



**INCREASE PRODUCTION CAPACITY BY APPLYING SINGLE
MINUTES EXCHANGE OF DIE IN MANUFACTURING
INDUSTRY**



**BACHELOR OF MANUFACTURING ENGINEERING
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**Faculty of Mechanical and Manufacturing Engineering
Technology**



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Bachelor of Manufacturing Engineering Technology with Honours

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2023

DECLARATION

I declare that this Choose an item. entitled “Increase Production Capacity By Applying Single Minutes Exchange Of Die In Manufacturing Industry” is the result of my own research except as cited in the references. The Choose an item. has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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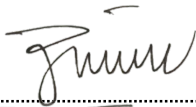
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APPROVAL

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Manufacturing Engineering Technology with Honours.

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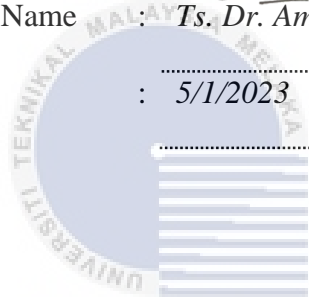
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DEDICATION

To my mother, father, siblings, and friends who always provided me with moral,
emotional, and spiritual support.

Ts. Dr. Amir Hamzah Bin Abdul Rasib, who has always guided, assisted, and mentored me
in completing this thesis.



ABSTRACT

Because of the numerous challenges that competitors in the same sectors, particularly in the production industries, manufacturing sectors are now working to improve their performance in order to increase production capacity. The goals of this research are to identify the internal and external SMED activity, to conduct the SMED in production and to propose improvement for increasing production capacity by using SMED. Furthermore, SMED can predict and provide solutions for the company's future state in order to increase production capacity and efficiency in production. Moreover, the second objective is that to conduct the SMED in production. Unnecessary processes, such as value-added activities, will have a negative impact on the company's production changeover time. These causes must be addressed because production productivity and effectiveness will decline, and other competitors will be able to move ahead quickly. In addition, a few tools are employed in order to complete this research. The first step is to define the research problem and goal. The data is then collected through observation as well as company data. An interview is also conducted in order to determine the exact process that occurs within the production line. The Why Why Analysis would then be applied to the data set. This analysis is used to identify the root cause of a problem. The outcome can only be achieved after the data has been analyzed to find solutions to industry problems. Aside from that, an action of optimization and improvement activities using SMED to minimize or eliminate internal activity in production will be suggested to that company.

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ABSTRAK

Oleh kerana pelbagai cabaran yang dihadapi oleh pesaing dalam sektor yang sama, terutamanya dalam industri pengeluaran, sektor pembuatan kini berusaha untuk meningkatkan prestasi mereka untuk meningkatkan kapasiti pengeluaran. Matlamat penyelidikan ini adalah untuk mengenal pasti aktiviti SMED dalaman dan luaran, menjalankan SMED dalam pengeluaran dan mencadangkan penambahbaikan untuk meningkatkan kapasiti pengeluaran dengan menggunakan SMED. Tambahan pula, SMED boleh meramal dan menyediakan penyelesaian untuk keadaan masa depan syarikat bagi meningkatkan kapasiti pengeluaran dan kecekapan dalam pengeluaran. Proses yang tidak perlu, seperti aktiviti nilai tambah, akan memberi kesan negatif ke atas perubahan masa pengeluaran syarikat. Di samping itu, beberapa alat telah digunakan untuk melengkapkan penyelidikan ini. Data tersebut kemudiannya dikumpul melalui pemerhatian dan juga data syarikat. Temu bual juga dijalankan untuk menentukan proses tepat yang berlaku dalam barisan pengeluaran. Analisis "Why Why" kemudian akan digunakan pada set data. Analisis ini digunakan untuk mengenal pasti punca masalah. Hasilnya hanya boleh dicapai selepas data dianalisis untuk mencari penyelesaian kepada masalah industri. Selain itu, tindakan pengoptimuman dan aktiviti penambahbaikan menggunakan SMED untuk meminimumkan atau menghapuskan aktiviti dalaman dalam pengeluaran akan dicadangkan kepada syarikat tersebut.

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LIST OF SYMBOLS AND ABBREVIATIONS

SMED	-	Single Minute Exchange of Die
DMAIC	-	Define, measure, analyze, improve, and control
VSM	-	Value Stream Mapping
TPM	-	Total Productive Maintenance
TQM	-	Total Quality Management
JIT	-	Just In Time



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CHAPTER 1

INTRODUCTION

1.1 Research Background

In the age of globalization, Malaysia faces a difficult economic period as it strives to become a developed country, particularly in the manufacturing sector. In comparison, developed countries have a sovereign state, a fast economy, and cutting-edge technology. Infrastructure than other less developed countries developed countries like Japan, for example. Germany, for example, or the United States. Furthermore, developed countries can entice customers.

Long-term loyalty because they have increased manufacturing efficiency operations, developed technology, and, most importantly, satisfied customers. According to Obradovi et al. (2021), the rapid advancement of technology intensity has resulted in increased the value and significance of open innovation (OI), which has been identified as a strategic priority important component.

Productivity measures the efficiency of the production process. It also indicates the level of performances of the industry. As the global economic condition growing in a rapid motion, the industry is generally paying attention on the profit margin, high quality product based on customer and improved productivity, Hence, growth in productivity is important for every industry.

Increase in productivity is one of the core strategies towards manufacturing excellence and it will come with good financial and operational performances of industry. In order to

compete with their competitors, most of the company or industry are seeking to maintain or improve their productivity from time to time.

Factors such as duration of each process take, the number of workstations operators, and the worker's ability will contribute to the productivity of the manufacturing process (Bon and Nasihah, 2016). Because of that, a lot of the management strategies are involved to attend the factors that affect it. Therefore, increasing productivity through quantitative research methods plays a major role.

In this project, the productivity measurement will be carried out determine the current productivity of the industry. Then, improvement will be made by identifying the root cause.

1.2 Problem Statement

Malaysia's manufacturing sector is still vital to the country's economic transformation. Despite global economic uncertainty, the country's contributions to export revenue and job creation ensured continued growth. The emphasis will remain on developing more high-value-added, diverse, and complex products, particularly in the catalytic sub-sectors of Electrical and Electronics (E&E), Machinery and Equipment (M&E), and chemicals and chemical products. Aerospace and medical devices, the other two high-growth subsectors, will also be pursued.

Companies are encouraged to increase productivity by speeding up automation and innovation, implementing green and sustainable manufacturing practises, and collaborating with industry associations to share best practises.

Productivity is a metric used to assess an organization's performance. Productivity will help the company grow. In order to achieve higher productivity, the industry must overcome

numerous challenges. The most effective way to address the challenges is to introduce and begin using lean manufacturing tools.

1.3 Research Question

Three research questions are identified based on the problem statement

RQ1: What are the factors affecting the changeover time?

RQ2: What are items consist in SMED during changeover?

RQ3: How to increase production capacity using SMED?

1.4 Research Objective

The overall goal of this research is to increase production in the manufacturing industry by incorporating Single Minute Exchange of Die (SMED). This study's specific goals are as follows:

- a) To identify the internal and external SMEDs' activity.
- b) To conduct the SMED in production.
- c) To propose improvement for increasing production capacity by using SMED.

1.5 Research Scope

Particularly, this study will focus on increasing production capacity by using lean tool Single Minute Exchange of Die (SMED) in manufacturing industry. The primary goal in the manufacturing industry is to increase production capacity. This is important to achieve timely delivery to customer also continuous improvement in the industry. The performance measure is done before and after implementing the SMED concept to compare results. SMED

implementation will reduce changeover time and unnecessary stoppages proportionally increasing the production capacity.

1.6 Expected Results

The expected result for this research is to identify the factors that affect the production capacity in manufacturing. Implementation of SMED concept can improve and increase production capacity in manufacturing industries. It is also a mandatory requirement for most manufacturers. Moreover, after defining and having solutions to refine the production capacity, validate new improvement ideas using SMED concept.

Furthermore, the implementation of SMED in a manufacturing company to increase production capacity is expected as a result of this research. SMED is one of several lean manufacturing techniques for reducing manufacturing waste. It enables a quick and efficient transition from running the current product to running the next product in a manufacturing process. This quick switch is critical for reducing production lot sizes and thus improving flow.

This research aids in gaining the ability to apply the experience and analysis in an actual scenario. This is an excellent opportunity to gain exposure outside of the classroom. This research aids in understanding the use of the SMED technique in the industry. Identify the strengths and weaknesses of the method based on the implemented procedure in the manufacturing industry and improve based on the findings. Besides, this research should help enhance the importance of SMED implementation in the industry.

1.7 Thesis Frame

In this chapter, chapter one focuses on the introduction of this study. Then, the research background described the details in this research. Next, the problem statement of this research is stated in this chapter. Next, the problem statement is used to describe the research problem. Finally, in addition to the research question, the research objectives are listed in this chapter. Finally, the research scope is also explained in this chapter. The expected result of this research and the thesis frame are also stated.

Next, chapter two focuses on the literature review of this research revised and reviewed. It is to get extra information and knowledge relevant to this research. Then, the literature that has been created is based on reliable previous journals. This chapter emphasizes the case study, such as production capacity, SMED concept, lean manufacturing and process of SMED. Writing in the literature review is more on reading and selecting the appropriate key point in other journals.

In chapter three, the methodology launch in this research is also implemented. In this chapter, the tools and techniques were defined and had the guideline on doing this research. The tools and techniques will give a detailed explanation in this research. The problem-solving techniques are also explained in this chapter.

After that, chapter four will show the result and discussion of this study. In this chapter, the tools and techniques are explained in chapter three will be used in this research. Then, further information on applying the tools and techniques is described. Next, the result of using these tools and techniques will be discussed in this chapter. Finally, the discussion will base on the findings result and achieve the objectives of this research.

In chapter five, the case study has been concluded where the overall research had been completed. This chapter presented the recommendation to strengthen the analysis along with an interpretation. Thus, a conclusion to explain the overall description of this thesis will be

addressed meanwhile in this chapter there are future research proposals been discussed to increase the production capacity using SMED in manufacturing industry.



CHAPTER 2

LITERATURE REVIEW

2.1 Preliminaries

J.Lozano (2019), claims that production processes, allowing them to offer high-quality products in a short period of time. Waste reduction and increased efficiency are two advantages of implementing lean tools, which can be obtained by eliminating waste and producing high-quality goods. Single minute die exchange is one of several lean manufacturing approaches for reducing waste in a manufacturing process (SMED). According to the Kaizen Institute, the approach provides a quick and effective way of transitioning a production process from running the current product to running the next product, as the name implies. The SMED technique is used as part of Total Productivity Maintenance and the "continuous improvement process" in several studies to achieve lean manufacturing. Shigeo Shingo invented SMED in the 1950s in response to the emerging need for increasingly smaller production lot sizes to meet customer demand flexibility. Shingo created the SMED (Single Minute Exchange of Die) methodology to shorten and simplify setup time during changeover. SMED, another Japanese process-based innovation, enables rapid response to fluctuations in demand, shortens lead times, eliminates waste during changeover, and reduces lot sizes (J.Lozano, 2019).

2.2 Production Productivity

To begin, production is defined as the process of creating, processing, manufacturing, and improving goods and services, whereas productivity is defined as a measure of rate of production efficiency. Batra (2016) defines productivity as the time-varying ratio of input and output coefficients. In other words, the rate of productivity refers to the rate at which a product is produced over time. Consumer production and productivity are critical for any firm or company. When there is production and sales on the local or global market, there will be an increase in demand. Batra (2016) and Grewal (2008) agree that the global marketplace has observed that there is increasing pressure among customers and competitors in manufacturing due to high demand. As an outcome, faster productivity was required to meet demand while maintaining product performance and quality. As a result, maintaining these key features is critical for every company all over the world.

Product demand has been increasing from time to time since the early 18th century, especially when people use the product more frequently. As demand and market scope expand, more labour, tools, and machines are introduced into the manufacturing line to improve production performance. As there was more demand and sales market available by the middle of the 18th century, manufacturing companies began to focus on the production performance of their product. Manufacturers begin to focus on production performance to determine a company's rate of success. Features are extremely important to every company in the world.