PRODUCTIVITY IMPROVEMENTS THROUGH POKA YOKE CONCEPT IN FOOD INDUSTRY

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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I hereby, declared this report entitled “Productivity Improvements Through Poka Yoke Concept in Food Industry” is the results of my own research except as cited in reference.

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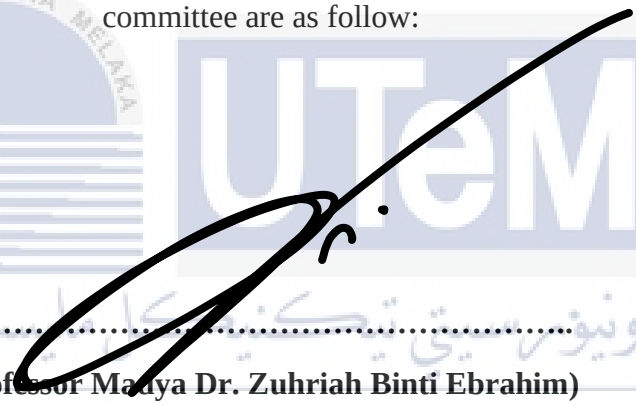
APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of Universiti Teknikal Malaysia Melaka as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Hons.). The members of the supervisory committee are as follow:



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(Professor Madya Dr. Zuhriah Binti Ebrahim)

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ABSTRAK

Konsep Poka-Yoke ialah pendekatan untuk menghapuskan atau meminimumkan kesilapan manusia tanpa kehilangan kecekapan dalam proses pengeluaran. Pelbagai operasi dijalankan oleh pekerja semasa pembuatan sebenar mana-mana produk sepanjang proses pembuatan sebenar semua kesilapan atau kesilapan yang dilakukan oleh pekerja. Tujuan projek ini adalah untuk menghapuskan kesilapan manusia menggunakan konsep Poka-Yoke. Tiga objektif projek ini adalah (i) untuk mengenal pasti kesilapan manusia dalam perniagaan makanan berasaskan rumah pada proses pengeluaran, (ii) untuk menganalisis punca kesilapan manusia dalam industri makanan Perusahaan Kecil dan Sederhana (PKS), dan (iii) untuk mencadangkan penyelesaian dengan mekanisme kawalan untuk setiap masalah. Semua data yang diperoleh melalui pemerhatian keterukan dan berlakunya kesilapan manusia dalam setiap proses dikumpul daripada ketiga-tiga syarikat bagi mengenal pasti masalah kritikal yang perlu diselesaikan. Seterusnya, semua data yang diperolehi melalui pemerhatian dan 4M*(Man, Machine, Material, and Method)* dikumpul daripada setiap syarikat untuk mengenal pasti punca punca setiap masalah. Punca punca dikenal pasti menggunakan Diagram Ishikawa dan seterusnya dianalisis dengan analisis 5*Why*. Terdapat tiga belas kesilapan manusia untuk tiga belas penyelesaian dan mekanisme kawalan yang telah dikenal pasti dan dibincangkan, iaitu untuk NB Emerald Resource Company sedang mengurangkan kuantiti makanan ringan dalam pembungkusan, menggunakan mangkuk pengumpul sekerap dengan dilampirkan di atas meja, gunakan pengekodan warna dan label, *Design of Experiments* (DOE) , dan tukar bahan penutup botol. Syarikat CNoah Bakery adalah menukar bahan beg paip, helaian penyelenggaraan, peti sejuk atau kunci penyejuk, jadual masa penghantaran, dan penyelenggaraan kenderaan. Syarikat Dapur Diva adalah jadual waktu penghantaran, penyelenggaraan kenderaan, *Material Requirements Planning* (MRP), dan penyelenggaraan ketuhar.

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ABSTRACT

Poka-Yoke concept is an approach for eliminating or minimize human error without losing efficiency in a production process. In today's competitive environment, any firm must make high-quality, defect-free items at lowest possible price. Various operations are carried out by operators during the real manufacture of any product throughout the actual manufacturing process all of the mistake or errors made by the operator. The Poka-Yoke mechanism is critical in homebased food industry as most processed are still in manual. Poka-Yoke concept helps to prevent human mistakes from occurring on the production line. The aim of this project is to eliminate human errors using Poka-Yoke concept. The three objectives of this project are; (i) to identify human errors in home-ased food business at production processes, (ii) to analysis the root causes of human errors in SME's food industry, and (iii) to propose solution with control mechanisms for each problem. All the data obtained through observation of severity and occurrence of human mistake in each process are collected from all three companies in order to identified critical problems need to be solve. Next, all data that obtained through observation and 4M (Man, Machine, Material, and Method) are collected from each company to identify the possible root cause of each problem. The root cause was identified using Ishikawa Diagram and further analyzed with 5Why analysis. In total 13solutions with control mechanisms have been proposed based on root causes analysis, which is for NB Emerald Resource Company is reducing quantity snacks in packaging, using scrap collecting bowl by attached at tabletop, use color coding and label, Design of Experiments (DOE), and Change material of secure bottle cap. CNoah Bakery Company Changing material of piping bag, maintenance sheet, Fridge or Chiller Lock, Schedule of delivery time, and vehicle maintenance sheet. Diva's Kitchen Company is schedule of delivery time, vehicle maintenance sheet, Material Requirements Planning (MRP) Table, and oven maintenance sheet.

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DEDICATION

Only

my beloved father, Baharud-din bin Abu Bakar

my appreciated mother, Zalila binti Ali

my beautiful sisters, Normala and Nabila Aina

my adored brothers, Mohd Ameerul

for giving me moral support, money, cooperation, encouragement, and understandings

Thank You So Much & Love You All Forever

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LIST OF ABBREVIATIONS

COVID-19	-	Coronavirus Disease-2019
WHO	-	World Health Organization
SMEs	-	Small and Medium-Sized Enterprises

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CHAPTER 1

INTRODUCTION

Using this project, it wants to introduce the phrase "Poka-Yoke system," which has recently been adopted in the industry, and to examine the effectiveness of the Poka-Yoke system in the workplace. Poka-Yoke is a device used in the lean manufacturing process to aid an operator in avoiding errors and reducing waste. Human mistake must be avoided, corrected, or brought to the attention of those who are responsible for the product flaw. A strategy that has been developed to avoid personnel from making mistakes while conducting a task is also known as preventative maintenance. This "Poka-Yoke" strategy may assist individuals and processes in getting things done correctly the first time. It may also help to enhance the product's overall quality and dependability. It is the approach that makes it difficult to make any errors that is known as "Poka-Yoke."

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This chapter provides a summary of the project as well as an explanation of the project's primary goal. The chapter contains information on the project's background, the problem statement for the project that was intended to be built, the goals that were set of the project's completion, and the scope of the research that will undertake.

1.1 Background Project

Poka-Yoke is a strategy for reducing unintentional mistakes made by process from becoming defects, non-conformances, and, eventually, incidents. Poka-Yoke is one of the simplest tools to master; it's extremely compatible with Six Sigma's basic goals and philosophy, and it's useful in manufacturing, engineering, and transactional processes. Poke-Yoke entails devising actions aimed at eliminating faults, blunders, or flaws in daily tasks and procedures. Poka-Yoke begins with a knowledge of a fault's cause-and-effect connection, then moves on to a repair that prevents the mistakes that lead to the defect from happening again.

The global food industry is facing a variety of challenges that need firms to improve their efficiency and quality management systems in order to remain competitive. The companies' partner with major merchants that want a varied product assortment, rapid delivery time, frequent deliveries, and ongoing price reductions. Additionally, industrial characteristics such as product perishability entail making every effort to minimize lead times and to avoid wasting items that cannot be sold after their shelf life expires (Pauls-Worm et al., 2016).

Food is one of the most important industries in the world since it is a human's most fundamental requirement. It is a significant contribution to Malaysia's economy. Malaysia's food sector is dominated by small and medium-sized businesses. In this project, the food business is prevalent in Seri Kembangan and Shah Alam, Selangor. This trio of businesses was chosen as the food industry in the homebased field. This project was conducted on a homebased business, that aims to solve most common human mistakes along the production line.

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1.2 Problem Statement

As the population of home cook business is on a hike in our country especially during pandemic Covid-19, the quality of product for this Small-Medium Enterprise (SME) business is becoming one of the important factors that determine whether the business can last long amongst the bombardment of other else online home cook business. Efficiency is

often defined as ability to avoid or to eliminate human mistakes during the process of the production. It measures how well a business can turns all the inputs like labor and material into the output such as revenues. In recent years, many SME in food industry especially for those homebased business facing competition from others in online platform.

As knowing, homebased food business is using manually and semi-auto process in their production line the possibilities of human mistakes occur is high due to it completely human operations. Due to human mistakes that could not solve, the productivity drop with the quality of products. In addition, there is an issue in homebased business which is the lack of database production such as defect quantity. Database is the most important data for any kind of business to make business stronger, raising ability to increase profits. Therefore, the aim for this project is to improve the productivity by using Poka-Yoke concept for SME in food industry.

After a few observations and several interviews are carried out at three different SME in food industry especially focuses on home cook business, there are some feedbacks from owners and co-workers regarding the common human mistakes in their own business. A total of three companies shops owner and two co-workers are interviewed about their experience from handling the production in small medium food industry business.

Table 1. 1: Common Problems in company's

Companies	Common problems
CNoah Bakery	1. Overload in packaging 2. Scattered when opened raw material 3. Overheat 4. Wrong flour when mixing 5. Untied bottlecap 6. Not enough raw material 7. Finger injury 8. Bottles dents 9. Time - Delay
Diva's Kitchen	1. Pipping bag burst 2. Wrong flour of ingredients 3. Un-cooked product 4. Unprepared fondant 5. Time – delay 6. Miscommunication on design of the cake 7. Product falls while packing
NB Emerald Resource	1. Time-Delay 2. Not Enough Ingredients 3. Burnt Cookies 4. Ran Out of Stickers

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1.3 Project Objectives

There are four objectives to be archive in order to improve the productivity through Poka-Yoke as follows:

i. To identify human errors in homebased food business at production processes.
ii. To analysis the root causes of human errors in homebases' food industry.
iii. To propose solution with control mechanisms for each problem related to human errors in homebased food industry.

1.4 Project Scope

This project focuses of homebased food business on the human errors along the processes and provide the solution to human errors at SME by using Poka-Yoke concept in the production processes only. This project is focusing in three SME's company, there are NB Emerald Resource, CNoah Bakery, and Diva's Kitchen. All this company are state at Selangor. It will cover the entire processes from receiving order until delivery to customers

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1.5 Project Significant

This project is conducted to improve the knowledge and performance of Poka-Yoke concept in small business homebased owners. When the Poka-Yoke approach is successfully implemented at SME food industry, it shows that Poka-Yoke concepts are not limited to the size of enterprise. Small medium in food industry focusing on homebased business can also learn to bring the Poka-Yoke concept into their business management to increase productivity in homebased product. In this way, the SME in food industry can reduce or even can eliminate human mistakes that causes the small profit margin.

1.6 Summary

As noted previously, this study focuses on the Poka-Yoke-based model of an efficient small homebased food enterprise. This study sought to define and introduce the Poke-Yoke ideas in Chapter 1's Introduction. The research problem statement was also explored. After confirming the issue statement, the study's objectives were established before the research scope was narrowed to meet the needs of the small homebased food company.

In Chapter 2 of the Literature Review, the origins of Poka-Yoke notions are described. Due to the focus of this study on human mistakes in the homebased food industry, prior research utilizing the Poka-Yoke principles in a small to medium business (SME) of the homebased food industry has been examined and summarized.

In Methodology Chapter 3, the techniques for identifying human faults in the homebased food sector are outlined. To offer a deeper picture of this study, this chapter also discusses the approach for assessing the fundamental factors that led to each human error at the selected homebased food company.

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In Chapter 4, Results and Discussion, all of the obtained data from the study are examined. From the gathered data, a critical analysis of the comparison with the prior study has been conducted. In Chapter 5, the study's findings and recommendations for the lean model are presented.

CHAPTER 2

LITERATURE REVIEW

2.0 Preliminary

A literature review is a body of writing that seeks to evaluate the crucial point of present state of knowledge, in addition to theoretical and methodological contributions a topic has to offer. It's used to figure out how much work has previously been done and to spot any knowledge gaps. Aside from that, a literature study is utilized to get understanding of the broad subject within the specialized field and to find all of the material required in this research.

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2.1 Human Errors

Human error according to Dhillon and Liu, (2006a) is failing to fulfil a task or taking prohibited activity that ma interrupt operations or damage equipment and property. A human error may be characterized as either critical or non-critical. A major human error is one that can result in the complete system failing, but non-critical human errors will only result in a partial system failure or another minor failure. According to Dhillon and Liu (2006b) human mistake has happened from the beginning of time, but only in the last 50 years has it been investigated scientifically. Among the things they observed were inadequate illumination in the work area, insufficient training or expertise of the people engaged, bad equipment design,

excessive noise levels, an unsuitable work arrangement, incorrect tools, and a poorly designed equipment maintenance system and operating system (Dhillon and Liu, 2006c).

2.1.1 Types of human error

Poka-Yoke is a method to reduce or eliminate the defect occurs in the production line in the industry. Every day, many kinds of mistake can be available in the complex environment of workplace that cause by human error. This oversight will result in the production of faulty items. When defects are not detected and corrected as quickly as feasible, they have the potential to degrade the quality of the product and hence disappoint the client. The Poka-Yoke method is a simple method in order to achieve the Zero Defect of the products. There are ten different kinds of human errors by (Shimbun, 1988), which are presented in Table 2.1 according to these, it will eventually conclude that human error accounts for almost all faults. Table 2.1 shows 10 types of human errors with examples.

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