



**PROCESS OPTIMIZATION WITH LEAN APPROACH:
ROOF TILE**

This report is submitted in accordance with requirement of the University Teknikal Malaysia Melaka (UTeM) for Bachelor Degree of Manufacturing Engineering

by

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2018

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: **PROCESS OPTIMIZATION WITH LEAN APPROACH: ROOF TILE**


Sesi Pengajian: **2017/2018 Semester 2**

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DECLARATION

I hereby, declared this report entitled “Process Optimization with Lean Approach: Roof Tile” is the result of my own research except as cited in references.

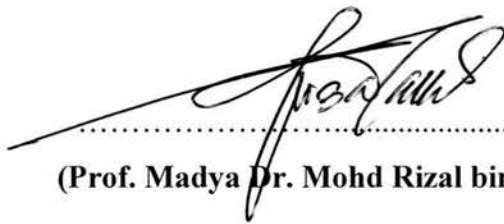
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APPROVAL

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:



(Prof. Madya Dr. Mohd Rizal bin Salleh)

ABSTRAK

Tujuan projek ini adalah untuk menambahbaik proses pembuatan jubin bumbung di syarikat Lama Tile (Sarawak) Sdn Bhd dengan menghapuskan pembaziran. “Process Optimization with Lean Approach: Roof Tiles” adalah tajuk projek ini. Projek ini dijalankan di Universiti Teknikal Malaysia Melaka (UTeM). Dasar-dasar pembuatan kejut (Lean Manufacturing) digunakan bagi melaksanakan proses penambahbaikan secara berterusan dengan mengurangkan kos operasi dan menghapuskan pembaziran atau dikenali sebagai sumber yang tidak bernilai dalam sistem pembuatan. Pengoptimum proses dengan pembuatan kejut akan dapat meningkatkan pengurusan buruh, mengurangkan pembaziran dan kos. Hal ini akan menyebabkan peningkatan dari nisbah keuntungan. Oleh itu, ia sangat penting untuk memahami tentang apa jenis pembaziran yang wujud dalam industri. Data yang diperlukan untuk penyelidikan projek ini dijalankan melalui kaedah pemerhatian, data sejarah dan kajian masa. Pembaziran kemudian dikenal pasti dan penambahbaikan dengan LM dicadangkan. Penambahbaikan yang dicadangkan dan keputusan kemudiannya disahkan dan dianalisis dengan menggunakan perisian simulasi. Cadangan untuk kajian lanjut juga telah dibincangkan. Kesimpulannya, kadar pembuatan jubin bumbung ditingkatkan dan kadar kerosakan dikurangkan melalui pelaksanaan dasar pembuatan kejut.

ABSTRACT

The purpose of this project is to improve the manufacturing process of roofing tiles at Lama Tile (Sarawak) Sdn Bhd by the elimination of wastes. “Process Optimization with Lean Approach: Roof Tiles” is the title of this project. This project is conducted at Universiti Teknikal Malaysia Melaka (UTeM). The basics of Lean Manufacturing (LM) employ continuous improvement processes by reducing operation costs and removing waste or non-value-added resources within the manufacturing system. Process optimization with lean approach will improve labor management, reduced wastes and cost, hence increase from profit ratio. Therefore, it is very important to understand exactly what types of waste exists in the industry. The data required for the research are done by through observation, historical data and time study. The wastes is then identified and then proposed the improvement with LM. The improvement that proposed and result was then validated using Witness simulation software and the suggestion for further study were being discussed. At the end of this project, it can be concluded that implementation of lean increase the productivity of roof tile and decrease the percentage of defect occurs

DEDICATION

This project is dedicated to my parents, Liew Kee Khiong and Lee Nyuk Lian, and other family members who provide a loving, caring, encouraging, and supportive atmosphere. These are characteristic that contribute to the environment that is always needed to achieve the goals of a heads.

ACKNOWLEDGEMENTS

First of all, I would like to thank my PSM supervisor, Prof. Madya Dr. Mohd Rizal bin Salleh for his kindness, guidance, experience, advice, constructive ideas, and spending time for discussion regarding this project.

Furthermore, I also would like to thank to all my colleagues. I want to thank them for all their help, support, interest and valuable hints in completing this project. Especially, I would like to give my special thanks to my family whose patient love enabled me to complete this work.

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LIST OF ABBREVIATIONS

UTeM	-	Universiti Teknikal Malaysia Melaka
LM	-	Lean Manufacturing
DMAIC	-	Define, Measure, Analyze, Improve and Control
DOE	-	Design of Experiment
VSM	-	Value-Stream Mapping
TPS	-	Toyota Production System
SMEs	-	Small and Medium Enterprises
MRP	-	Materials Requirement Planning
PMTS	-	Predetermined Motion Time System
PTS	-	Predetermined Time System
JIT	-	Just-In-Time
PIK	-	Production Instruction Kanban
PWK	-	Production Withdrawal Kanban
WIP	-	Work-In-Progress
SMED	-	Single-Minute Exchange Dies
EOQ	-	Economical Order Quantity
SIMAN	-	SIMulation ANalysis
FYP	-	Final Year Project
PSM	-	Projek Sarjana Muda

CHAPTER 1

INTRODUCTION

1.1 Project Background

Continuous innovation is important for a company to improve and survive in the current competitive market. A well-designed knowledge management system in manufacturing can boost up the continuous innovation of a company (Zhang et al., 2016). Manufacturers need to quickly respond to customer demand in order to make a move earlier. Therefore, manufacturers are strived to seek for a better ways of operating and strategy to achieve the process optimization. The common goal of process optimization in manufacturing is defined as cost minimizing and maximizing of the throughput of a process.

Lean Manufacturing (LM) also known as “Toyota Production System” was developed by a Japanese car manufacturer in their manufacturing and production system. This methodology was first designed and practiced by Japanese industrial leaders such as Eiji Toyoda, Taiichi Ohno and Shingeo Shingo to maximize the productivity in industry and improve customer satisfaction. LM embodies a concept of pull system in production, which refers to the ability of quickly respond to customer demand instead of pushing product to market. This concept differentiates between the LM with traditional system, because pull system of Lean approach only produce the product when the customer need it rather than pushing product to the customers. The main focus of this principle was the reduction of waste in a production system in order to optimize the process and productivity.

Lean approach can be considered as the only method to eliminate waste. A lean operation uses fewer resources and more flexibility system to achieve better productivity, lower cost and production time.

In LM, unaccounted resources which added no value to a product are considered as waste and needed to be eliminated in order to achieve process optimization. Any process or activity that contains wastes will add cost and time to the manufacturing and production system. Taiichi Ohno indicated that there are seven types of waste that may seem extremely limit the business performance. The categories of seven types of waste that indicated are overproduction, waiting, inappropriate processing, transportation, unnecessary motion, unnecessary inventory and also re-work.

A higher practicing of brainstorming that aids in performance area need to be practiced extensively for the implementation of LM in a companies or industry, either in Define, Measure, Analyze, Improve and Control (DMAIC), Design of Experiment (DOE), regression analysis, Value-Stream Mapping (VSM), Kaizen, Takt time or time study. On the other hand, practicing with tool and techniques such as 5S, Kanban and Standardized Work were intent on achieving continuous improvement within their organizations and productivity (Alhuraish et al., 2015).

Womack and Jones (1996) outlined the five key-principles of lean thinking, which are identity value, map the value stream, create flow, establish pull and seek perfection. Philosophy of Toyota regarded a defect is a challenge, and should be improved. In addition, lean concerning about to decrease effort, time, space, cost, and mistakes without ignore the customer needs.

The success of Toyota is the most powerful evidence that lean enterprise is an effective improvement for manufacturing. Toyota has achieve process optimization with lean approach in manufacturing by improving quality, waste elimination, lead time

reduction, and total cost reduction. Ford Motor Company was also practiced lean concept in the 1920s. The organization such as construction, education, and health care can also be improved through lean approach. Therefore, LM is an effect of a complex, pro-quality management in all areas of enterprise activities.

1.2 Problem Statement

Optimization of the process is important to ensure the profit of the company and also the customer satisfaction. The current production and manufacturing system of roof tiles at Lama Tile (Sarawak) Sdn Bhd is having the problems which affect the optimization of the process.

First at all, the selected company showed an unstable production output of roof tiles. Table 1.1 and Figure 1.1 show the customer demand of industry Lama Tile (Sarawak) in seven months from June to December 2017. The data indicate that the type of Smokey Grey has the highest demand compared to the other types of roof tile from June to December 2017.

Table 1.1: Quantity of customer demand from June to December 2017
(Source: Lama Tile Sdn Bhd)

Months	Smokey Grey	Harmony Gold	Charcoal	Ruby	Total
June	300	6750	150	23400	30600
July	10800	13500	1800	24750	50850
August	13950	2400	600	8400	25350
September	31200	11250	4050	0	46500
October	30000	52800	150	13200	96150
November	47250	5850	2250	22350	77700
December	44100	19050	8100	31500	102750
Total	177600	111600	17100	123600	429900

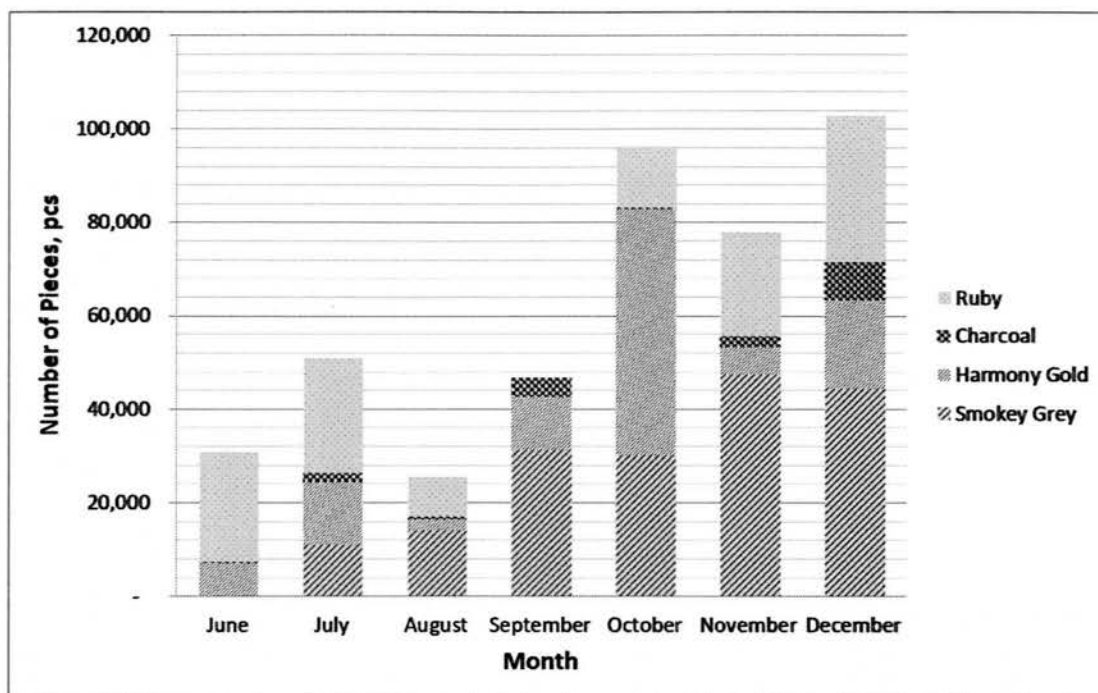


Figure 1.1: Quantity of customer demand/sales from June to December 2017
(Source: Lama Tile Sdn Bhd)

Table 1.2 shows the production output of industry Lama Tile (Sarawak) in seven months from June to December 2017. The data indicates that the production per month of roof tile is unstable.

Table 1.2: Production output in seven months from June to December 2017
(Source: Lama Tile Sdn Bhd)

Months	Smokey Grey	Harmony Gold	Charcoal	Ruby	Total
June	0	0	6519	21089	27608
July	13002	0	0	25025	38027
August	24970	0	0	8488	33458
September	28584	0	0	0	28584
October	25085	30420	0	13616	69121
November	50443	0	6994	23047	80484
December	41864	14603	0	15900	72367
Total	183948	45023	13513	107165	349649

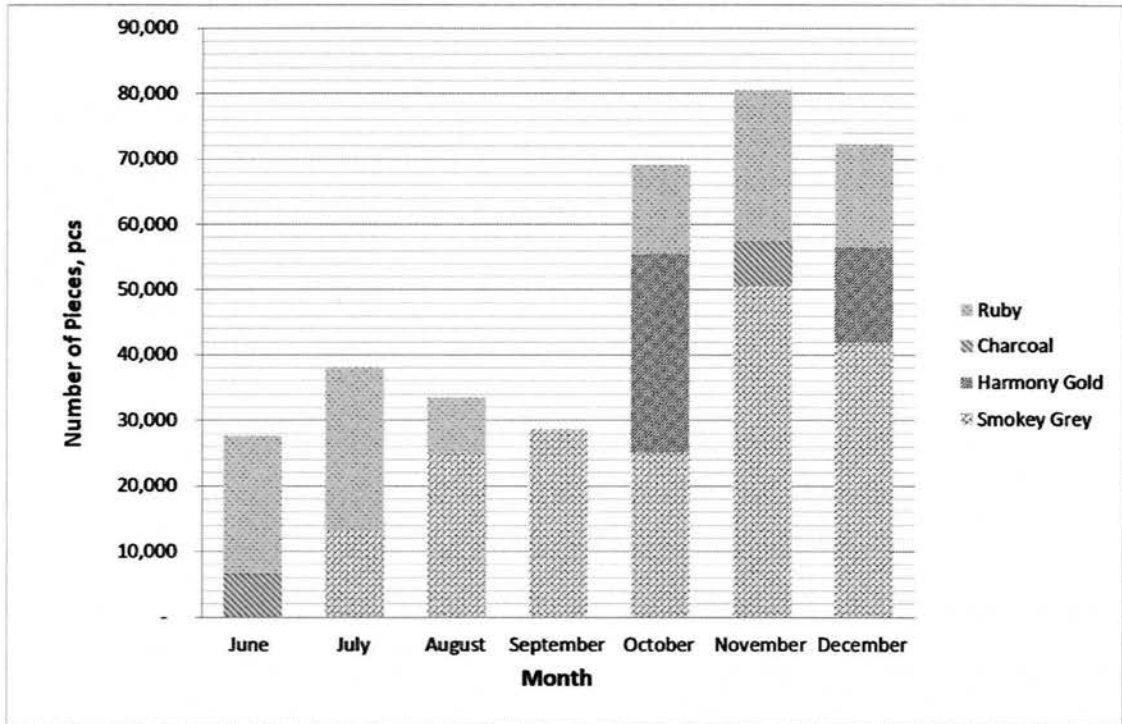


Figure 1.2: Production output record from June to December 2017
(Source: Lama Tile Sdn Bhd)

Secondary, the percentage of roof tiles rejected is also seemed too high. Instable production output is due to the overstressing of equipment or machine, and systems. Continually using equipment without proper maintenance will lead to a breakdown, or continually requiring overtime will lead to poorer performance and high rejection. The Table 1.3 represented the percentage record by randomly reviewed from historical data.

Table 1.3: The percentage of roofing tiles rejected
(Source: Lama Tile Sdn Bhd)

Type	Production			
	Charcoal	Smokey Grey	Harmony Gold	Harmony Gold
Manufactured date	18/8/2017	16/10/2017	15/12/2017	27/12/2017
Amount produced	3071	3376	3944	3463
Amount rejected during production	250	238	317	260
Amount rejected during packaging	34	16	3	21
Total amount rejected	284	254	347	281
Percentage of rejection	9.24%	7.52%	8.80%	8.11%

Thirdly, unaccounted resources which added no value to a product will affect the productivity of the company. The 7 types of waste are seem exist in the production and manufacturing system of roofing tile. In quality costing the failure or defect categories are internal failure (scrap, rework, delay) and external failure (including warranty, repairs, field service, but also possible lost custom).

1.3 Objective

The main purposes of this project research can be composed into the following:

- i. To investigate the process flow and manufacturing system of roof tile.
- ii. To propose of using Lean Manufacturing in minimizing the waste in the process of roof tile without sacrificing productivity.
- iii. To validate the lean approach implementation using graphic simulation software and low-cost powerful desktop computer.

1.4 Scope of Study

The scope of this project is to pay considerable to optimize the process of roof tile. Industry of Lama Tile (Sarawak) Sdn Bhd is the research target of this study. There are many types of production line of concrete product in Lama Tile (Sarawak), however only the production and manufacturing of the roof tile will be studied and analyzed in this research. All the types of roof tile are chose for the investigation and observation. This is because no exchange of die is required for the change of the product of roof tile and only the colorant used is changed, which influence nothing to the productivity. The data collected at the production floor. The data collected will be gathered and analyzed, and then Lean Manufacturing is approach by simulation to improve and maximize the process of roof tile.

Upon the study of this research, the elimination of 7 types of wastes and also the lean tool in the process sector are used to implement lean manufacturing at a process facility. This refers to a number of different categories of 7 types of wastes, which are overproduction, waiting, transportation, defects, inventory, motion and extra processing. Instead of 7 types of wastes, but also refers to a number of different lean techniques, including Takt time, Kaizen, 5S, Value Stream Map (VSM) and other tools which suitable for the process achievement.

This research project is conducted in Universiti Teknikal Malaysia Melaka, UTeM and with all the data that provided by Lama Tile (Sarawak) Sdn Bhd.