which make a big impact to the company's production process.

The interview with the CEO also stated that the production per month for the company production is approximately 100-200 part per month. The CEO also stated that the important of tooling stock systems which is by knowing the life span of a cutting tool. Different brands have different life span and grade. When a tool breaks it must be changed before the CNC can continue running, otherwise the part will be scraped. When the stock of end mills runs out, the company will need to buy from a local supplier which uses a different brand than the regular brand. Because of this, the life span for the tools cannot be estimated which, means the machinist need to check the machine every 15-20 minutes to make sure

the tool has not broken. Besides, this also affects the efficiency because the machinist need to adjust the CAM program to accommodate for the new tool.

Moreover, the CEO also stated in the interview that the important of tooling stock system for rarely used tools. Sometimes, if there is a job that requires uncommon tooling, the company will have to order it from the supplier. The time for ordering tools such as end mills and inserts usually takes two weeks and this will cause problems for the production because without cutting tools, the machine cannot operate, thus will affect the time and profit for the company and also make the customer to wait for longer time to receive their parts. Having some stock of small end mills means that they can launch a job immediately once the order is received. Therefore, this is why it is important to have an inventory system that tracks each of the sizes and notifies production when a size low on stock and needs to be ordered.

## 1.3    Objectives

i.    To investigate the problems that affect the production performance at Elite Industries Sdn. Bhd.
ii.   To propose the appropriate methods using the lean tools for enhancing the performance of production line.
iii.  To validate the propose improvement methods for production line.

## 1.4    Research Scopes

This project is mainly focused on the inventory stock of the tooling cutter which is inserts and end mills. This investigation is done by monitoring and capturing the problems in the industry during their working hour and also to get the feedback from the general manager and also machinists about the current tooling system. Moreover, the research is done by researching the specification of cutter and sort it according to its specification. This will provide information which tools always are used regularly.

## 1.5    Significance of the Study

The investigation of the case study will help the industry to solve their problems on the tools inventory and to implement lean tool to enhance their manufacturing performance. This will also provide the suitable method needed to improve their manufacturing performance. The lean tools are the tools used to remove any waste in the industry to maximize the profit or any unnecessary activity so that the industry can perform better.

The study also will propose a new inventory system for the tools so that it can enhance the manufacturing performance and will not make the production stop because of insufficient tools. The system is based on the lean tool method which will organize the system with better improvement than the current manual system and the workers can review the available stock in the new system.

## 1.6    Summary

Lean tools are an important tool in manufacturing industry that can enhance the manufacturing performance, which can increase the productivity and efficiency especially in the Elite Industries Sdn. Bhd. The lean tools also can help to minimize waste in the industry and to propose a new system for their tool inventory management.

# CHAPTER 2
## LITERATURE REVIEW

This chapter consists of a review based on the research conducted according to the objectives and scope. The literature review focus on the past studies on lean tools adoption for enhancing manufacturing performance, which has been conducted by researchers based on their journals, articles, and website. This literature review is based on the information and the method used related to this study. A summary of lean tools also discussed in this chapter.

## 2.1    Company Background

The case study has been conducted at Elite Industries Sdn. Bhd. in Kuching, Sarawak based on the problem identified during the industrial training. The industrial supervisor had asked to solve a problem in the industry on the tooling stock system for end mills and inserts that always make the production to stop when there is no certain cutter that is needed for the project. The research on the type of inserts and end mills that used regularly is done so the current stock will easily to be monitored.

Based on the data given by the industry, for insert's brands that always been used in the company was *Seco, Mitsubishi, Carmex, Lamina, Sumitomo,* and *Walter* and the type of inserts are boring, turning, grooving, parting, threading and drilling respectively. While for end mills there is on only one brand which is Li Hsing and the type are square and ball nose end mill.  The factors that make the cutting tools to quickly replace are because of wear and tear. Wiciak-Pikuła (2020) stated that the speed of cutting, the rate of feed and the depth of cut played major role in the wear and tear of the cutting tools. This is because the tools might be forced to do an excessive amount of work that is needed to be done than it can afford to

do. Thus will make the cutting tool life to be shortened and new tools are needed. This also affects the stock of current tools.

The delivery of the new order tools to arrive took around 2 weeks, which is a very long time to wait because when there is no cutting tools, the machine will also have to stop and this will affect the entire process of the product. The company usually order 2 boxes of inserts which in the box contain about 10 pieces of inserts and for end mill the company usually order about 5 pieces of end mills.

For the inventory, the company uses manual system by counting the current stock available in each box. This system has many weaknesses which are when the person who in charge on the stock might forget how many left before the cutter are empty and he might forget to order new stock for an upcoming project. Besides, there is no record for in and out tools, whether it is in hardcopy or softcopy to monitor the current stock available in the inventory.



Figure 2.1: Current system inventory for cutting tools.

## 2.2    Introduction to Lean Tools

The successful implementation of lean tools gives industry a high quality system which makes the productivity increased and reduce the waste, thus will also increase profits and benefit the industry in the long term (Shah & Ward, 2003). The lean tools are known to identify and eliminate waste of non – value added activities which are to improve the service

and quality, decrease the total costs, minimize the time and to remove the waste. This is to make a smooth manufacturing performance that can satisfy the customer's requirement without any waste involved (Zhou, 2016).

For industry in Malaysia, the most utilized lean tools are Kaizen, 5S and Standardised Work as shown in Figure 2.2. This shows that every industry need the lean tools to make their organization to be better and it is also to improve their knowledge on how to implement in their organization (Yahya et al., 2019).
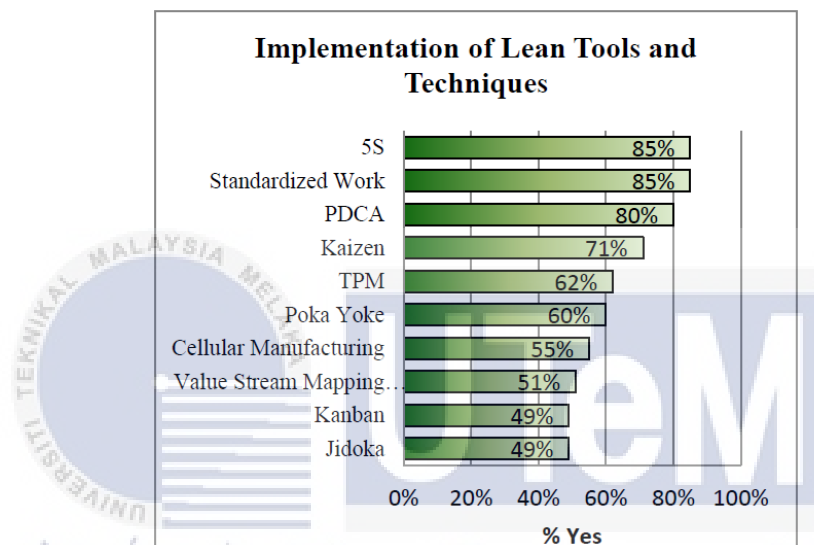


Figure 2.2: Lean tools status implementation in Malaysia (Yahya et al., 2019).

### 2.2.1 5S

5S is a one of the important lean tools in manufacturing management. The meaning of 5S in English are sort, set in order, shine, standardize and sustain. This tool can eliminates and make the management more solid when doing their business. Besides, 5S is also a basis attainment in quality management which helps to remove wastes thus will improve the working performance and also make it become more organize (Randhawa & Ahuja, 2018). For the implementation of 5S in their industry in three years, it can be concluded that during that time the result shows that the industry is determine in practicing 5S by good support from the management (Randhawa & Ahuja, 2017).

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The first 1S of 5S lean tools is sort which means removing any unnecessary things in the worktable or working area. This is also to organize back all the things to their own original place to make it easier to find it back for future use. Seiri make the process of picking tools smooth for the workflow and also make the searching time shorter (Mehta & Dave, 2020). In the industry, especially in the storage and office area, the majority of the industry has performed well in the implementation of sorting tools and now are free from any of the unwanted waste such as time wasting in searching, inventory that is not needed, and also the freedom from any crowdedness (Randhawa & Ahuja, 2017).

The second S is for Seiton which mean set in order. This is a method to arrange the tools by their own use or specification which help to achieve 30 seconds retrieval of tools (Randhawa & Ahuja, 2017). This is important because it can make the process of taking out tools even faster than before which also make the production line more efficient. Seiton also can make the work more safer, create a better working environment and also to remove useless finding (Mehta & Dave, 2020).

The third S is Seiso which means shine. This is a process of cleaning the equipment, machines and also the workplace (Randhawa & Ahuja, 2018). The cleaning of the mind is a result of clean surrounding (Randhawa & Ahuja, 2017). This is because when the workplace is clean, the mind will also at ease when doing work. This also can increase productivity and release the stress during working time and also effect workers' health and the product quality.

The fourth S is the Seiketsu which when translated means standardize. To make the good habit last for longer time, the management and the workers play an important role in preserving clean environment and good work in the industry (Randhawa & Ahuja, 2018). It is the best when the all the worker practices and follow all the guidelines when standardizing the 5S lean tools for better productivity (Bharambe, 2020).

The last S of the 5S is Shitsuke which means sustain. The implementation of this 5S is depends on workers self – discipline and it will be successful if they maintain the good working attitude for a long time without going back to the bad habit (Randhawa & Ahuja, 2017). This need regular practices on the 5S tools such as doing a consistent cleaning to make the workers always practice the 5S lean tools.
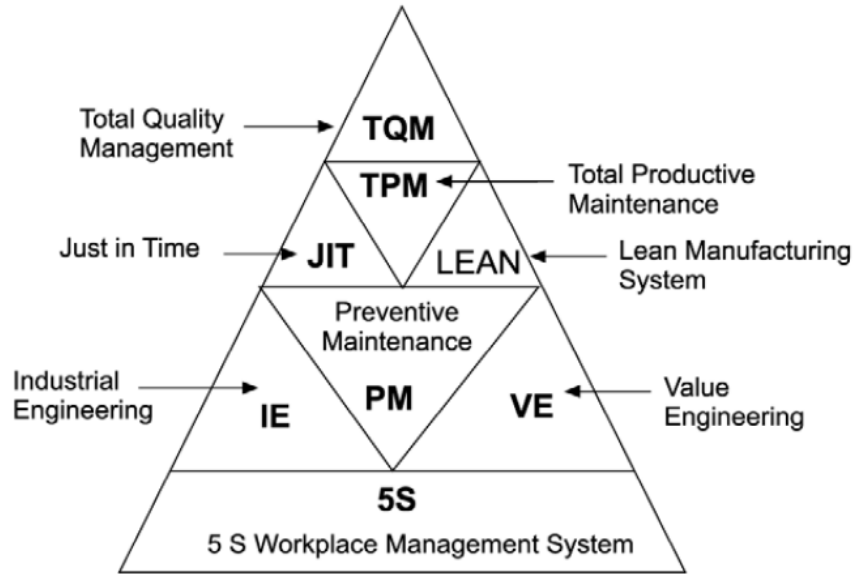
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Figure 2.3: The base for lean manufacturing is 5S (Singh & Ahuja, 2015).

## 2.2.2 Value stream mapping

According to Verma & Sharma (2017), Value Stream Mapping is an action that combines all the activities of a product which is the value added and non-value added that shows the flow of the material to the customers. The objective of VSM is to get to the problem and solve the waste by eliminating all the wastes (Rohani & Zahraee, 2015). All of these have the same objective which is to improve the productivity and to add more value onto the product.

Rohani & Zahraee (2015) found that the first step of VSM is to get a product which needed improvement. Secondly, create a process flow in map to show how the process from start to finish. Harun et al. (2018) stated that by gathering all the data in current state map, this data shows the status for the current system and from that the process is investigate and improvement methods are applied. Thirdly, to show how the waste has been eliminate, draw a map for the future state (Rohani & Zahraee, 2015). Harun et al. (2018) claimed that for future state map, it is for the future improvement after all the wastes is eliminated. This will help to identify and design better value stream. Finally, a map for suggestion is created to review any changes needed for the system. According to Deshkar et al. (2018), 15% to 89.85% are the increase of value added time when VSM is implemented in the industry. This shows that the VSM is one of the tools to increase the value of production.

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