DEVELOPMENT OF SEMI-AUTOMATED AMPLANG PACKAGING MACHINE

This report 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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DECLARATION

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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 with Honors.
The members of the supervisory committee are as follow:

(DR. SYAMIMI BINTI SHAMSUDDIN)

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ABSTRAK

Projek ini menerangkan mengenai pembangunan mesin pembungkusan amplang separa automatik. Pembangunan mesin hanya memberi tumpuan pada pembungkusan amplang dan bukan untuk bagaimana amplang itu dibuat. Mesin ini direka khusus untuk meningkatkan kadar pengeluaran syarikat perusahaan sederhana dan kecil seperti Rosmie Bersaudara Sdn Bhd di Sabah. Syarikat ini bergantung sepenuhnya kepada pekerja manual untuk mengisi makanan ringan amplang ke dalam paket plastik. Ini memerlukan banyak masa. Dengan mesin baru, masa yang diambil untuk pekerja membungkus satu paket amplang akan lebih pendek. Oleh itu, kesegaran amplang akan dikekalkan. Mesin ini menggunakan mikrokontroler Arduino Uno dan sensor sel beban untuk mengukur berat amplang sebelum paket dimeteraikan. Untuk mensimulasikan litar elektrik, perisian Fritzing telah digunakan. Dalam hasilnya, mesin itu mampu membungkus 100 g berat amplang. Mesin ini terdiri daripada lorong penyuapan getaran, pemeterai dan sensor sel beban yang digunakan untuk process menimbang dan membungkus. Masa yang diambil untuk amplang yang ditimbang untuk mencapai 100 g adalah kira-kira 8.17 saat untuk satu paket sahaja. Harga keseluruhan mesin ini ialah RM715.89 termasuk kos bahan dan perkakasan yang telah digunakan. Berdasarkan hasilnya, projek objektif untuk menimbang berat amplang pada keadaan berat yang sama iaitu 100 g telah dicapai. Oleh itu, mesin ini telah direka bentuk dan berjaya dengan fungsinya untuk menyokong syarikat pembuatan amplang.

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ABSTRACT

This project describes the development of a semi-automated amplang packaging machine. The development of machine only focused only on packaging of amplang and not for how amplang was made. This machine is specifically designed to increase the production rate of an SME company of Rosmie Bersaudara Sdn Bhd in Sabah. This company totally relies on manual workers to scoop the amplang snacks into the plastic packet. This requires a lot of time. With the new machine, the time taken for the workers to package one packet of amplang will be shorter. Thus, the freshness of amplang will be preserved. This machine implements Arduino Uno microcontroller and a sensor of load cell to measure the weight of amplang before the packets are sealed. To simulate the electric circuit, Fritzing software was used. In results, the machine able to packed 100 g weight of amplang. This machine consists of vibrational feeder lane, sealant and load cell sensor for weighing and packaging process. The time taken for the amplang to be weigh and reach 100 g is about 8.17 seconds. The overall price for this machine is RM715.89 including cost of material and hardware that have been used. Based on the results, this machine able to weight the amplang with similar weight of current process. Therefore, the machine has been designed and fabricated successfully with their functionality to support amplang manufacturing company.

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DEDICATION

To my beloved Gema Family, My Parents and Friends.

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LIST OF ABBREVIATIONS

SME	-	Small and Medium Enterprise
LCD	-	Liquid Crystal Display
DC	-	Direct Current
PCB	-	Printed Circuit Board
CAD	-	Computer-Aided Design
CAE	-	Computer-Aided Engineering
SDLC	-	System Development Life Cycle
FKP	-	"Fakulti Kejuruteraan Pembuatan"
MCU	-	Microcontroller Unit
USB	-	Universal Serial Bus
PWM	-	Pulse Width Modulation
ICSP	-	In-Circuit Serial Programming
RPM	-	Revolution per Minute
ABS	-	Acrylonitrile Butadiene Styrene
IDE	-	Integrated Development Environment
LED	-	Light Emitting Diode
TIG	-	Tungsten Inert Gas
MIG	-	Metal Inert Gas
HAZ	-	Heat Affected Zone
DXF	-	Drawing Interchange Format or Drawing Exchange Format
BOM	-	Bill of Materials
RFID	-	Radio Frequency Infrared Detector

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LIST OF SYMBOLS

V	-	Voltage
G	-	Gram
Kg	-	Kilogram
mA	-	Milliampere
kB	-	Kilobits
ms	-	Milliseconds
MHz	-	Mega Hertz
Oz-in	-	Ounce inch
A	-	Ampere
mm	-	Millimeter
°F	-	Fahrenheit
%	-	Percentage
S	-	Second(s)

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CHAPTER 1

INTRODUCTION

1.1 Background

In the food packaging industry, increasing demand and stiff competition makes it imperative for producers to improve the purchasing process. This study aims to solve problems related to food packaging in Malaysia. This study focuses on a packaging problem at a small and medium scale enterprise (SME) in Sabah. Malaysia is a country blessed with a wonderful blend of cultures. There are various types of religion, nation and races, this were contributed to different ethnic and traditional food. In Sabah, there is one famous food name as amplang as shown in Figure 1.1. Amplang is a type of square crackers that become a family snack eaten while sipping hot coffee, the people do not know why the crackers are square not round or any other form (Ishak, 2009).

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Figure 1.1: Amplang snack (Ucop, 2015)

One of the major SME that produces amplang is name as Perniagaan Rosmie Bersaudara in Tawau. According to Fauzrina Bulka, the founder of this amplang snacks food producer was Rosmie Nariddin, 63 years old. He was operated this SME at his own home and was worked out by 10 workers at early started on 1990 at Kampung Muhibbah Raya, Tawau. Now, the job was giving to his son name as Rozekin Suratman, 37 years old and the workers are double or more as their average profit RM60,000 per month roughly (Bulka, 2016).

This company packs about 100 kilogram of amplang per day or more depends on order. Today, the wholesale price for this amplang was increased due to unsustainable local economy. The price for 1 kilogram is RM20, for 500 gram the price will RM10, for 200 gram the price is RM5 and for 100 gram the price is RM3. In addition, according to Rozekin the main ingredients are Mackerel (kind of fish), powder and small shrimps stayed mix together to become amplang. They also have separate recipe that inherited from his family and cannot be told or share with others, except for his inheritance.

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Figure 1.2: An example of amplang packaging (Aniawatitri, 2011)

1.1.1 Packaging Process at Small and Medium Enterprise (SMEs)

The main purpose of designing and simulation of low cost packaging machine in synchronization with assembly line was to provide the small sector food industry (MSME) or (SMEs) with a platform that they are able to process their food item in safe packets by reducing the cost of packaging machines (Singh and Chaurasia, 2016). The author also added that he did it through designing the whole machine in virtual environment (SolidWorks 2013) where every component was based on standard available mainly electronic part for automation (semi-automation).

In Malaysia, these SME is important in the development and growth of Malaysia economic (Khalique and Jan Khan, 2014). As stated by SME International Malaysia (2013) the SMEs forms an important part of some advanced succeeded economies, which comprising over 98% of total establishment and contributing to over 65% of employment as well over 50% of the gross domestic product.

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1.2 Problem Statement

The main problem statements that need to be considered when carrying out this project are stated below:

(a) Manually operated packaging process

The problem that occur at Rosmie Bersaudara industries is that only manual worker are employed to do amplang packaging, in which the workers only scoop the amplang into the package and measure the weight of each fulfill pouch using electronic balancing as shown on Figure 1.3.

Figure 1.3: Process of filling and weighing the amplang pouch (Bulka, 2016)

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(b) Time consuming

The time cycle for completing the packaging of one pack amplang have to be shortened and seal properly to preserve the freshness of amplang. The Figure 1.4 also shows that the amplang may expose to the air for a longer time and the freshness of amplang will be decreases.

Figure 1.4: The workers scoop amplang into plastic packet (Hassan, 2015)

(c) Hygiene and cleanliness

As the amplang was expose to the air for a long period of time, the amplang may contaminated from the dust or other unwanted substances.

(d) Current prototype and improvement

Previously, the first design of this machine was for the Mechatronics project as shown on Figure 1.5. The machine did not function effectively especially on the door of chamber before amplang drop and fill the pouch. The design of door was not idle to the chamber and need to design again. Thus, the chamber also needs to redesign again regarding to the patent of filler machine from industries.

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Figure 1.5: Previous packaging and weighing machine of amplang.

1.3 Project Objectives

The ultimate goal of this project is to ease the workers at Perniagaan Rosmie Bersaudara Sdn. Bhd that rely 100% on manual packaging for a large amounts of amplang production. The specific objectives that need to be achieved are:

(a) To design a semi-automated amplang packaging machine with the functionality of weight measurement, safe sealing and vibrational feeder lane for an amplang manufacturing company.

(b) To develop the amplang packaging machine and test its sealant function, load cell sensor and vibrational feeder lane to produce packages that weighs of 100 g each.

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