**POLITEKNIK BANTING SELANGOR**

# SEMI AUTOMATIC SNACK PACKAGING SEALER MACHINE


| NAME | MATRIC NUMBER |
|---|---|
| MUHAMMAD SYAKIR IRFAN BIN SHAHARUDDIN | 24DKM22F1014 |
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**SUPERVISOR: PN. ROSEDHILA BINTI RAMLI**

**DEPARTMENT OF MECHANICAL ENGINEERING**


**1: 2024/2025**

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**A report submitted to Mechanical Enginering Department in partial fulfilment of the requirement for a Diploma in Mechanical Engineering**

**DEPARTMENT OF MECHANICAL ENGINEERING**

**1: 2024/2025**

## DECLARATION OF ORIGINALITY AND OWNERSHIP

## SEMI-AUTOMATIC SNACK PACKAGING SEALER MACHINE

**1.We,** **1.MUHAMMAD SYAKIR IRFAN BIN SHAHARUDDIN (24DKM22F1014)**
**2.MUHAMMAD ABDUL SALIM BIN SUMAR (24DKM22F1069)**
**3.AKMAL HAFIZAN BIN ABU BAKAR (24DKM22F1044)**
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Are final year students of **Diploma in Mechanical Engineering, Politeknik Banting Selangor,** which is located at **Persiaran Ilmu, Jalan Sultan Abdul Samad, 42700 Banting, Selangor Darul Ehsan.** (Hereinafter referred to as "Polytechnic")

2.We present that "aforesaid project" and the intellectual property contained therein is our original work / design without taking or imitating any intellectual property from other parties.

3.Wehereby agree to relinquish the ownership of the intellectual property in 'the project' to 'the Polytechnic' to fulfil the requirements for the award of **Diploma in Mechanical Engineering** to us.

Subscribed and solenmnly declared

# ACKNOWLEDGEMENT

In the name of Allah, the Most Gracious and Most Merciful.

We offer our deepest gratitude to Allah for His blessings and guidance throughout the completion of this project. We are immensely thankful for the opportunities, challenges, and resilience granted to us to bring this report to fruition. We extend our heartfelt appreciation to Prophet Muhammad SAW, whose teachings and example continue to inspire us.

First and foremost, we would like to express our sincerest gratitude to our supervisor, Pn. Rosedhila binti Ramli, for her invaluable guidance, patience, and understanding. Her constant encouragement and positive enthusiasm greatly motivated us in completing this project. It has been a privilege and honor to work under her supervision. We are also deeply grateful to En. Ahmad Syazwan, who provided essential in developed the coding and programming process in completing this project. Additionally, we acknowledge and appreciate the Department of Mechanical Engineering for their continuous support and cooperation.

Our heartfelt thanks go out to our families, whose unwavering support made it possible for us to complete this report. Finally, we extend our gratitude to everyone who contributed, directly or indirectly, towards the successful completion of this project. Their assistance and encouragement have been invaluable.

# ABSTRACT

In this modern era, the food industry is rapidly evolving alongside advancements in technology, particularly in mechanics and electronics. The packaging of snacks, like many other processes, needs to keep pace with these technological developments. Manually sealing snack packages is labor intensive, time-consuming, and often results in inconsistent quality, impacting freshness and shelf life. To address these issues, the "Semi-Automatic Snack Packaging Sealer Machine" was developed, incorporating innovative designs and partially automated functions to enhance efficiency in the packaging process. This machine is specifically designed to reduce human labor, minimize errors, and improve the quality of sealed packages. By integrating a semi-automatic heat-sealing mechanism, this machine consistently produces airtight seals, preserving the snacks' freshness and quality. With precise engineering and assembly, including components for adjustable heat settings and compatibility with various packaging materials. The application of this technology is highly beneficial for small to medium-sized food businesses, enabling them to scale up production and reduce labor costs. This project serves as an example of how technological advancement in food processing equipment can contribute to the growth of the Malaysian food industry, improving efficiency, product quality, and ultimately supporting higher production output.

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# CHAPTER 1

# INTRODUCTION

## 1.1 INTRODUCTION

The Semi-Automatic Snack Packaging Sealer Machine is inclined towards the need for better, more practical, and cheap user-friendly food packaging mechanisms especially for snacks.

Consider a novel combining the convenience of automated sealing operations with some degree of manual control, to realize the efficient packaging of the perishable products when there is a constant pressure to reduce the levels of spoilage and contamination in food circulation and packaging, catering to the growing food production industry which needs out of the box solutions to implement the current quality requirements without compromising too much on the cost and the technological simplicity for the small and middle manufacturers.

Food packaging is among the fundamental elements in the food industry. It embodies numerous features whose aim is to protect to the best quality the food from the site of its production to the site when it is eaten. The main task is to preserve the foodstuff from physical damage or chewing, from chemical contamination, from microorganisms, and environmental conditions, which are water, air, sunlight, temperature, etc. Excessive moisture, oxygen, sunlight or high temperatures, spoil or deteriorate the food. Maintenance of such external elements is done by packaging such that the packaging protects the food from those elements.

Modern food packaging has given much attention to the aspect of consumer convenience. For example, the package is made in a way that it is not hard to remove from the contents; the package can also be sealed for another use and it can also be ‘diet portioned’. Other than that, packaging serves the purpose of advertisement and carries information regarding the product such as the name of the product, how nutritious it is, how safe it is to consume with what substances (allergies), how to cook it, when it is not safe anymore as well as how to keep it. This is to ensure laws are acting and it helps the people to buy the right products when they are able to eat them.

## 1.2 BACKGROUND

A sealer is a device or tool used to close or seal containers, packages, or bags to protect the contents inside. This project focuses on the design and construction of the mechanical elements of the machine as well as the sealer machine system. To meet the goals of this project, the body structure mechanical system of the sealer, strength, safety and ergonomic design must be taken into account. Situations that we can see is when users experience fatigue when sealing packaging. The method used back then is requires the operator to perform each step manually. This involves positioning the packaging, applying pressure, and managing the sealing process from start to finish. In comparison, hand-operated sealing machines are slower in that they require a greater amount of time and labor per package compared to their automatic counterparts. The major drawback with this type is that it does become very slow and inefficient to operate on a large scale, thus easily causing congestion in a production line-up-especially when the demand is high.

## 1.3 PROBLEM STATEMENT

Day after day, automatic snack packaging activities involve the design of a system that is innovative, efficient and accurate to pack snacks into packets or plastic containers, often becoming a high demand especially for commercial businesses in our country. In addition, it must be cost effective and can be adapted to the amount of production and different types of snacks. This is said because based on research, the manual snack packaging sealer has several weaknesses, one of which is the lack of a safety mechanism on the machine, which can result in user accidents such as burn. In addition, packing snacks in large quantities using manual machines need to remember the packages that have been seal. This causes users to lose count so that it is difficult to predict the amount of packaging they can produce and production products. Packing snacks with a high amount using manual packaging machines requires more time to sealing. With this, discussed to produce a new asset by creating an automatic snack packaging machine specifically for commercial business.

## 1.3 OBJECTIVES

● To develop the circuit of the Ultrasonic Sensor with counter at Semi-Automatic Snack Packaging Sealer Machine.

● To reduce time taken to seal packaging.

## 1.4 SCOPE AND LIMITATIONS

This product is mostly produced for use in Small Medium Entrepreneurs (SME). They are our primary target since they may benefit from our product's ergonomic design, which is appropriate for commercial businesses who previously faced difficulties due to a lack of a suitable machine. Also aware that commercial business does not need a large sealer machine, therefore our target user focus must be on commercial business that only needs a simple machine that does not take up a lot of space.

Our sealer machine project also focuses on the type of plastic used. the plastic used must not be too thin, this is because this will cause the plastic to melt and the sealing process on the plastic will not be done, therefore the plastic must be in the best condition to ensure that the seal produced looks neat and completely airtight. The plastic used must also have a maximum weight of 4kg. this is because excessive mass will make the sealing process difficult because this machine is specified for Small Medium Entrepreneur (SME) users only and not for large industries.

One of our objectives is to develop an ultrasonic sensor to count how much packaging has been sealed. So, for the ultrasonic sensor there is no limit for the calculation of sealed packaging. This will make it easier for users who are running small medium entrepreneur businesses that produce food products in the amount of 1000 or more. The calculation data and information will be stored in Google Sheets which can be viewed via mobile phone or laptop, this will indirectly increase the productivity of the production.

## 1.5 CONCLUSION

Throughout this, this project had managed to describe each subject in depth in this chapter 1. Additionally, able to define the problem statement and make the project goals very clear. Next, as seen above, carefully build the scope of the project according to the planned product. We can see here that we have covered every necessary aspect in this chapter so that the jury panel can see what the real purpose of this product is. After that, will also cover the literature review of each item that used for our project in the next topic, which is the literature review.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 INTRODUCTION

A sealing machine is a device that securely closes and seals packaging materials such as bags, pouches, or containers. These machines use heat, pressure, or sealer to create airtight and tamper-proof seals, preventing the entry of air, moisture, or contaminants that can compromise the quality of the packaged products. Sealing machines come in various types to cater to different packaging needs. Sealing machines are like unsung heroes of the packaging world, quietly ensuring the freshness and safety of various products we use in our daily lives. From sealing bags of snacks to sealing medical equipment, these machines play a key role in preserving the honour of countless items. [1]. Heat sealing involves sealing one thermoplastic with another same kind of thermoplastic by means of heat and pressure. The direct contact procedure of heat sealing uses either a sealing bar or a constantly heated die for the purpose of applying heat over a specific path or contact area to weld or seal the thermoplastics together. Heat sealing has several applications, including thermally activated adhesives, heat seal connectors, plastic ports, film media or foil sealing [2]. Manual sealing machines, requiring direct human intervention, are primarily employed for sealing plastic bottles, containers, and bags. These devices are particularly beneficial in environments with limited-scale operations or in situations where the volume of output is relatively low, offering a tailored solution in contexts where automation is neither practical nor essential. [3]. An automatic sealing machine is a piece of equipment that automates the process of sealing bags, pouches, or other packaging materials. It is designed to provide a fast, efficient, and consistent method of sealing products, ensuring that they remain fresh and protected during transport and storage. In this blog post, we will dive deeper into the world of automatic sealing machines, exploring their functionality, benefits, and applications. [4]

## 2.2 TYPES OF SEALING MACHINE

### 2.2.1 Can Sealing Machine

Figure 2.1: Can Sealing Machine

Figure 2.1 shown that Can Sealing Machines are intricately engineered devices designed to hermetically seal containers, thereby ensuring the contents within are meticulously safeguarded against external contaminants. These machines are pivotal in sectors like the food industry, pharmaceuticals, and beyond, where the integrity and preservation of product quality are of the utmost importance [5].

### 2.2.2 Foil Sealing Machine

Figure 2.2: Foil Sealing Machine

Figure 2.2 shown that Foil sealing machines are sophisticated apparatuses engineered for the precise application of an aluminium foil heat induction liner, which is crucial for products necessitating tamper-evident and hermetic seals, particularly prevalent in the pharmaceutical and culinary sectors. These machines play a critical role in ensuring product safety and longevity [6].

### 2.2.3 Heat Sealing Machine

Figure 2.3: Heat Sealing Machine

Figure 2.3 shown that Heat sealing machines are sophisticated devices that harness the principles of thermal energy to effectuate the sealing of diverse materials. These machines are ingeniously calibrated to accommodate a plethora of applications, showcasing their remarkable versatility and indispensability in multiple industrial sectors [7].

## 2.3 TYPES OF SENSORS

### 2.3.1 Temperature Sensor

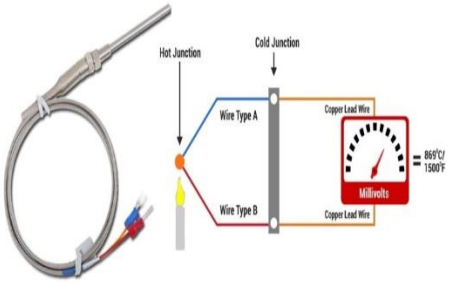



Figure 2.4: Temperature Sensor

Figure 2.4 shown that Temperature sensors are used for measuring the temperature of any object or medium. Temperature is a fundamental measurement of thermal energy which has an SI unit in Kelvin. It is one of the most widely used sensors. The majority of these are contact sensors while infrared and ultrasonic temperature sensors are contactless sensors [8].

### 2.3.2 Proximity Sensor

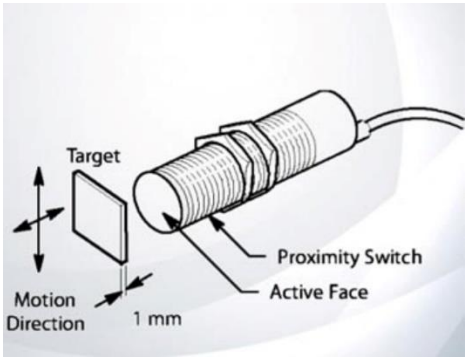



Figure 2.5: Proximity Sensor

Figure 2.5 shown that Proximity sensors are sensing devices capable of detecting the presence of objects without physical contact. These are among the most commonly used sensors. There are different kinds of proximity sensors depending on the physical quantity they measure. It is most commonly used in industries to measure the close proximity of any mechanical parts, in mobiles, proximity sensors are used for the detection of faces during calls. They are used in safety systems and in the automotive, aerospace industry [9].

### 2.3.3 Position Sensor

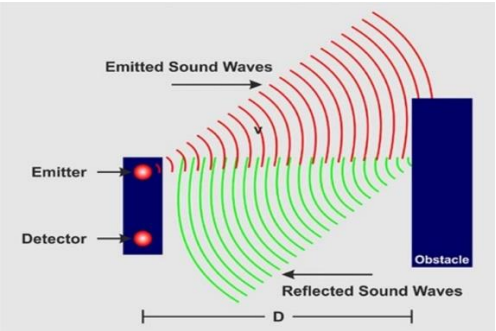



Figure 2.6: Position Sensor

Figure 2.6 shown that Position sensors are devices that can detect the movement of an object or determine its relative position measured from an established reference point. These types of sensors can also be used to detect the presence of an object or its absence. Position sensors are sometimes confused with proximity sensors [10].

## 2.4 TYPES OF HOLLOW STEEL

### 2.4.1 Square Hollow Section

Figure 2.7: Square Hollow Section

Square Hollow Section (SHS) has a flat surface which is also economical for joining and welding and requires minimal edge preparation. In comparison with circular segments, SHS also has Circular Hollow characteristics with their symmetrical appearance formed in equilateral square hollow sections. It has high-carrying characteristics which in turn decrease radii at the corner [11].

### 2.4.2 Rectangular Hollow Section

Figure 2.8: Rectangular Hollow Section

Rectangular hollow sections or rec tubes are cold formed and welded from either hot rolled, cold rolled, pre-galvanized or stainless steel.

In order to form the rectangular steel sections the appropriate mother tube, a round steel tube, has to be formed first [12].

### 2.4.3 Circular Hollow Section

Figure 2.9: Circular Hollow Section

Circular hollow sections (CHS) have evolved to be a primary choice for the fixed type offshore structures (namely jackets) and the mobile type offshore platforms (jack-ups), due to its appealing characteristics in minimizing the wave forces and structural efficiency in resisting various loading conditions [13].

## 2.5 TYPES OF WOODS

### 2.5.1 Pine Wood

Figure 2.10: Pine Wood

Pine wood has a straight grain, medium texture, ensuring stability when used as furniture. However, some types will have uneven texture and appear knots. There are sapwood and core that are not clearly distinguished, the heartwood is light brown and the sapwood is lighter yellowish white [14].

### 2.5.2 Maple Wood

Figure 2.11: Maple Wood

Maple wood comes from deciduous maples, which are found in about 200 different species in Eurasia and North America. Maple wood (Latin name: Acer) is mainly used in construction and furniture. European woodcarvers prefer the wood of maple species growing at high altitudes such as mountain maple and curly maple [15].

### 2.5.3 Mahogany Wood

Figure 2.12: Mahogany Wood

Mahogany is an exotic wood prized for its durability, workability, and elegant look. It has a pink or reddish-brown hue that deepens over time. The grain is straight and uniform, typically with relatively few knots or blemishes [16].

## 2.6 TYPES OF WHEELS

### 2.6.1 Heavy-Duty Casters

Figure 2.13: Heavy-Duty Caster

Heavy-duty casters are designed to handle substantial weights, typically ranging from 1,000 to over 2,000 pounds per caster. Unlike standard casters, they are built with reinforced materials like high-quality polyurethane or steel and feature larger wheels to manage heavy loads without compromising on mobility [17].

### 2.6.2 Polyurethane Casters

Figure 2.14: Polyurethane Caster

Polyurethane caster wheels are made of robust, long-lasting polyurethane material instead of commonly used plastic or metal. They are one of the most durable wheel options on the market and can support heavier equipment that needs smoother, more agile movements than standard caster wheels may provide [18].

### 2.6.3 Pneumatic Casters

Figure 2.15: Pneumatic Caster

Pneumatic casters have wheels filled with air, like a bicycle or car tires, versus the more common solid caster wheels. Before you spend money on upgrading or repairing your carts, pallets, or other wheeled equipment, learn more about pneumatic casters from Caster Central [19].

## 2.7 TYPES OF MODULE INTERFACE

### 2.7.1 Infrared Sensor

Figure 2.16: Infrared Sensor

Infrared sensors are a specific type of motion sensors that use infrared radiations. The main use-case of this device is within physical security and, in particular, for intrusion detection purposes. The two types of infrared sensors are active infrared sensors and passive infrared sensors with these last ones being the preferred ones in the context of physical security.[20]

### 2.7.2 Bluetooth Module

Figure 2.17: Bluetooth Module

A Bluetooth module, such as the RN41, is a device that enables wireless communication between electronic devices over short distances. It is designed to be easily integrated into embedded systems and supports various data connection interfaces. The RN41 Bluetooth module specifically operates on a 3.3-V power supply and offers low-power operation, encryption for secure communication, and error correction for reliable data transmission. [21].

### 2.7.3 Arduino UNO


Figure 2.18: Arduino UNO

The Arduino UNO is a standard board of Arduino. Here UNO means 'one' in Italian. It was named as UNO to label the first release of Arduino Software. It was also the first USB board released by Arduino. It is considered as the powerful board used in various projects. Arduino.cc developed the Arduino UNO board.

Arduino UNO is based on an ATmega328P microcontroller. It is easy to use compared to other boards, such as the Arduino Mega board, etc. The board consists of digital and analog Input/Output pins (I/O), shields, and other circuits. The Arduino UNO includes 6 analog pin inputs, 14 digital pins, a USB connector, a power jack, and an ICSP (In-Circuit Serial Programming) header. It is programmed based on IDE, which stands for Integrated Development Environment. It can run on both online and offline platforms. [22]

### 2.7.4 Application Programming Interface (API)

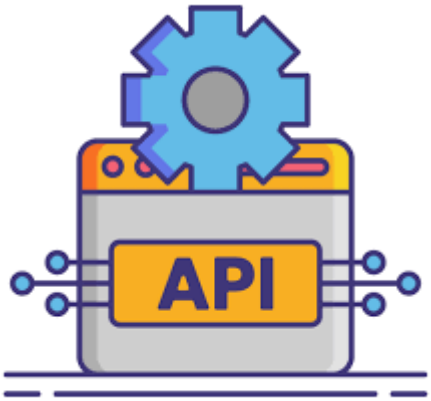



Figure 2.19: Application Programming Interface (API)

APIs are mechanisms that enable two software components to communicate with each other using a set of definitions and protocols. For example, the weather bureau's software system contains daily weather data. The weather app on your phone "talks" to this system via APIs and shows you daily weather updates on your phone.

API architecture is usually explained in terms of client and server. The application sending the request is called the client, and the application sending the response is called the server. So, in the weather example, the bureau's weather database is the server, and the mobile app is the client.[23]

### 2.7.5 IoT

The term IoT, or Internet of Things, refers to the collective network of connected devices and the technology that facilitates communication between devices and the cloud, as well as between the devices themselves. Thanks to the advent of inexpensive computer chips and high bandwidth telecommunication, we now have billions of devices connected to the internet. This means everyday devices like toothbrushes, vacuums, cars, and machines can use sensors to collect data and respond intelligently to users.

The Internet of Things integrates everyday "things" with the internet. Computer Engineers have been adding sensors and processors to everyday objects since the 90s. However, progress was initially slow because the chips were big and bulky. Low power computer chips called RFID tags were first used to track expensive equipment. As computing devices shrank in size, these chips also became smaller, faster, and smarter over time. [24]

## 2.8 POSTURE BODY

### 2.8.1 Posture body while sealing

Industrial workers were frequently exposed to injury at work due to an incorrect working posture. Improper working posture such as bending, twisting and uncomfortable posture contribute to musculoskeletal disorder (MSD). This paper deals with the survey of the posture practices by Malaysian industrial workers [25].

#### 2.8.1.1 Bending

This study aims to assess the effects of gender and work postures on subjective discomfort, muscle fatigue, and kinematics during a manual packaging task. METHODS: Twenty participants, including 10 males and 10 females, were recruited to perform a 60-minute manual packaging task in sitting and standing postures. RESULTS: Discomfort was evidenced by increased the rating of perceived exertion (RPE) values (sit: from 6 to 14.55; stand: from 6 to 17.15) and muscle fatigue was supported by decreased median power frequency (MPF) values for right brachioradialis (RB) (sit: –23.68%; stand: –16.20%), right upper trapezius (RUT) (sit: –20.14%; stand: 11.79%), and right erector spinae (RES) (sit: 8.64%; stand: 11.21%) muscles. Women were more likely to bend forward in a relaxed upper body position, especially while sitting, which may increase the risk of low back pain and women also reported greater discomfort than men, but not in the hands and back. Compared with sitting, the back showed greater muscle fatigue in standing, while muscle fatigue for the shoulders and hands was the opposite [26].

#### 2.8.1.2 Twisting

Ergonomics in working industries play an important role which make any task being done easier, thus improving the company production quality. By applying the ergonomics systematically in working life, the work-related musculoskeletal disorders (WMSDs) can be reduced. WMSDs generally affect human body by working in awkward posture which gives discomfort and pain [27].

## 2.9 SUSTAINABLE DEVELOPMENT GOALS (SDG)

### 2.9.1 SDG 9 (Industry, Innovation and Infrastructure)

A small business helps to uplift economic growth. Coase (1937) referred that the transaction cost of large organization can reduce productivity. He argued “the operation of market cost is something and by forming an organization and allowing some authority (an entrepreneur) to direct the resources, certain marketing cost can be saved” (pp.392) [28].

## 2.10 PACKAGING FUNCTION

Based on this project, this machine used to seal snack packaging. Packaging is the basic necessity of every product. Without packaging the product cannot be stored or moved from one location to another. Packaging provides an identity to the product. Therefore, packaging is the process of providing a protective and informative covering to the product in such a way that it protects the product during material handling, storage and movement and also provide useful information to all the concerned parties about the content of the package. Packaging snacks in multicomponent mini-meals provides a balanced nutrient profile in lower calorie counts. Snack-food packaging also serves low-income populations because of their smaller, more affordable size.

## 2.11 SUMMARY OF CHAPTER

In this chapter, it is explained about how the literature review was done with specifically and the reason why this project was chosen. In this chapter, machine comparisons are also made to see the advantages and disadvantages of machines on the market. In addition, sensors also have a variety of types with a variety of functions, so here you can see the advantages and disadvantages of each sensor. and finally, the packaging used for this project, regarding snack packaging and what its functions are.

# CHAPTER 3

# METHODOLOGY

## 3.1 INTRODUCTION

In this chapter, the design of the project and its functionality will be discussed. Design sketch and details of the project that we will build starting in chapter 3.2, showing how process throughout the completion of project 1 and components that will have resources selected by us, production methods, and work routines. The material cost for each item will be shown in section 3.6. Gantt chart will also be included in this chapter. From week one to week fourteen, it will show progress throughout the project 1. This work has been divided into several stages based on the flow chart. Includes information gathering, market research, project research design, idea generation, design process, design detail, design specification, and material selection. Each member works together to complete the task that has been divided. Follow this trend methods, team members will be able to understand how to complete tasks by changing different processes. In this chapter focuses on the manufacturing process of an Automatic Snack Packaging Sealer Machine.

### 3.1.1 FLOW CHART

Figure 3.1 shows entire work flow and process from idea generated to testing the machine. After that, carry out a market survey at Small Medium Entrepreneurs (SME) near Banting to make a study about the sealer machine used specifically for snack packing. From that, we have already collected important information from the market survey that has been carried out to complete the project report 1. After that, doing research for the design of the project that want to create, many ideas have been presented to evaluate which one is the best. After choosing the best design, perform the design process in detail according to the scale and dimensions that are compatible with its ergonomics. the material selection process is also important to ensure whether the material to be used has advantages or disadvantages. all done, if this project 1 report is accepted by the panel, it will continue for the fabrication and testing process. if it doesn't work will look back to the fabrication process.

### 3.1.1.1 FLOW CHART PROJECT 1

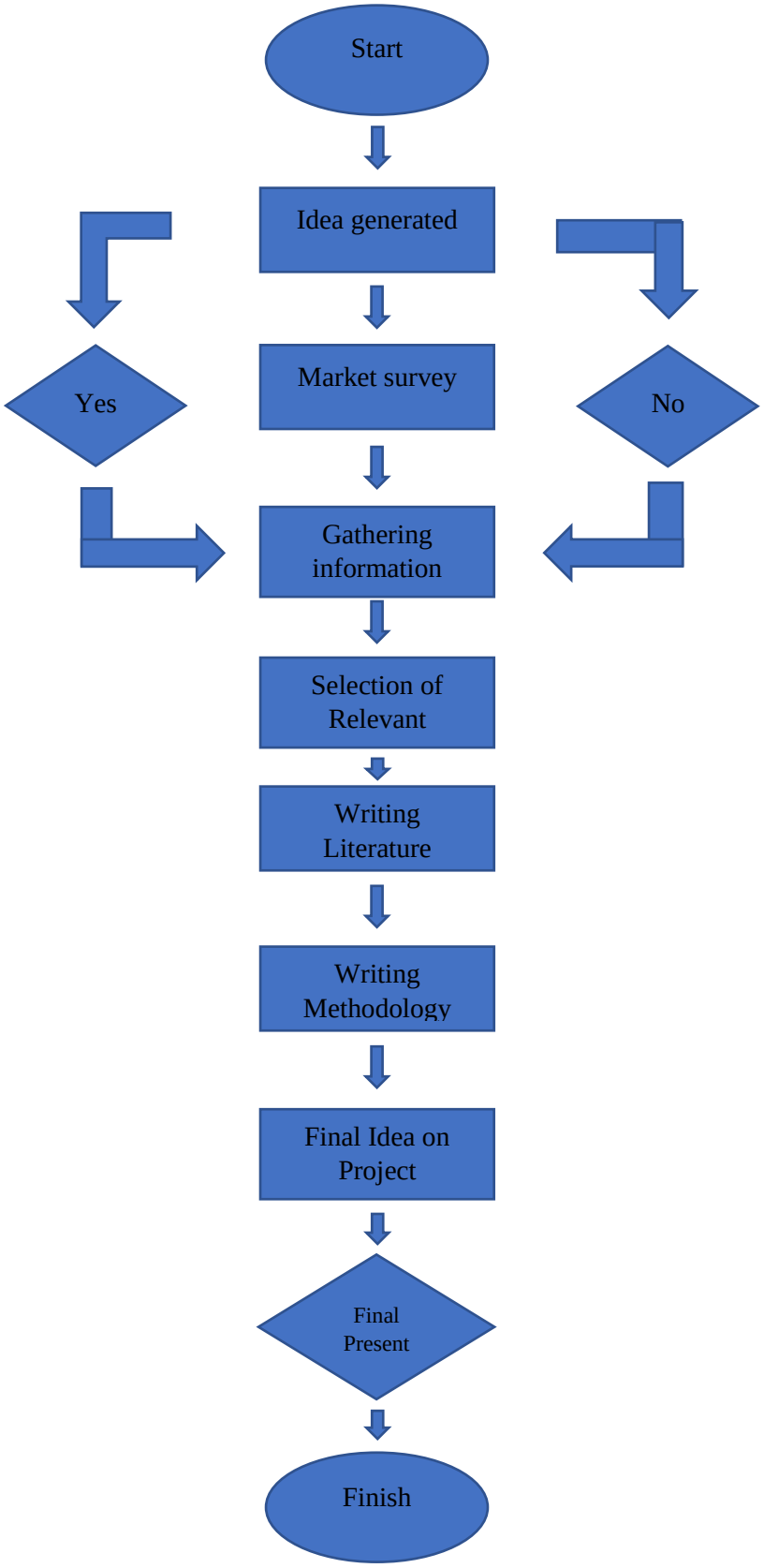



Figure 3.1: Flow Chart Project 1

Figure 3.1 shown that the flowchart illustrated above represents a sequential process that begins with the initiation phase that is characterized by coming up with various ideas for the project through brainstorming and conceptualization, validating the idea through a market survey to evaluate the viability and relevance of the given idea; in the case that the market survey sunk the idea, it goes back to the idea generation stage for improvement or rethinking, and if confirmed, the next stage focuses on gathering information from extensive research done from trustworthy academic sources such as scholarly articles, business-related publications, and experts in the field which is then narrowed down to the most concise and related information to avoid distractions, as a consequence, leads to compiling a literature review that creates an organized documentation of what is known, what theories exist and practices if any regarding the topic in question, thus assisting in the discovery of and justification of writing on a particular methodology, which details the development, strategies, tools, techniques, processes and human and non-human resources needed for the achievement of the project in question; and this is how the latter stage of the project is reached; project scope is by then some synthesis of all prevous phases into a coherent proposal which stage transpires after the stage of the so-called project pitch to interested parties or to the audience in the closing presentation, the presentation consisting of purpose, methods, results and conclusions and the final WIIFM stage where comments and remarks are voiced before the end of the process, that is when all project outcomes are delivered and the project objectives are met.

### 3.1.1.2 FLOW CHART PROJECT 2

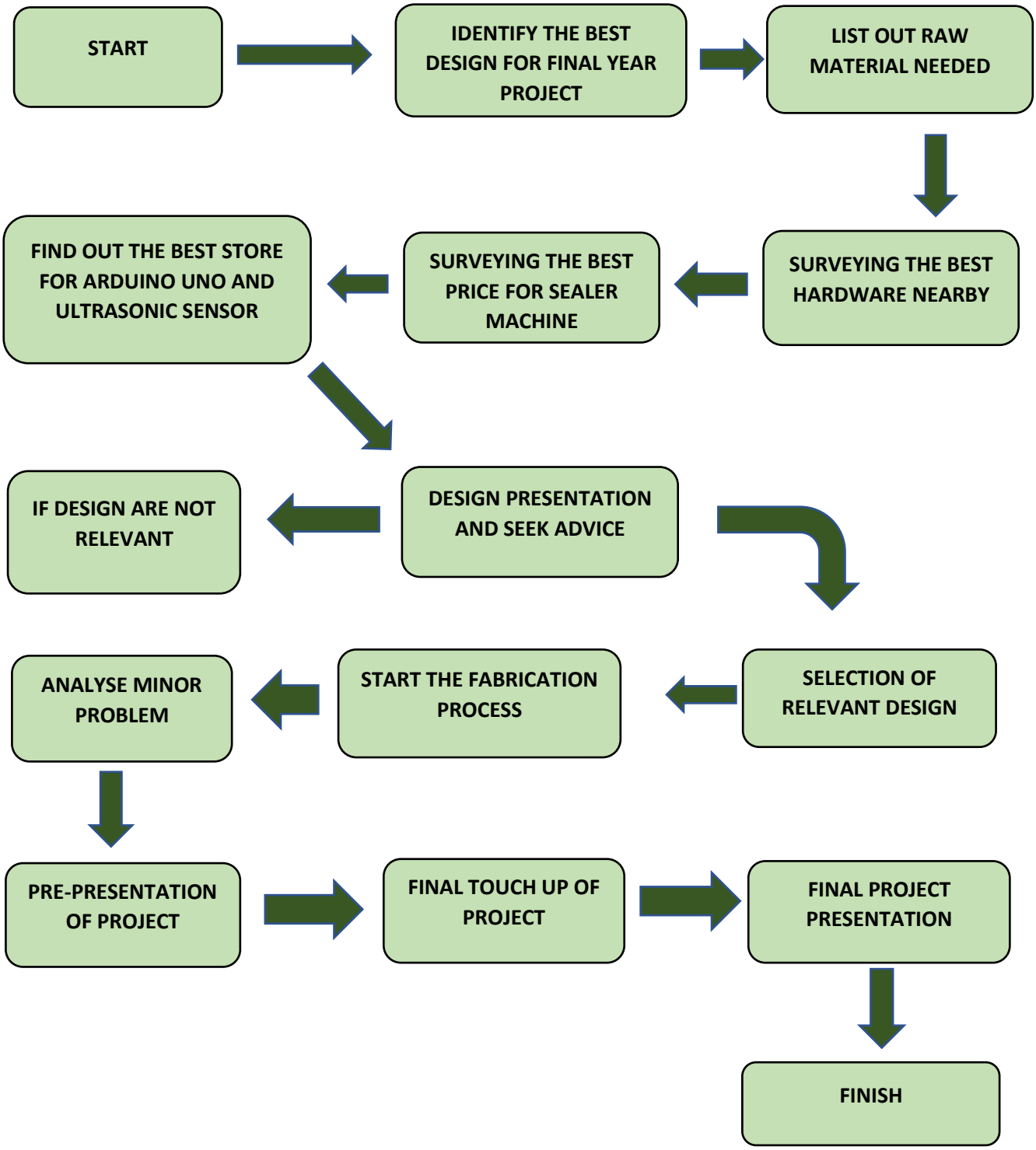


Figure 3.2: Flow Chart Project 2

Flow chart 3.2 shows the entire workflow process until the project is successfully completed on Final Year Project 2. First, we have made a survey about the type of materials and components needed. It is like mild hollow steel, wooden pallet, Arduino board and other necessary items. Next, the materials are purchased and manufacturing of the machine table leg is started bay marking and cutting the material and doing assembly by welding the material. The LCD, Arduino, and ultrasonic sensor have also been made. Additionally, we create programming using Arduino IDE app to meet project specifications.

After 11 weeks, our machine works well after several tests. Testing on the machine was done to test the effectiveness and analysis was recorded. After that, Chapter 4 which is the analysis and discussion of the results obtained is analyzed. We also state the safety purpose found in the machine. We have summarized the conclusions and suggestions for improvement found in Chapter 5 as well as the overall discussion of the project. Finally, the project was presented in front of a panel.

## 3.2 MACHINE CONCEPT AND DESIGN

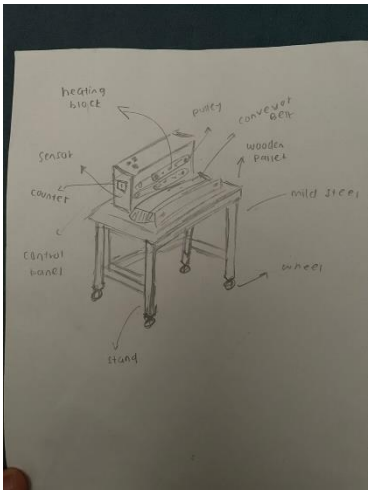



Figure 3.3: Sketching Design

Before the selection of the concept is made, each member of the group holds a brainstorming session to pour out their respective design ideas. Next, the selection of this final design is the agreement of each member of the group and the project supervisor.

The figure 3.3 above shows the final result of the Semi-Automatic Snack Packaging Sealer Machine design. Design with the concept of semi-automatic machine. The use and application of Internet of Things (IoT) on this machine became the main concept of this project created. It aims to facilitate and give awareness to users about today's technology. Locking wheels are used for mobility purposes. Ultrasonic sensor is used to count the packaging that have been sealed to make operation more smoothly. Drawers are used to store any small valuables. The design also has a safety purpose such as a heat protection to prevent any injuries happening. The storage box also been made to collect the packaging that have been sealed.

## 3.3 TECHINICAL DRAWING

Computer Aided Design (CAD) and Autodesk Inventor are uses of computer technology to help design and optimize especially make sketches for technical drawings and engineering drawings of a part of part or product, including the overall design of project. Figure 3.4 and 3.5 shows the technical drawings of the Semi-Automatic Snack Packaging Sealer Machine.

### 3.3.1 ASSEMBLY DRAWING AND BILL OF MATERIAL (BOM)

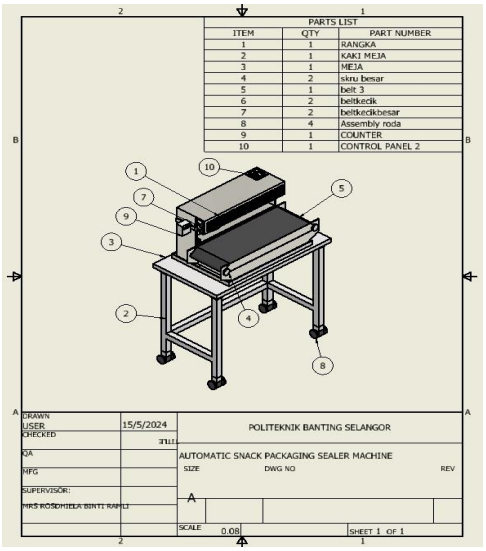



Figure 3.4: Assembly Drawing and Bill of Material

Figure 3.4 shows an assembly drawing with a bill of material showing the resolution of each component. The first part is the main part of the structure which is the table leg of machine. Next, the second part is the lower structure which has four locked wheels. The third part is the drawer inside the table leg machine.

The fourth part shows the part of the project is the sealer machine that use to seal the packaging. We innovated this sealer machine with an ultrasonic sensor to count how many packages have been sealed. In addition, the storage box is made to collect all the packaging that have been sealed.

## 3.4 SCHEMATIC CIRCUIT

The type of Arduino connection affects function and control, interaction and communication, reliabilty and signak quality, power and energy consumption. Figure 3.7 below shows the schematic circuit for the arduino installation. We use this Arduino circuit assemblyy is to meet the project specifications. With the installation, is to connect the electronic components. It can also control the function of the component.

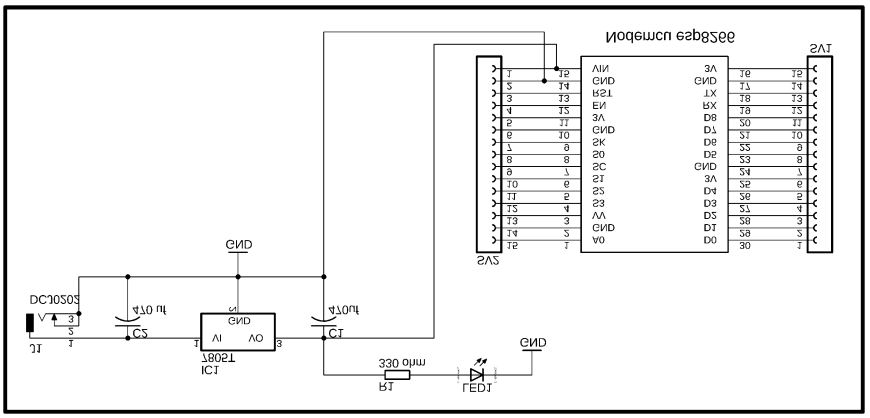


Figure 3.5: Schematic Circuit Arduino

### 3.4.1 PROGRAMMING

Code writing and programming is done using the Arduino IDE (Integrated Development Enviroment) software. It is because it simplifies programming and uploading code to Arduino boards, provides a user-friendly interface, supports extensive libraries, and offers built-in tools for debugging and real-time monitoring, making it an essential tool for electronics projects. This coding language is in C++ language. So, there is some programming done on this project including:

i. Wi-Fi Module Coding

The use of the Wi-Fi module is to connect between the smartphone and the machine. A new application has been created to control the machine. Figure 3.8 shows the code writing and programming of the Wi-Fi module used in this project.

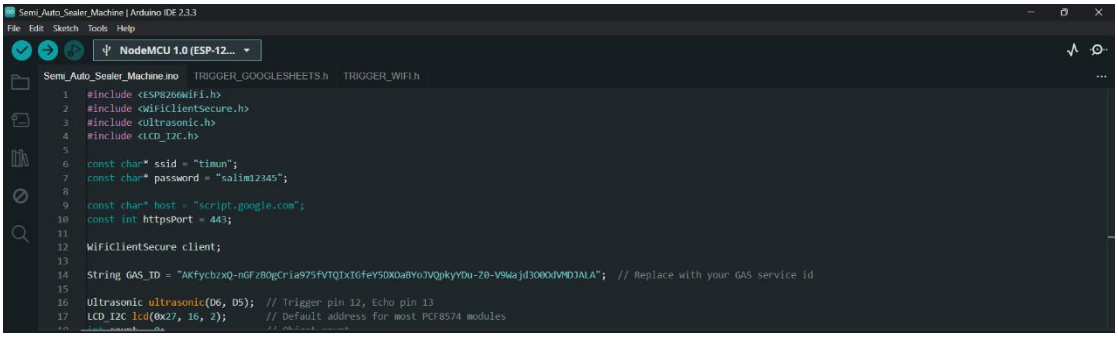



Figure 3.6: Code Writing for Wi-Fi Module

ii. LCD Coding

LCD is installed on the machine to display machine information. For example, the operating time of the machine will be displayed on the IoT box. The LCD will be connected to the Arduino. Programming is done to control the display. Figure 3.9 shows writing code and LCD prograamming on Arduino.


Figure 3.7: LCD Coding

## 3.5 MATERIALS AND COMPONENTS SELECTION

The material selection process is the first step that needs to be done. It is very important to control expenses in order to minimize production costs. The selection of materials must be according to the desired specifications to avoid project failure.

### 3.5.1 MATERIAL SELECTION

#### 3.5.1.1 MILD HOLLOW STEEL

Figure 3.8: Mild Hollow Steel

Apart from its strength and durability, mild hollow sections are required for a semi-automatic snack packing sealer machine because they are also light enough for easy handling and assemably, cheap to protoype and mass produce, easy to manufacture by cutting, welding, and drilling and also corrosion protective coatings can be applied to these materials in the end making the framework construction of the machine efficient, effective and durable.

#### 3.5.1.2 WOODEN PALLET

Figure 3.9: Wooden Pallet

A wooden pallet is essential for conducting a semi-automatic snack packaging sealer machine project because it is an inexpensive and easy to source material that can be relied upon to offer support and movement of the machine.

In addition, it provides good load distribution ensuring stability when the machine is in use and this makes a design easy as any dimensions or weight requirement can be achieved by modification of the design. Last but not least, this component is a green and long lasting solution that can cope up with the rigors of industrial or commercial conditions while making sure the equipment is light and well secured.

### 3.5.2 COMPONENT SELECTION

#### 3.5.2.1 WHEELS

Figure 3.10: Wheels

Wheels are an integral component of the semi-automatic snack packaging sealer machine project because they enable movement and increase mobility thereby allowing for the easy transfer of the machine in different workplaces or production areas without the need for carrying which promotes flexibility in operations by making it easy for the repositioning of the machine according to the work flow and also improving operator's ergonomics by reducing their exertion hence the machine is more efficient in fast changing working environments.

#### 3.5.2.2 DRAWER


Figure 3.11: Drawer

The inclusion of drawers is essential in a semi-automatic snack packaging sealer machine project since they create an orderly storage compartment for important equipment, extra components, and packing goods, facilitating operators' retrieval of such necessary frequently used items quick and easy, therefore making the operations more efficient by reducing the idle time spent looking for tools and greatly improving the design and pleasantness of the working area, which is very vital in the cleanliness and professionalism standards of the manufacturing activities.

### 3.5.3 COMPONENTS INTERNET OF THINGS (IoT)

The internet of Things (IoT) is an innovation that we included in producing this machine. To produce according to the specifications of our project, we have used several components. The diagram below shows the use of those components in our project.

#### 3.5.3.1 ARDUINO LCD DISPLAY

Figure 3.12: Arduino LCD Display

The 16x2 I2C LCD serves as a space-saving and useful display for the user of the "semi-automatic snack packaging sealer machine" fitted with an ultrasonic counter sensor by providing information like number of packages sealed, machine's status, operation instructions, fault indications and others in real time to the operator. Moreover, its I2C interface ignores extraneous wiring and microcontroller pin connections while communicating with LCD, thus making several pin connections unnecessary improving reliability and integration of the system.

### 3.5.3.2 ULTRASONIC SENSOR

Figure 3.13: Ultrasonic Sensor

The semi-automatic snack packaging sealer machine employs an ultrasonic sensor as an effective and non-fail counter. The ultrasonic waves are projected towards the sealed packaging just as it leaves the sealing unit. When the sound waves hit the packaging surface, echoes are returned and received by the sensor.

Each returned echo signifies an item present. Hence, as every item is counted, the machine is able to accurately know the number of sealed packages. This enables the machine to accurately and non-invasively count the number of sealed packages, which in turn reduces mechanical wear and chances of inaccuracies, and allows for production and quality control tracking in real time.

### 3.5.3.4 ESP 8266 WI-FI MODULE


Figure 3.14: Esp 8266 Wi-Fi Module

This is an electronic device control device and a home monitor made in order to turn on and off electronic devices, and to monitor the state of the home from a distance, since there are still many people who forget to turn off electronic devices at home. The

creation of this gadget will ensure the security of the home in case nobody is at home. This device, in its operation, uses PIR sensors, DHT sensors, and Magnetic Switch sensors, is supporting components such as fans, lights, and door lock solenoids, all connected with Node MCU as the brain for processing units, and blynk is the application that will connect the device to a smartphone.

### 3.5.3.5 UNIVERSAL SERIAL BUS

Figure 3.15: Universal Serial Bus (USB)

USB, or universal serial bus, is a mechanism used to connect peripheral devices to computers. Before the advent of USB technology, a PC typically included one or two serial connections, a parallel port, keyboard and mouse connectors, and in some instances, a joystick port.

## 3.6 FABRICATION PROCESS

The fabrication process of the Semi-Automatic Snack Packaging Sealer Machine was made in the project workshop of the Department of Mechanical Engineering, Polytechnic Banting Selangor. To ensure a smooth process, each member of the group is given their own task. This chapter will explain in detail each task and the steps that have been implemented during the Semi-Automatic Snack Packaging Sealer Machine manufacturing process.

### 3.6.1 MEASUREMENT AND MARKING PROCESS

Figure 3.16: Measurement and Marking Process

This process is the first process before installing the project. A tape measure adds a ruler are used as measuring tools, while a marker pen is used to mark the material to make the body frame. To make this part, the marking is done for table leg machine that divided into 4 parts. we need to ensure that the measurements used are accurate and compatible with the ergonomics of users who will use this sealer machine, taking into account the aspects of durability, longevity and others.

### 3.6.2 CUTTING PROCESS


Figure 3.17: Cutting Process

Figure 3.17 shows the process after measuring and marking. The cutting process, the mild hollow steel is cut into four parts to make the table leg machine using a grinding machine so that the iron can be cut well and accurately. After that, the excess material will be used to make a storage box to store the packaging that has been sealed as well as make a drawer to store various items.

### 3.6.3 WELDING PROCESS

Figure 3.18: Welding Process

Figure 3.18 shows the welding process of joining mild hollow steel using MIG (Metal inert gas), TIG (Tungsten Inert gas) and Arc welding. This welding process is done to form beautiful and perfect sealing table legs and to make storage boxes and storage drawers. after the welding process we use a grinder machine to smooth the iron surface.

### 3.6.4 INTERNET OF THINGS (IoT) SYSTEM AND APP DEVELOPMENT

Figure 3.19 below shows the installation of the IoT system. coding is done by writing code using aruduino IDE to program on arduino. programming language for written wi-fi and LCD modules. Once completed, we use a dedicated laptop device to store all information and data. the installation of electronic components is done using cable data. The Arduino LCD display will then be placed next to the ultrasonic sensor to detect the packaging that passes under it.

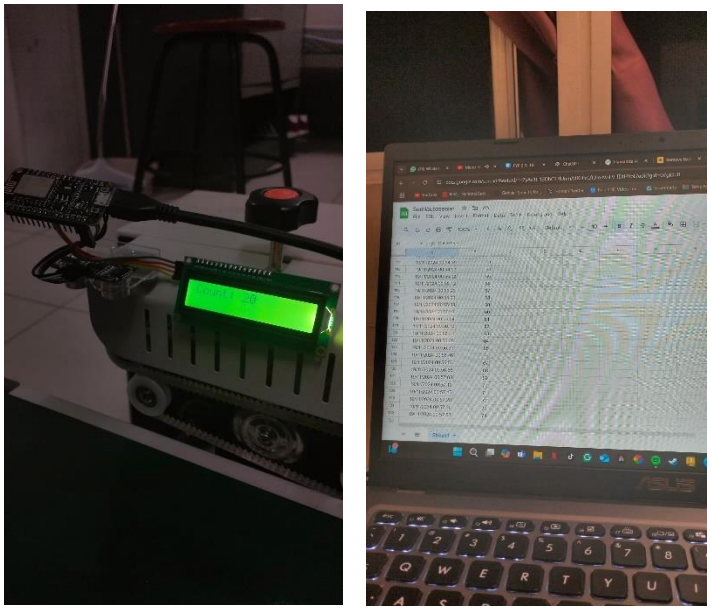


Figure 3.19: Internet of Things (IoT) Installation

### 3.6.5 FINISHING PROCESS

The finishing process is the last process in a fabrication project. this process is done in order to beautify the finished project. we use black spray to clean the surface of the iron after grinding, we do it as many as 3 layers to ensure that the colour does not fade after a few days.

Figure 3.20: Finishing Process

## 3.7 OPERATIONAL TESTING

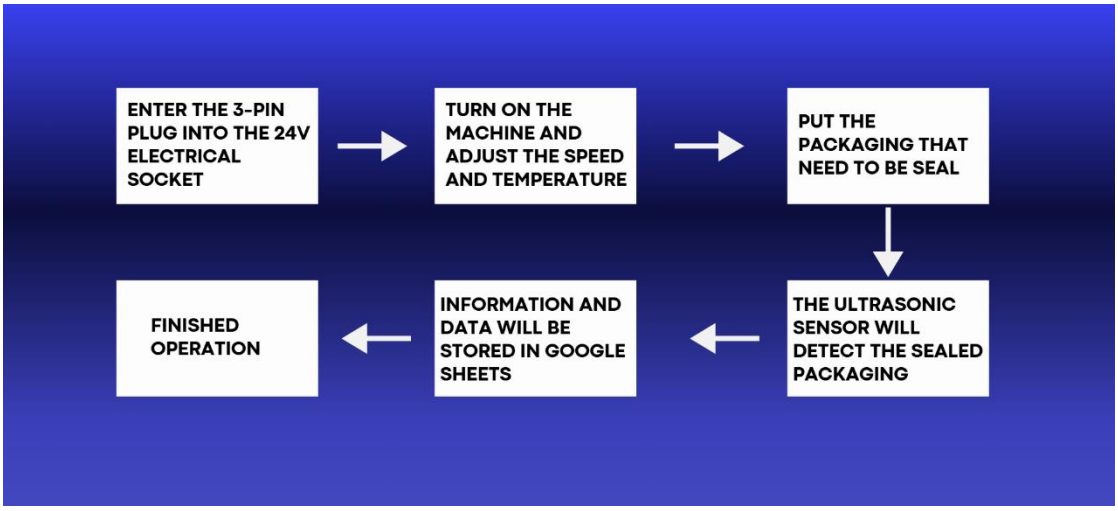



Figure 3.21: Flow Chart Working Principle

Figure 3.21 shows the working process of the Semi-Automatic Snack Packaging Sealer Machine. First, the 3-pin plug is connected to a 24V electrical socket, then the machine is turned on, and its speed and temperature are adjusted; next, the packaging to be sealed is placed in the machine, and the ultrasonic sensor detects the sealed packaging; after detection, the operation is completed, and the information and data are stored in Google Sheets for record-keeping.

## 3.8 GANTT CHART

### 3.8.1 GANTT CHART PROJECT 1

Table 3.1: Gantt Chart Project

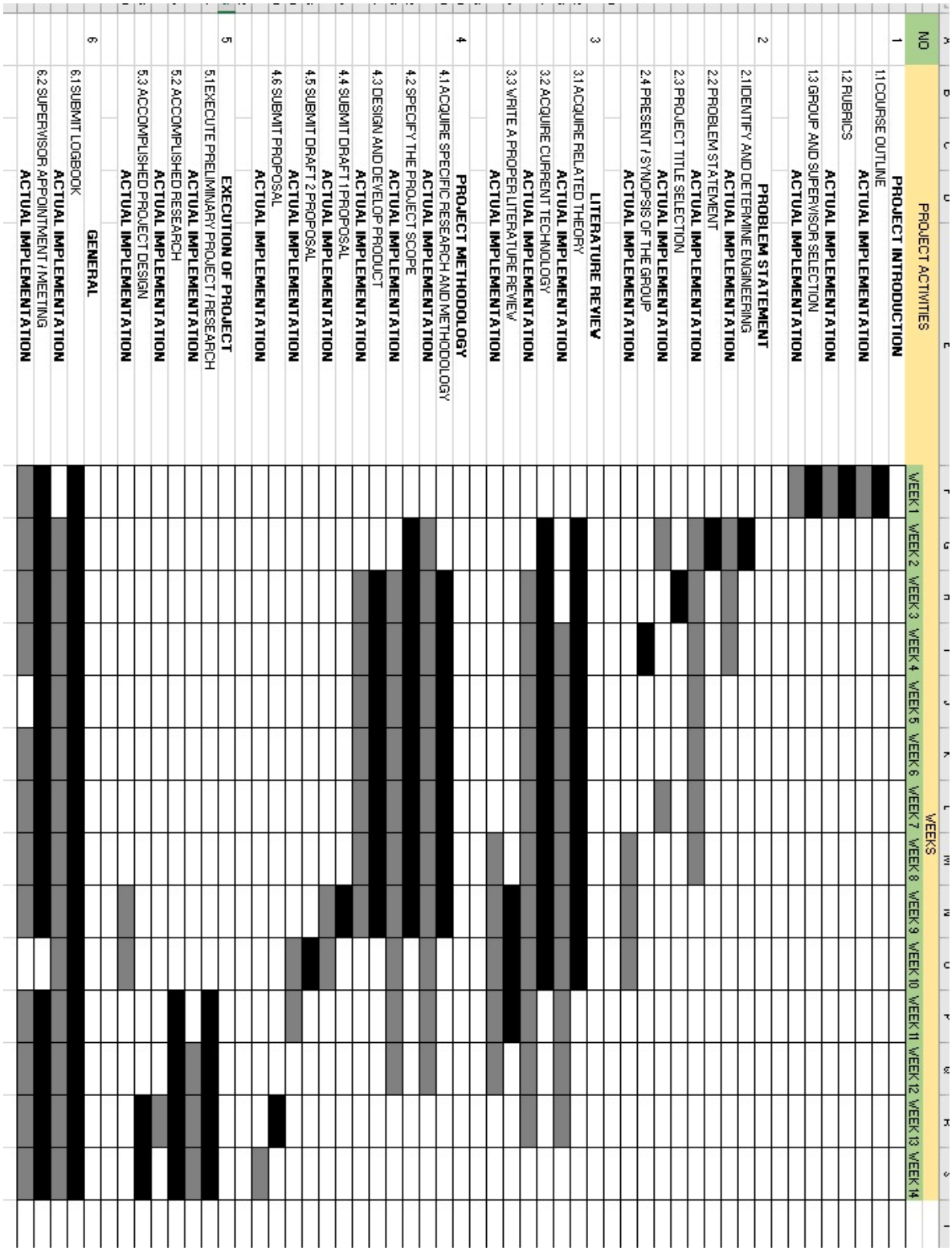


Table 3.18 is showing the task we had to finish for our project 1 as our final year project. The black colour boxes represent the planned activities from first week until fourteen, followed by the flow chart. Next, grey colour represent activities that have already executed in those weeks successfully as have planned with fully guidance of our supervisor.

Next, collected data from previous projects and are thinking of upgrading the ideas for our project from week 2 until week 12. Next is, we do Chapter 1, Chapter 2, Chapter 3 and finding material at week 4 until week 13. In additionally, did do the market survey to get reviews and feedback that can be used for our project. Lastly, also had done slide and final presentation.

### 3.8.2 GANTT CHART PROJECT 2

Table 3.2: Gantt Chart Project 2

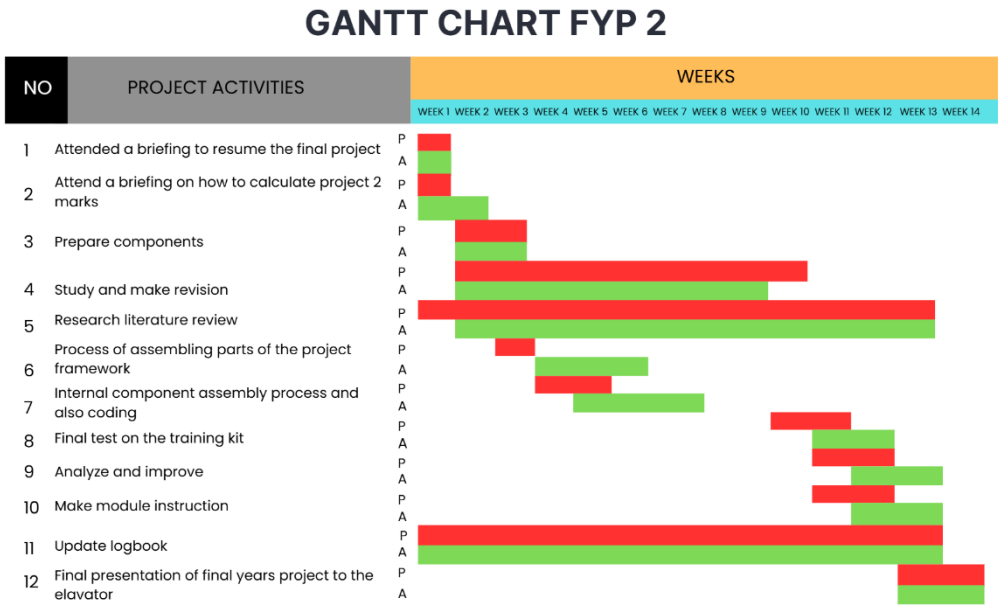



Table 3.2 shows the timeline and progress of project activities over 14 weeks, detailing tasks such as attending a briefing to resume the final project (Week 1), attending a briefing on calculating project 2 marks (Weeks 1–2), preparing components (Weeks 2–4), studying and revising (Weeks 3–6), conducting a literature review (Weeks 4–7), assembling parts of the project framework (Weeks 5–7), working on internal component assembly and coding (Weeks 6–9), performing a final test on the training kit (Weeks 9–10), analyzing and improving (Weeks 10–11), creating a module instruction (Weeks 11–12), updating the logbook (Weeks 12–13), and culminating with the final project presentation to the evaluator in Week 14, with color-coded bars showing planned activities (green) and actual progress (red) for each task.

# CHAPTER 4

# DATA AND DISCUSSION

## 4.1 INTRODUCTION

This chapter discusses the data obtained from our project which is the Semi-Automatic Snack Packaging Sealer Machine. In this chapter it will also be discussed about the results of the analysis of the project that has been carried out. This Semi-Automatic Snack Packaging Sealer Machine improvement project has made the packaging process of the snack food manufacturer small scale by improving the functionality of the machinery used. Modifications to the machine's table legs increase flexibility, which easily accommodates a wide variety of packaging sizes and set-ups. With this, operators of such machines, who are usually involved in handling various types of products during the packaging process, find it easy to use. The addition of an ultrasonic sensor to the counter mechanism that has been developed will enable highly accurate detection of sealed packages. This is indeed a technological advancement that is very helpful in achieving quality assurance and effective monitoring during production. Finally, optimizing the sealing process reduces packaging time; therefore, it will tend to the pressing needs of the industry's desire for faster production. This, in turn, increases the general level of productivity. Carefully engineered, these strategic improvements constitute a more efficient and highly customizable packaging solution for small businesses dealing in snack foods. This has allowed them, without a doubt, to meet their production demands effectively and efficiently better than at any other time.

## 4.2 PROJECT FINDINGS

Following the successful and comprehensive completion of the project, an extensive testing was done using the two different versions of the package seal machine. This includes the manual as well as the semi-automatic machine. From this extensive study, it established that the semi-automatic machines are projects that are highly convenient and easier to use by consumers. Additionally, the machine can handle large amounts of packaging material simultaneously without developing any fault hence ideal for consumers in high volume usage conditions. Table 4.1 shows the details of the tests that have been carried out.

Table 4.1: Detail of Test Performed

| Series | SASPSMachine | MANUAL |
|---|---|---|
| Date | 12/11/2024 | 12/11/2024 |
| Time | 2pm | 4pm |
| Weight Snack | 4kg | 4kg |

## 4.3 COMPARISION DATA OF THE OPERATION TIME

Two types of test were performed to compare the operation time between the Semi Auto Snack Packaging Sealer Machine and the manual method of sealer packaging. This the uses 4kg of snack due to the scope of the project. Started by testing 1kg up to 4kg of snack. The timing results are shown in the table below.

Table 4.2: Time Taken to packaging

| Attempt | Package (pcs) | Weight (kg) | Time Taken (s) | |
|---|---|---|---|---|
| | | | MANUAL | SASPSMachine |
| **1** | 10 | 1 | 120 | 60 |
| | 10 | 2 | 180 | 120 |
| | 10 | 3 | 240 | 180 |
| | 10 | 4 | 300 | 240 |
| **2** | 10 | 1 | 180 | 120 |
| | 10 | 2 | 240 | 120 |
| | 10 | 3 | 300 | 120 |
| | 10 | 4 | 360 | 120 |

The table 4.2.1"Time Taken to Packaging" shows the performance of manual packaging and the SASPS Machine in packaging 10 pieces of snacks weighing different weights (1 kg to 4 kg) in two tries. In the manual mode, the time needed increases with the weight, from 120 seconds for 1 kg to 360 seconds for 4 kg. The SASPS Machine is more efficient because it takes less time. In the first attempt, with the increase in weight, the machine's time taken increases gradually, i.e., from 60 seconds for 1 kg to 240 seconds for 4 kg. However, during the second attempt, the machine performed consistently and required only 120 seconds regardless of the weight. This just demonstrates the efficiency and reliability of the SASPS Machine, in contrast to manual packaging, especially since the machine works best for the second trial.

Table 4.3: Time Taken to count packaging

| Attempt | Package (pcs) | Weight (kg) | Time Taken (s) | |
|---|---|---|---|---|
| | | | MANUAL | SASPSMachine |
| 1 | 10 | 1 | 60 | 10 |
| | 10 | 2 | 60 | 10 |
| | 10 | 3 | 60 | 10 |
| | 10 | 4 | 60 | 10 |
| 2 | 10 | 1 | 60 | 10 |
| | 10 | 2 | 60 | 10 |
| | 10 | 3 | 60 | 10 |
| | 10 | 4 | 60 | 10 |

This table, "Table 4.2.2 Time Taken to Count Packaging," depicts a comparison in time taken for packages to be manually counted as opposed to using a SASPS machine at different weights and after two tries. It will show how both methods work under the same conditions, especially on the particular packages weighing between 1 kg and 4 kg, while the number of packages is set at 10 in all cases. The table is set up with clear columns: Attempt displays the trial number, either 1 or 2; Package displays the number of packages being counted in pieces; Weight shows the weight range in kg; and Time Taken displays the time taken for each method in seconds.

Manual counting gives results that are steady; it takes 60 seconds to count 10 packages, whatever the weight. The SASPS machine works fine and a lot faster, taking only 10 seconds to count the same quantity of packages, however heavy they might be. That's how the machine efficiently manages to save time when compared with manual operations, completing the job in only one-sixth the time it takes by hand. Also, both methods are reliable because they work similarly under differing weights and trials.

Data shows that the SASPS machine is superior to manual counting, since it is capable of maintaining a constant speed across all weight categories. This efficiency and reliability imply that it will be an excellent choice to expedite the counting process in a production environment by greatly reducing labor time while enhancing productivity.

Figure 4.1 below shows the design that has been designed using Inventor software. We have successfully designed a Semi Auto Snack Packaging Sealer Machine according to the scope of the project.

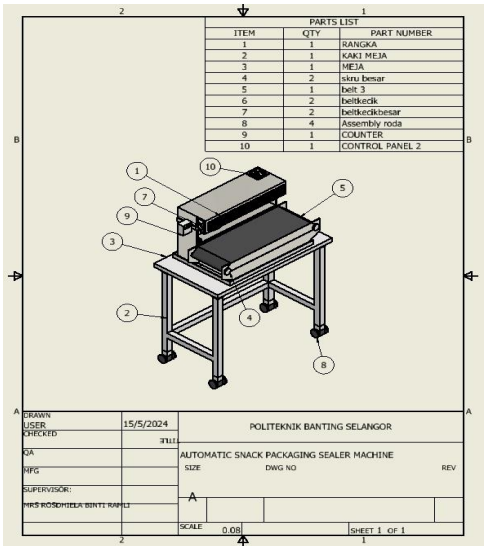



Figure 4.1: Design Project

ii) Product manufacture complemented with Internet of Things (IOT) system.

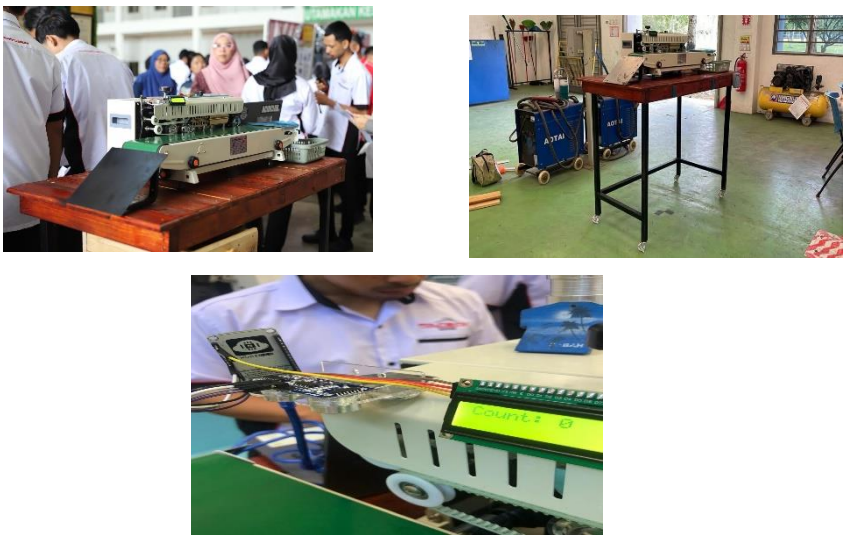


Figure 4.2 Semi Auto Snack Packaging Sealer Machine

So this is the end result of this project. A Packaging Sealer Machine with an Internet of Things (IOT) system application has been produced. Another project objective has been achieved,figure 4.3.1 shows the completed project.

## 4.4 COST ANALYSIS

Cost analysis includes all cost used in producing this project. Table 4.4 shows the cost list of metarials and components required. Although there are no manufacturing and service cost. This is because the manufacturing of this Project is done at the Polytechnic Banting project workshop.

Table 4.4 Cost Material

| No | Materials/Components | Quantity | Price per unit (RM) | Price (RM) |
|---|---|---|---|---|
| 1 | Mild Steel | 3 | RM 30.00 | RM 90.00 |
| 2 | Wooden Pallet | 2 Set | RM 5.00 | RM 10.00 |
| 3 | Wheel (3 inch) | 1 Set | RM 12.00 | RM 12.00 |
| 4 | L Bracket (30X30) | 10 | RM 0.50 | RM 5.00 |
| 5 | LCD Counter | 1 | RM 25.00 | RM 25.00 |
| 6 | USB Cable Data (MICRO) | 1 | RM 10.00 | RM 10.00 |
| 7 | Jumper Cable | 1 Set | RM 3.00 | RM 3.00 |
| 8 | Wifi Module (Esp 8266) | 1 | RM 30.00 | RM 30.00 |
| 9 | Sealer Machine | 1 | RM 400.00 | RM 400.00 |
| 10 | Others Costs | | RM 50.00 | RM 50.00 |
| TOTAL | | | | RM 635.00 |

## 4.5 SECURITY RISKS

Every product design must comply with safety specifications either during the development process or its operation. Table 4.5 shows the safety risks when operating the Semi Auto Snack Packaging Sealer Machine.

Table 4.5: Safety Analysis

| No | Risks | Preventive Measures |
|---|---|---|
| 1. | Possible injuries inflicted to the users due to exposed heating surfaces, sharp directional edges, or rotating items. | Safety covers, insulations of hot surfaces, panic switch installation, and user training should be offered. |
| 2. | Security violations caused by operational data logging and retention in an insecure manner. | Implement use of encrypted storage and secure all data transmission. |
| 3. | Unbending cables or lack of insulation that may result to electrical shocks or fires. | Ensure adequate electrical insulation, proper earthing and regular checking of wiring and circuits. |
| 4. | Presence of dust, moisture or even pests that can damage the machine and/or the product. | Ensure that the equipment is used within a clean, dry, controlled environment and that there are effective control measures against pests. |
| 5. | The danger of contamination or spoilage due to improper sealing of packages. | Periodically inspect the assessment of sealing effectiveness, control that the appropriate settings for the snack materials are utilized, and implement flaw identification systems. |

# CHAPTER 5

# CONCLUSION AND RECOMMENDATION

## 5.1 INTRODUCTION

The Semi-Automatic Snack Packaging Sealer Machine is a new innovation that aims to improve small entrepreneur that use packaging method working time and make them easier to use the machine. It is specially designed as an semi-automatic machine that uses power supply. In addition, the difference in this machine is the addition of an IOT system as an automatic counter and data saver tool. It can benefit consumers and small entrepreneurs a lot because they can learn advanced and new things about the internet of things (IOT). This machine is modified to speed up the time during the food packaging process. To ensure the effectiveness of the project, we have tested this machine together with a manual sealer machine. The test showed that the Semi-Automatic Snack Packaging Sealer Machine successfully reduced the time of seal each snack packages. The test showed that our project can seal up to 15 snack packages with 250 grammed of each packages in 1 minutes and the manual sealer machine can only seal 7 packages in 1 minutes. So it is proven that our project successfully can control and save packing time compared to the manual sealer machine. Other than that, the machine can seal up to 6kg due to the strong table that have been built and it's depended on how consumer use it. Overall, it can be concluded that this machine successfully achieved the objective written in chapter 1.

## 5.2 IMPACT OF PROJECT

This machine has several advantages including;

a) Sustainability

This machine is modified with more ergonomic use than manual machine. The machine was produced using some recycled materials, such as mild steel and wooden sticks. The accessories added to the machine is energy efficient, incorporating smart advanced technology that optimizes energy consumption during the operation. This can reduce the environmental impact.

b) Durability

Machine accessories such as the table and basket holder are constructed from materials that are relatively durable and hard but strong and light. This will convince the user for quite a long period. Indirectly, the durability of the project will remain if the user uses this machine wisely and according to the specifications.

c) Impact to the community and users

This project will give a good effect on consumers, especially on small entrepreneur who use packaging methods where they will reduce the time it takes to package their products with sensors and tables created with ergonomic shapes. In addition, it also give benefits and awareness to the public by an advanced technology and use the machine with IOT (Internet Of Things). The project will also sold at a reasonable prices for small entrepreneurs.

## 5.3 RECOMMENDATIONS

Text below showed the improvement and recommendation for our project (Semi-Automatic Snack Packaging Sealer Machine)

i) Our group was given a suggestion to add a roller at the end of the table to make it easier for the sealed packages to fall into the basket slowly and orderly. Currently, we built a small 45-degree angled slide that also helps the packaging plastic fall down slowly but not so neatly. So, building a roller at the end of the table is something that can be said to be important to ensure that the snack package is neatly arranged and not damaged.

ii) Using the touch screen display to control data such as the number of packages that have been packed, the date, day and time of the packaging work being carried out. This is because to ensure the work of calculations and data is easier to see than using a laptop as we use now.

iii) Adding a robotic hand to control the process. This suggestion is given because this will make it easier for small entrepreneurs because they only need to press the on button and the work will be carried out automatically without manpower.

iv) Using larger and stronger wheels to ensure the movement of the project is smoother therefore will ensure the lifespan of the built project table will be longer.

v) Changing the form of the table to a form that can be folded to make the project more portable and easy to carry anywhere can indirectly save space.

vi) Using solar energy sources to ensure the use of energy is wise and can make the project more smart and save electricity.

For now, all suggestions cannot be fulfilled due to lack of time and relatively high cost to improve our project. But in the future, we will fulfill all the recommendations given to ensure the progress of our project is increased and more advanced according to the existing advanced and smart technology.

## 5.4 REFERENCES


[1] Daundkar, M.M. and B.N. Savant (2016) **http://martpackindia.com/blog/the-versatility-and-convenience-of-sealing-machines-types-advantages-and-benefits/**

[2] Guangzhou Leva Packaging Equipment Co. (2024) https://www.levapack.com/types-of-sealing-machine-packaging-solutionshttps://www.levapack.com/types-of-sealing-machine-packaging-solutions/

[3] Guangzhou Leva Packaging Equipment Co. (2024) https://www.levapack.com/types-of-sealing-machine-packaging-solutionshttps://www.levapack.com/types-of-sealing-machine-packaging-solutions/

[4] Honor Packaging Machinery Co. (2024) https://honorpack.com/what-is-an-automatic-sealing-machine/

[5] Guangzhou Leva Packaging Equipment Co. (2024) https://www.levapack.com/types-of-sealing-machine-packaging-solutionshttps://www.levapack.com/types-of-sealing-machine-packaging-solutions/

[6] Guangzhou Leva Packaging Equipment Co. (2024) https://www.levapack.com/types-of-sealing-machine-packaging-solutionshttps://www.levapack.com/types-of-sealing-machine-packaging-solutions/

[7] Guangzhou Leva Packaging Equipment Co. (2024) https://www.levapack.com/types-of-sealing-machine-packaging-solutionshttps://www.levapack.com/types-of-sealing-machine-packaging-solutions/

[8] Components101 (2023) https://components101.com/article/different-types-of-sensors-and-sensing-technologies

[9] Components101 (2023) https://components101.com/article/different-types-of-sensors-and-sensing-technologies

[10] Components101 (2023) https://components101.com/article/different-types-of-sensors-and-sensing-technologies

[11] https://www.jfeindia.com/hollow-sections.html#:~:text=Square%20Hollow%20Section(SHS)&text=SHS%20has%20a%20flat%20surface,in%20equilateral%20square%20hollow%20sections

[12]https://tubecon.co.za/technicalinfo/tubeconwikisub/RectangularHollowSections#:~:text=Rectangular%20hollow%20sections%20or%20rec,has%20to%20be%20formed%20first

[13] https://www.sciencedirect.com/topics/engineering/circular-hollow-section#:~:text=Circular%20hollow%20sections%20(CHSs)%20have,in%20resisting%20various%20loading%20conditions

[14] https://ssr.vn/the-information-of-pine-wood/#:~:text=Pine%20wood%20has%20a%20straight,uneven%20texture%20and%20appear%20knots.&text=There%20are%20sapwood%20and%20core,sapwood%20is%20lighter%20yellowish%20white

[15] https://www.lignoma.com/en/magazine/maple-wood/#:~:text=Maple%20wood%20comes%20from%20deciduous,mountain%20maple%20and%20curly%20maple

[16] https://vermontwoodsstudios.com/pages/mahogany-wood?srsltid=AfmBOop6UUW6n2t9GquzOvjUUfeNWhzrwpIuh4WhhZebUDc6LudgnKrF
[17] https://casterconnection.com/blog/choose-casters-heavy-equipment#:~:text=Heavy%2Dduty%20casters%20are%20designed,loads%20without%20compromising%20on%20mobility
[18] https://www.zambus.com/blog/everything-you-need-to-know-about-polyurethane-caster-wheels/#:~:text=Polyurethane%20caster%20wheels%20are%20made,standard%20caster%20wheels%20may%20provide
[19] https://castercentral.com/blogs/blog/pneumatic-casters#:~:text=Pneumatic%20casters%20have%20wheels%20filled,pneumatic%20casters%20from%20Caster%20Central
[20] https://www.getkisi.com/guides/infrared-sensors
[21] https://www.sciencedirect.com/topics/computer-science/bluetooth-module#:~:text=In%20subject%20area%3A%20Computer%20Science,supports%20various%20data%20connection%20interfaces.
[22] https://www.javatpoint.com/arduino-uno
[23] https://aws.amazon.com/what-is/api/
[24] AP Plageras, KE Psannis, C Stergiou, H Wang… - Future Generation …, (2018) https://www.sciencedirect.com/science/article/abs/pii/S0167739X17314127
[25] RM Zein, I Halim, NA Azis, A Saptari, SR Kamat - Procedia Manufacturing, (2015) https://www.sciencedirect.com/science/article/pii/S2351978915000797
[26] L Liu, F Guo - Work, (2022) https://content.iospress.com/articles/work/wor205107
[27] S Mahmood, SA Aziz, HS Abdul… - … of Computational and …, 2020 https://www.ingentaconnect.com/contentone/asp/jctn/2020/00000017/00000002/art00028
[28] HAKM Kamrul - International Journal of Business and Social …, (2018) https://d1wqtxts1xzle7.cloudfront.net/88689840/28c12073804b4b5958e7b0b30adb4d1ddf08-libre.pdf?1658075584=&response-content-disposition=inline%3B+filename%3DSME_Finance_A_Comparative_Study_of_Europ.pdf&Expires=1731523999&Signature=Dtx1CgS7t08-aHRh2dF2SBnm10WlqsGq9nxDKCOkPlYXNfLeaB7xfhHAJBmi7L4LNHzr0tSmzp9CiCmhcT4cCslOIU-LZMob53AQIbO1pp1uTTN~uDNGNy2uuRg-Yw9L5ashDOOvquUaVQ-c6EXfccY1RnbmzZQcRm1wgwHfyymK~KyYeVEZSr1zN4Fj9NycLz4Q1cwuZ8clnFjVwdMDuZP6R3bRyqu3AKF1G3U5oMoshzlXC90xz8RE0dTb4QqkwusPdf2PzoitTJS0NpOTvQLP2b33UguHq2mzSuVHAv9~EX9A7My0iV1pAej2dVMuIOgUWj9IwIxWnepEZXN-iQ__&Key-Pair-Id=APKAJLOHF5GGSLRBV4ZA

# APPENDICES

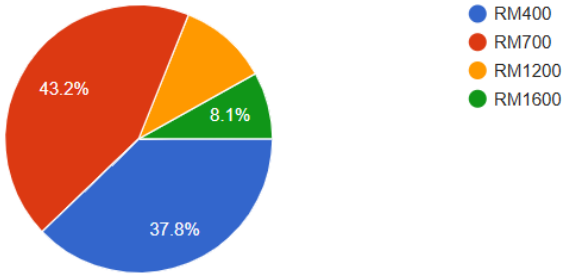
## APPENDICES A

## SURVEY DATA

3. What is your budget for a snack packaging sealer machine?

Copy chart

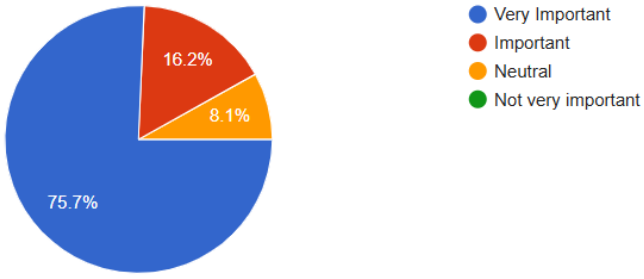
37 responses




4. How important is the seal quality for the snack packaging sealer machine?

Copy chart

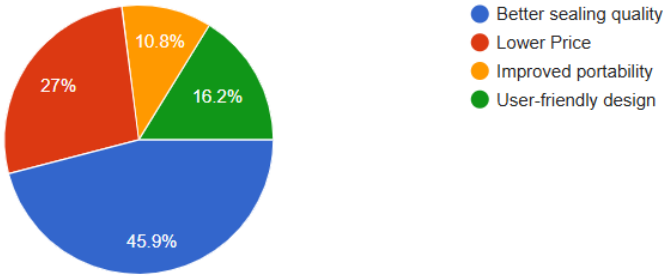
37 responses



6. What factors would make you more likely to purchase a snack packaging sealer machine?

Copy chart

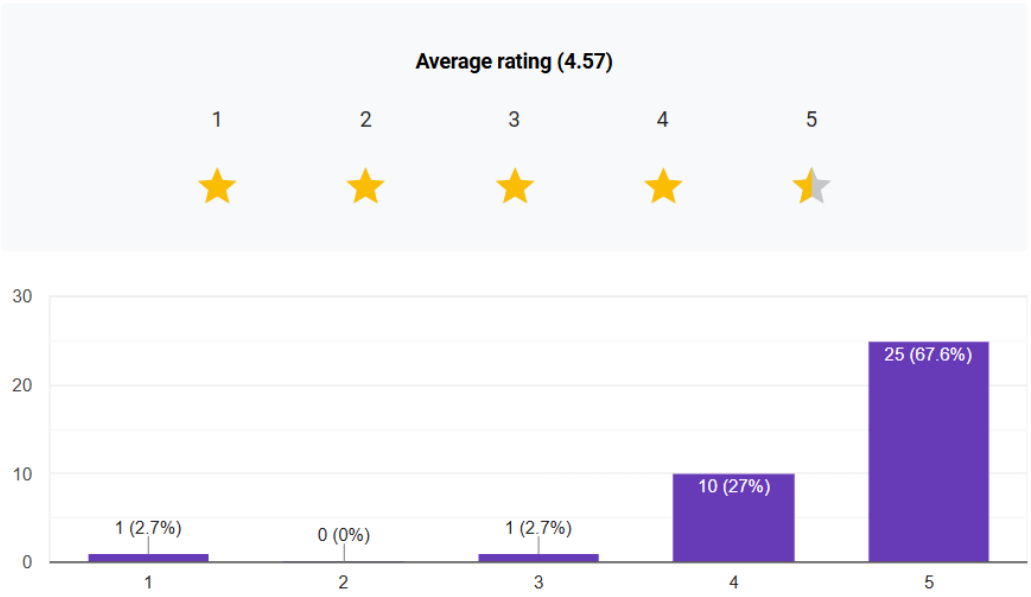
37 responses




9. Does it get more interesting when you know about the semi-automatic snack packaging sealer machine? Please rate the effectiveness. (1-star to 5 star)

Copy chart

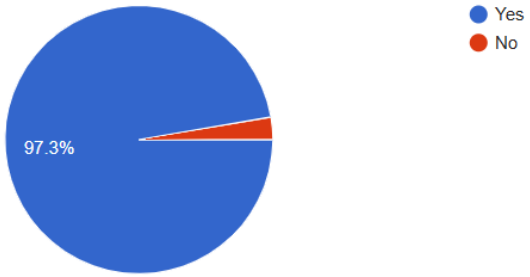
37 responses



5. Do you have any concern about the hygiene or cleanliness of a snack packaging sealer machine

Copy chart

37 responses



## APPENDICES B

## DECLARATION OF REPORT WRITING SEGREGATION

| SUB CHAPTER | DESCRIPTION |
|---|---|
| | MUHAMMAD SYAKIR IRFAN BIN SHAHARUDDIN (24DKM22F1014) |
| 1.1 | INTRODUCTION |
| 1.2 | PROBLEM STATEMENT |
| 1.3 | OBJECTIVE |
| 1.4 | SCOPE AND LIMITATION |
| 1.5 | CONCLUSION |
| 5.1 | INTRODUCTION |
| 5.2 | IMPACT OF PROJECT |
| 5.3 | RECOMMENDATION |
| 5.4 | REFERENCES |
| | MUHAMMAD ABDUL SALIM BIN SUMAR (24DKM22F1069) |
| 2.1 | INTRODUCTION |
| 2.2 | TYPES OF SEALER MACHINE |
| 2.3 | TYPES OF SENSORS |
| 2.4 | TYPES OF HOLLOW STEELS |
| 2.5 | TYPES OF WOODS |
| 2.6 | TYPES OF WHEELS |
| 2.7 | TYPES OF MODULE INTERFACE |
| 2.8 | POSTURE BODY |
| 2.9 | SUSTAINABLE DEVELOPMENT GOALS (SDG) |
| 2.10 | PACKAGING FUNCTION |
| 2.11 | SUMMARY OF CHAPTER |
| | AKMAL HAFIZAN BIN ABU BAKAR (24DKM22F1044) |
| 3.1 | INTRODUCTION |
| 3.2 | MACHINE CONCEPT AND DESIGN |
| 3.3 | TECHNICAL DRAWING |
| 3.4 | SCHEMATIC CIRCUIT |
| 3.5 | MATERIALS AND COMPONENTS SELECTION |
| 3.6 | FABRICATION PROCESS |
| 3.7 | OPERATIONAL TESTING |
| 3.8 | GANTT CHART |
| | MUHAMMAD HAZIQ BIN MUHAMMAD AZHAR (24DKM22F1065) |
| 4.1 | INTRODUCTION |
| 4.2 | PROJECT FINDINGS |
| 4.3 | COMPARISON DATA OF OPERATION TIME |
| 4.4 | COST OF ANALYSIS |
| 4.5 | SECURITY RISKS |

**TURN IT IN**

# SEMI-AUTOMATIC SNACK PACKAGING SEALER MACHINE

*by* SHAHARUDDIN MUHAMMAD SYAKIR IRFAN

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