

**ARDUINO BASED SYSTEM FOR INGREDIENT DISPENSING IN GULA  
MELAKA PRODUCTION**

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in fulfillment of the requirement for the degree of  
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## DECLARATION

I hereby declare that the thesis entitled "Arduino Based System for Ingredient Dispensing in Gula Melaka Production" in this thesis is my own, except for quotations and references that have already been duly acknowledged.


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Date : 29 June 2019 .....

## APPROVAL

I have checked this report and hereby declare that in my opinion, this thesis is sufficient in terms of scope and quality for the award of the degree of Bachelor of Mechanical Engineering.

Signature :  .....

Name of Supervisor : DR. SHAMSUL ANUAR BIN SHAMSUDIN

Date : .....

## **DEDICATION**

I would like to dedicate my thesis to both my mother, Faridah Binti Mamat and father, Mohd Shukran Bin Kadir for their encouragement, pray of day and night, and for their endless support throughout my Final Year Project (FYP) journey.

## ABSTRACT

Gula Melaka or palm sugar used, mainly for cooking purposes. It is a nutrient-rich, low-glycemic crystalline sweetener that behaves almost exactly like sugar. However, the industry of palm sugar production still relies on manpower in the production system. The process of making palm sugar is time-consuming and takes a lot of work to make them. In other words, for the ones who make them could involve in serious injuries or back pain from making this delightful palm sugar. This project is to encounter those negative impacts by improving the ingredient dispensing process in palm sugar production. This goal could be achieved by installing Arduino, and by doing that this project will be able to control the ingredient dispensing process automatically so that the ingredient smoothly, accurately and automatically be dispensed based on the quantity of the production needed. The idea is to reduce the time in preparing the ingredient by dispensing it at the same time reducing the manpower needed in the production system.

## ABSTRAK

*Gula Melaka digunakan terutamanya untuk tujuan memasak. Ia adalah pemanis kristal yang kaya dengan nutrien, yang hampir sama seperti gula biasa. Walau bagaimanapun, industri pengeluaran gula sawit masih bergantung kepada tenaga manusia dalam sistem pengeluaran. Proses membuat gula melaka memakan masa yang lama dan mengambil banyak kerja untuk membuatnya. Dalam erti kata lain, bagi mereka yang membuatnya boleh terdedah kepada kecederaan serius atau sakit belakang dari membuat gula melaka yang sedap ini. Projek ini adalah untuk menghadapi kesan-kesan negatif ini dengan meningkatkan bahagian penyediaan bahan dalam pengeluaran gula melaka. Matlamat ini boleh dicapai dengan menggunakan Arduino, dengan itu projek ini akan dapat mengawal proses pengedaran bahan secara automatik supaya bahannya lancar, tepat dan secara automatik akan disediakan berdasarkan kuantiti pengeluaran yang diperlukan. Idea ini adalah untuk mengurangkan masa dalam menyediakan bahan dalam pengeluaran gula melaka dan dalam pada masa yang sama mengurangkan tenaga kerja yang diperlukan dalam proses pengeluaran.*

## ACKNOWLEDGEMENT

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## LIST OF ABBEREVATIONS

ASEAN	Association of Southeast Asian Nations
FYP	Final Year Project
HOQ	House of Quality
QFD	Quality Function Deployment
IDE	Integrated Development Environment
PVA	Polyvinyl Acetate

## LIST OF SYMBOL

$p$	=	Pressure
$\rho$	=	Density
$v$	=	Velocity
$g$	=	Gravitational Force
$h$	=	Height
$m$	=	Mass
$A$	=	Area
$r$	=	Radius
$Q$	=	Flow Rate
$\Delta V$	=	Volume
$\Delta t$	=	Time

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# CHAPTER 1

## INTRODUCTION

"Arduino based system for ingredient dispensing in Gula Melaka production" entitled as the project background provided by this chapter. This chapter includes the problem statement, the objectives, and the scope of this project. The summary of this project will also be discussed in this chapter.

### 1.1 Background Study

Arduino is an open-source platform with microcontrollers that commonly used to build electronic projects. The Arduino language is a set of C++ functions that can be used to write the code that tells the Arduino board to do various tasks (Yoshitaka, 2017). Satisfyingly, Arduino software which is also known as the Integrated Development Environment (IDE) software that runs on Linux, Mac or Windows (Nick, 2018) which makes it even more convenient.

On the other hand, Gula Melaka is the type of palm sugar that originated in the state of Malacca, Malaysia which is also known in English as "Malacca Sugar". It usually sold in bottles or tin. It also can be sold in the form of bricks or cakes but mostly in cylinders as in Figure 1.1 (Robyn, 2017). Traditionally, it is made by extracting the sap from the flower bud of the coconut tree first. The sap is then boiled until it thickens and left to solidify to form a shape and the product is then ready to be sold (Andrew, 2015).

# CHAPTER 1

## INTRODUCTION

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Figure 1.1: Palm Sugar (Gula Melaka 10kg, 2018)

## 1.2 Problem Statement

An automated ingredient dispensing process in palm sugar production is something that should be developed in the industries nowadays. This automated ingredient dispensing process can be developed by using Arduino, which has programmable functions that provide common control of the machine in performing a defined task including the ingredient dispensing process. The goal for this innovative statement is to counter the industry of palm sugar production which still relies on manpower in the production system (Mahalik and Nambiar, 2010). Hence, by doing so, the improvement of the ingredient dispensing process in palm sugar production can be achieved by reducing the manpower in that production.

## 1.3 Objective of Project

The objectives of this project:

- 1 To study and design an Arduino based system to create an automated ingredient dispensing process in palm sugar production.