



**POLTEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH**

**CANDLE MAKER MACHINE**

|  |                     |
|--|---------------------|
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**MECHANICAL ENGINEERING DEPARTMENT**

**SESI 1: 2021/2022**

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**This report is submitted to the Department of Mechanical  
Engineering as a part of the conditions for the award of the Diploma  
in Mechanical Engineering (Packaging)**

**MECHANICAL ENGINEERING DEPARTMENT**

**SESI 1: 2021/2022**

# DECLARATION OF AUTHENTICITY AND PROPERTY RIGHTS

## CANDLE MAKER MACHINE

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2. I acknowledge that the ‘Project Above’ and the intellectual property contained therein are the result of my original work/ invention without taking or copying any intellectual property from other parties.
3. I agree to relinquish ownership of the intellectual property of ‘the Project’ to ‘the Polytechnic’ to meet the requirements for the award of a Diploma in Mechanical Engineering (Packaging) to me.

Made and sincerely acknowledged )  
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## APPRECIATION

We were able to complete the final project with excellence within the stipulated period of 6 months without encountering any difficult-to-solve problems, which was a requirement for the awarding of the Diploma in Mechanical Engineering (packaging) June 2019 session, thanks to the Divine presence and blessings on our great master, the Prophet Muhammad SAW. We would like to thank everyone who was involved, directly or indirectly, especially our supervisor, Mrs. Giha Binti Tardan, who provided us with a lot of direction, advice, encouragement, and constructive criticism in order for us to complete this final project report successfully. Not to mention the friends and family members who contributed greatly to the completion of this final project assignment in terms of perspectives and finances.

We are grateful to Allah SWT for this, as it means that the final project is complete. We hope that in the future, this report can be used as an example and guide for the relevant parties.

## ABSTRACT

One of the main issues that the scientific community is concerned with is the reduction of greenhouse gas emissions associated with the production of cooking oil. Waste cooking oil is a major component of this process. This waste is produced by food industry, households, and establishments. Since it doesn't have a soluble nature, it can't be collected and thrown away properly. Therefore, it is considered a contaminant in the environment. The harmful effects of waste cooking oil on the environment and human health are numerous. It can cause flooding or overflows in sewers due to the build-up of waste cooking oil. The discharge of this oil into the water system will also change the oxygenation process and kill aquatic life. The main objective is to develop a simple and effective way to use used cooking oil. This method will help renew the used resources. The machine should be able to produce a candle with minimal effort and be easily stored. This machine helps the user to turn used cooking oil into a candle. By putting used cooking oil into this machine, adding the solution, and heating it up, everybody can easily make candle for their use or even for small business. The critical aspect is safety, we included a nozzle for easier access on pouring hot candle wax into a container. Functionality test performed to ensure the best performance. The fabrication methods started from generating and brainstorming idea followed by engineering design exploit technical drawing before the selection of parts. The fabrication continues by soldering, welding, and joining all selected elements. Functionality test performed to ensure the best performance in any condition. The results analyzed to defeat problem and solution offered attained for design purposes. Product and market review, financial management and mass production study engaged ready for market viable. "Candle Maker" offer functionality at a reasonable price, bid 40% cheaper than its competitor. The modern design makes them attractive and easy to be stored. For further improvement, using a wider rod to ensure a smoother candle wax output.

Keyword: used cooking oil, homemade candle, survey, waste management, environment.

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# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 PROJECT INTRODUCTION**

Waste cooking oil (WCO) is a form of household waste created when consumable vegetable oil is used to cook or fry food. WCO generally refers to high-temperature frying oil, edible fat mixed with kitchen trash, and oily wastewater discharged straight into sewers. WCO is classified as part of municipal solid waste (MSW), which is a synonym for household waste. However, because WCO is a type of residential trash, using the acronym "MSW" is inaccurate and, more importantly, demonstrates the lack of attention devoted to proper WCO management and collection. Official statistics on WCO collection in Europe range from 100,000 to 700,000 tonnes per year, or less than 1 kilogram per person per year.

The uncontrolled disposal of WCO has serious economic and environmental repercussions. Diverting WCO from poor disposal extends the product's life cycle and prevents the dangerous liquid waste from contaminating groundwater. Effective collection and controlled disposal of WCO, on the other hand, is also economically appealing. Due to its low cost and availability elsewhere, it is a potential and cost-effective option for candles, particularly for housewives, stay-at-home dads, teenagers or even to small business owner.

### **1.2 PROBLEM STATEMENT**

- I. Some of the common ingredients used in candle manufacture are quite “expensive”, and we need a method to reuse/reproduce wasteful materials.
- II. One of the challenges in the proper disposal of waste cooking oil. Is that when used cooking oil is not properly disposed of, it can cost congeal in pipes, triggering clogs and even pollution.

- III. A polluted river is an effect caused by improper disposal of used cooking oil, it's going to affect the aquatic ecosystem and also destroy clean water resources.

### 1.3 OBJECTIVE OF PROJECT

- I. The objectives of this study are to develop a candle making machine that will help common households to utilize used cooking oil in something new.
- II. To design a medium size machine suitable for common household usage and is easy to be store.
- III. To fabricate a candle making machine that is easy to handle especially by a stay at home wife, husband or even teenager as the main objective of this machine is to have a proper way of disposing of used cooking oil by making a candle and to renew used resources.
- IV. To make a machine that is environmentally friendly and useful for all to use.
- V. We need to analyze the quantity and material needed to make the candle by using used cooking oil, paraffin, soy wax, stearic acid, beeswax and some essential oil.

### 1.4 PROJECT SCOPES AND LIMITATIONS

| <b>Title</b>   | <b>Scope Writing</b>  | <b>Review</b>  |
|----------------|---|--|
| Automotive     | Using a medium-powered part.                                  | Not suitable because there is a chance that there will be a problem and damage to the final product. |
|                | Using a high-powered part.                                    | Acceptable because it can cut the burning time and save electricity.                                 |
| Material Study | Using a quality raw material and affordable at the same time. | Acceptable.  |
|                | Using a cheap raw material that is easy to find in any store. | Not suitable because it does not meet the main objectives of the project.                            |

|                         |  |  |
|-------------------------|--|--|
|                         |  |  |
| Engineering<br>Mechanic | Using the Engineering<br>Mechanic concepts that were<br>learned throughout the<br>diploma program in the<br>production of the project.   | Acceptable.  |
|                         | Using the Engineering<br>Mechanic concepts that were<br>learned outside of the<br>diploma program (research /<br>google/ YouTube) in the<br>production of the project.   | Not suitable because the project<br>must follow the learning syllabus<br>throughout the diploma program<br>to make sure the project was<br>using the correct methods and<br>concepts of mechanical<br>engineering. |
| Limitation              | This machine only works for the candle making process using<br>used cooking oil only. This machine only can heat used oil,<br>paraffin, soy wax, stearic acid and essential oil. This machine can<br>be used to heat up to 500 ml material only. This machine will<br>ensure that there is no human contact during the pouring process<br>to help take care of hygiene. However, the user still has to do<br>some manual work on putting the candle wick and jar into the<br>machine. The user also has to be careful of the hot liquid to avoid<br>any burn. The machine already has 3 kinds of on, off and high<br>setting to help the user. |  |
| Targeted<br>“users”     | Big company/ production  | Not suitable because of its small<br>size and does not meet the main<br>objective of the product.  |
|                         | Common household   | Acceptable.  |

### 1.5 IMPORTANCE OF THE STUDY

- I. The purpose of this project is to see if it can solve the problems caused by incorrect cooking oil disposal. Main problems mentioned are environmental problems and reusing renewable sources into something usable (candle).
- II. Apart from that, this project is also important to ensure that the objective of creating new products is met in line with the development of the Industry Revolution 4.0 that is being pursued in this age.
- III. The product to be produced can be used and function in teaching us about the proper way of disposing of used cooking oil and reusing wasted material into a useful daily product (candle).

- IV. In addition, the products produced are targeted for common household/everyday use. The products produced can also meet the needs, requirements of consumers and solve problems faced by society.
- V. Using this product will hopefully have a positive impact on the environment.

## **1.6 SUMMARY**

In conclusion, Chapter 1 describes the introduction of the project. Where chapter 1 starts from chapters 1.1-1.2 is an abstract as well as background about our project in detail. Then, chapter 1.3 is about the problems faced until the existence of ideas for this project as well as the problems that we will face in this project. Meanwhile, chapters 1.4-1.6 are project objectives, project questions and project scope where each chapter describes the direction of the project, what to achieve, questions that need to be resolved to succeed in this project and the scope of process involved and required to complete the project. Finally, chapter 1.7 describes the importance and contribution to the community that can be realized if the planning and construction of a complete project model becomes a reality. For the next chapter, we will be talking about literature review to know about our future studies.



## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

Literature review is a study conducted based on true theories and applied in fields related to the study such as journals, articles, books, and newspaper studies. Therefore, in this chapter some theories related to this study will be discussed such as the type of cooking oil, disposal method and the potential of used cooking oil.

#### **2.2 HISTORY OF OIL**

Cooking oil consists of edible vegetable oils derived from olives, peanuts, and safflowers, to name just a few of the many plants that are used. Liquid at room temperature, cooking oils are sometimes added during the preparation of processed foods. They are also used to fry foods and to make salad dressing.

Cooking oil is defined as any of numerous vegetable oils used in cooking. Vegetable oil includes any group of liquid edible fats that are obtained from plants. Waste cooking oils which are also known as used cooking oils (UCO) are resulted from the cooking of food by home cooks, food manufacturers and catering establishments such as restaurants and industrial kitchens. As oil have a density which is less than water, it has the ability to spread into thin and broad membranes which can slower down the oxygenation process of water. By this way, the presence of oil even in a small volume can contaminate a great amount of water.

After cooking, usually UCO is thrown into sinks, drains, onto the ground and also onto the garbage for disposal. These are not proper ways in disposing the UCO as it would arise many problems consequently. UCO might solidify into thick layers inside drainpipes and sewers which will cause blockage and constrict the water flow. Furthermore, clogged pipes/sewers lead to foul-smelling odours and rats, which will also leads to a dirty environment. Contaminated water caused by UCO will also affect the life of underwater flora and fauna.

There are a few proper ways to dispose UCO. The basic step is to put UCO in a sealed and non-recyclable container and discard it with regular garbage.

Besides than, refrigerating the UCO in container to harden is also makes disposal easier and less messy. But in our project, we have reused the UCO for another objective. We decided to produce candles by using UCO.

Today, candles are made not only for lighting purposes but for many other uses such as home décor, novelty collections, as fixtures for big occasions (weddings and baptismal), and as scented varieties for aromatherapy. Candles can be made out from different types of waxes and oils, including the UCO. Oil candles are alternatives of wax candles. Both types use a fuel source and a wick but instead of melting wax and burning the wick, oil candles use the wick as a conductor, burning the oil only. A quality oil candle has advantages over a wax candle in terms of safety and economy. An oil candle gives out less soot compared to wax candle. Overall, an oil candle is much safer to be used instead of a wax candle.

## **2.3 CHARACTERISTIC OF PARAFFIN WAX**

Paraffin wax is a complex hydrocarbon refined from petroleum. It comes from fossilized trees, animals, bacteria etc. It is considered a fossil fuel and is a precipitate from refining crude oil into natural gas, heating oil and gasoline. Paraffin is the most commonly used wax for candle making.

A drawback of the use of residual cooking oils as raw material for direct or indirect energy generation is that they have different properties than those of refined or raw oils since they are degraded by hydrolytic and oxidative reactions that occur during use. So that why by mixing used cooking oil with paraffin wax we can ensure a more stable and long-lasting candle than just used cooking just by itself.

### **2.3.1 Types of Paraffin Wax**

#### **i. Low Melt Point Paraffin:**

Paraffin with a melting point less than 130° F, this type of wax is soft and adheres well to the sides of containers. Therefore, they are best for container and tea light candles.

#### **ii. High Melt Point Paraffin:**

Paraffin with a melting point greater than 130° F, this type of wax is harder and therefore provides structural rigidity for use in votive and pillar candles.



**Figure 2.3.1:** Pure Paraffin Wax

### **2.3.1.1 Use of Paraffin Wax**

There are lots of information is available about candle making with paraffin:

- i. Most candle fragrances and dyes were formulated for paraffin, so they work quite reliably (note: fragrance and dye also work in natural waxes).
- ii. Paraffin burns cleaner and more reliably.
- iii. Consistent attractive appearance - does not frost like natural wax.
- iv. Paraffin has cosmetic and therapeutic benefits.

### **2.3.1.2 Properties of the Paraffin Wax**

Paraffin wax is mostly found as a white, odorless, tasteless, waxy solid, with a typical melting point between about 46 and 68 °C (115 and 154 °F), and having a density of around 900 kg/m<sup>3</sup>. It is insoluble in water, but soluble in

ether, benzene, and certain esters. Paraffin is unaffected by most common chemical reagents but burns readily.

### **2.3.1.3 Advantages of the Paraffin Wax**

- i. Inexpensive (about 9 times less than beeswax)
- ii. The candle production is easy, convenient and cent-percent safe.
- iii. It saves the conventional fuels and causes no environmental pollution.
- iv. No attendance is required during wax melting.
- v. Labour and vaporization losses are reduced.
- vi. Maintenance is easy and recurring cost is negligible.
- vii. The production time of candles is less.

### **2.3.1.4 Applications of paraffin wax**

Lubrication, electrical insulation, and candles are all common uses for paraffin wax. Paraffin wax that has been dyed can be used to make crayons. It differs from kerosene and other petroleum products that are sometimes referred to as paraffin.



**Figures 2.3.1.4:** Paraffin wax beads.

### 2.3. Types of wax

According to the source, there are four types of waxes, which are represented by the following:

- i. Animal waxes:  
These waxes are secreted by some insects.
- ii. Vegetable waxes:  
It comes from seeds flowers stems and leaves.
- iii. Mineral waxes:  
It comes from petroleum coal peat and lignite
- iv. Synthetic waxes:  
It comes from all kinds of waxes after synthesis.



**Figures 2.3.2 i:** Animal waxes : shellac wax



**Figures 2.3.2 ii : Vegetable wax : Soy wax**



**Figures 2.3.2 iii : Mineral wax: Shilajit Minera**



**Figures 2.3.4 iv:** Synthetic wax

## **2.4 MATERIALS**

The material used in the design of the Candle Maker Machine was chosen with efficiency in mind. This was accomplished by selecting acceptable materials in good operating order and component stability. The key component of the Candle Maker Machine's specs is shown below. The Stainless Steel Heating Rod, Stainless faucet, Aluminum melting pitcher and the base support are among these components.

i. Aluminum melting pitcher

Aluminum Melting Pitcher are versatile because they can resist high temperatures and hold a fair amount of wax. They're also easy to transfer liquid wax into if you're melting in a separate container.

ii. Stainless steel heating rod.

Serves as a conduit of heating heat to the machine.

iii. Stainless faucet steel triangle valve.

Can flow wax liquid directly into the wax container.

iv. Base of machine (iron).

Serves as a machine support.

v. Machine support metal (stainless steel).

Serves as a machine support and machine base

vi. Temperature regulator.

Serves as a temperature adjustment control for the machine.



**Figures 2.4 : Candle Maker Machine**

## **2.5 SUMMARY**

In conclusion, it is important to present all studies of materials and methods to improve the understanding of this project. Every thesis and other project relating to this used cooking oil recycling allows us to understand it fully. It refers to how we can preserve good and healthy environment by recycling the used cooking oil into something new and useful. So, we create candles by using the used cooking oil. This can reduce the contamination because of cooking oil waste that being dumped anywhere after being used. Even though the first trial of using used cooking oil and wick was failed, but the second trial shows a satisfying result which was paraffin wax was used into the formula. It gives the candle a hard composition of a solid, hard enough for being a candle. This experiment has been succeeded and is a preserve to good and healthy environment.



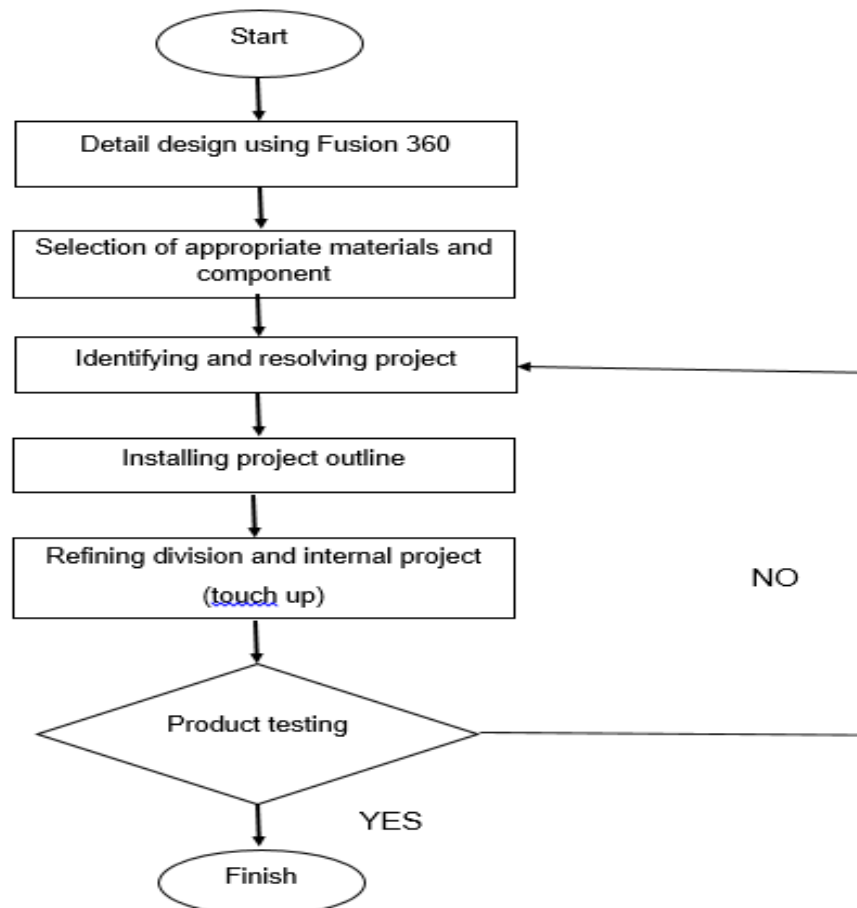
## CHAPTER 3

### METHODOLOGY

#### 3.1 INTRODUCTION

Making candles, like cooking, may be as simple or as complicated as you like. A thermometer, a tray to catch wax spillage, a knife and scissors, and several plastic containers for water baths are all necessary instruments, just as they are when cooking. You don't need a double boiler with water or oil because the wax melts very instantly over a low flame. If the wax is heated above 90 degrees Celsius, it will begin to smoke. It's also a good idea to use a fan to ventilate the space. If you want a variety of colors, go to a cafe and buy some recycled huge metal tins.

#### 3.2 FLOW CHART



### **3.2.1 Identifying problems**

This study began with the goal of making it easier for consumers to make candles out of used oils. This candle maker machine can also save energy and money. Users can also use this candle maker machine to pass the time in their spare time. By using a candle maker machine, users can start a small business making candles that are scented with used oils.

### **3.2.2 Analysis**

The collected data is collected, processed, and analysed to enable the next steps to be taken and the study to be determined as required by the objectives.

### **3.2.3 DESIGN PROJECT**

Before implementing a candle maker machine, the design was created to determine the best characteristics for determining the volume of liquid that can be incorporated. In fact, this design is intended to provide more detailed information to build a candle maker machine before implementation.

### **3.2.3 IMPLEMENTATIONS**

When a candle maker machine is finished, it should be put to the test by filling it with candle making ingredients and used oil to see if it works properly.

## **3.3 DATA COLLECTION METHOD**

To conduct this research, various data collection approaches were used to get data that would be useful during the analysis stage. The questionnaire method is one of the data collection methods. Primary data and secondary data are the two forms of data that can be collected.

### **3.3.1 Primary Data**

Primary data are important data in the study. Without key data, the objectives of the study will not be achieved. The data collection process was done through the distribution of questionnaires to respondents.

### **3.3.2 Secondary Data**

Secondary data includes literature reviews as well as other sources such as theses, books in the topic of study, local newspapers, journals, and other publications relevant to the research project. These resources were evaluated for suitability and served as the foundation for this research..

### 3.4.1 PROJECT REVENUE

Here are the ways of eraning CANDLE MAKER MACHINE:



**Figure 3.4.1 i :** paint the machine's body.

**Figure 3.4.1 i** indicates that the first step in the development of this project is to spray paint the machine's body in order to further draw it.



**Figures 3.4.1 ii:** manufacture component assembly and punching.

Following the completion of the body, the components for this project's manufacture will be punched and assembled.



**Figures 3.4.1 iii:** create the legs of the machine

Following the completion of the machine body assembly, the machine legs are created by welding iron legs to further strengthen the machine.



**Figures 3.4.1 iv:** The machine is up and running.

**Figures 3.4.1 iv** shows the results of a product that is ready and ready for use.

### **3.4.2 SUMMARY**

The study design, data collection methods, study instruments, data sampling techniques, and data analysis methods were made systematically in the initial stage of the methodological study to know the facts and information to support the study instrument and describe more clearly in this study.

## CHAPTER 4

### RESULT DISCUSSION

#### 4.1 INTRODUCTIONS

The project of the candle maker machine was designed to innovate to please users because its space -saving design is easy to be store. This project is intended for the use of stay-at-home parents, small businesses or even the public. The innovativeness of this project is taking advantage of used cooking oil and turned it into a candle for an eco-friendlier alternative for the problem of blockage in drain and river pollution. The nozzle at the bottom of the machine is for channelling the hot wax liquid to the candle holder, the design is intended to make it easier and safe for the user. The project design was successfully proposed and fabricated according to the designed material and fabrication method,A significant benefit from recycled cooking oil typically burn clean, have a low carbon content and do not produce carbon monoxide. This helps communities to reduce their carbon footprints. According to the survey findings from the questionnaire that we received, the majority of users are content with the existence of this candle manufacturing equipment, and we are satisfied with the survey results. We received 76.9% female responses and 26.9% male responses from the survey.

## 4.2 QUESTIONNAIRE STUDY

After all of the data and information has been gathered, an analysis is conducted to determine the Candle Maker. The process of analyzing the study data will be shown in the form of graphs, tables and charts. From a survey we did, we manage to discover some data that will help us to improve our product and get to know our targeted audience better.

This is the data that was taken through a questionnaire:

### 1. What is the common use for this Candle Maker?

26 responses

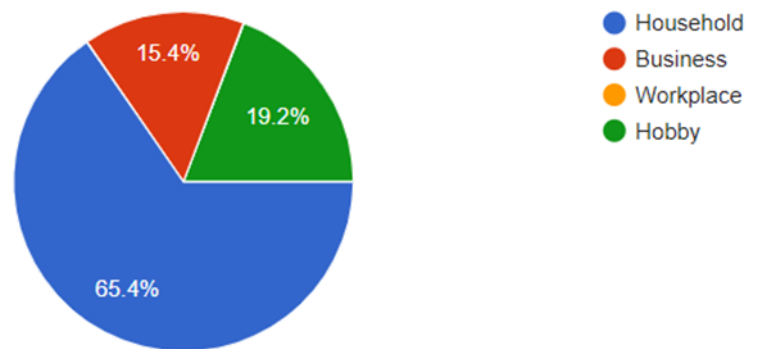


Figure 4.2 i

Found that 65.4% of users are household and 19.2% are hobby and also 15.4% of business which is using this product one of their business items

### 2. Do you have problem storing/disposing used cooking oil after using this product

26 responses

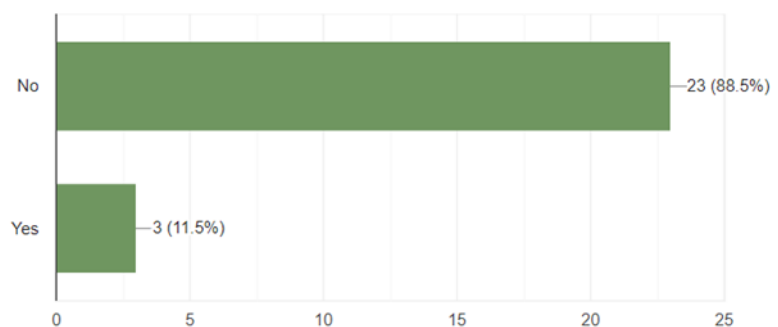


Figure 4.2 ii



According to the survey, 88.5% of consumers have no trouble storing or disposing of spent cooking oil after using this product. This means that our product Candle Maker Machine can help users solve storage and disposal issues.

3. Is the product exceed your expectation?

26 responses

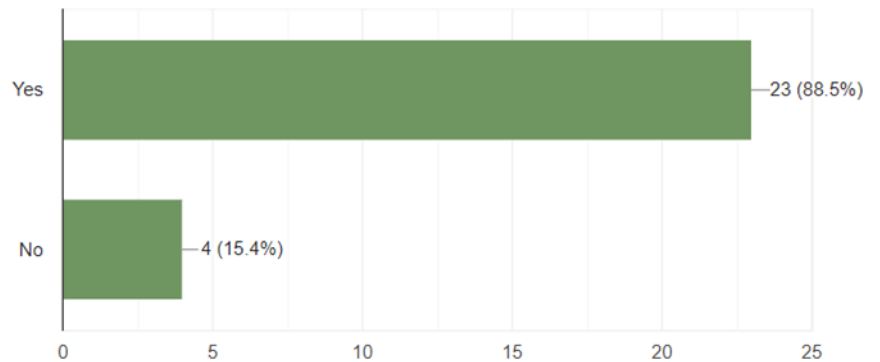


Figure 4.2 iii

From the analysis Almost all users (88.5%) indicated that this product met their expectations. This indicates that our product has been a success in terms of overall quality.

4. Is the price for this product is reasonable for what you are buying and using it for?

26 responses

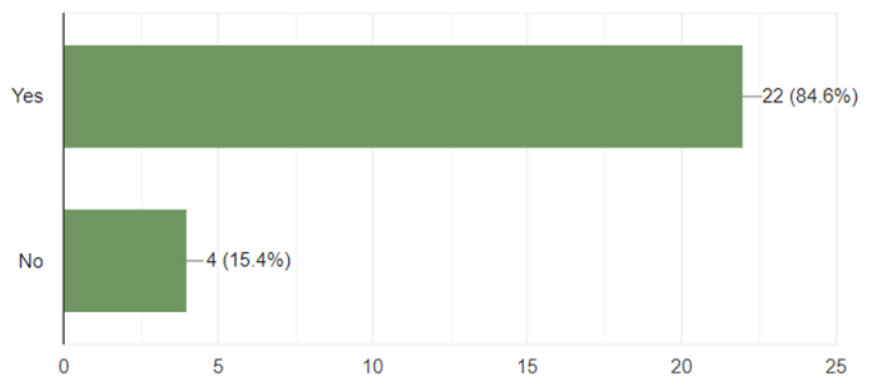
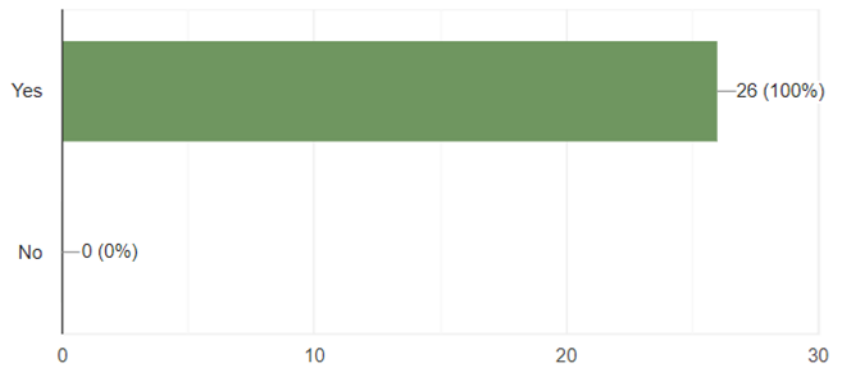


Figure 4.2 iv

in terms of product price 84.6% agreed that this product is reasonable for buying and using for. This is means our product Candle Maker is affordable and worth the price given.

5. Is the product eco-friendly and help solve your sewage blockage problem?

26 responses

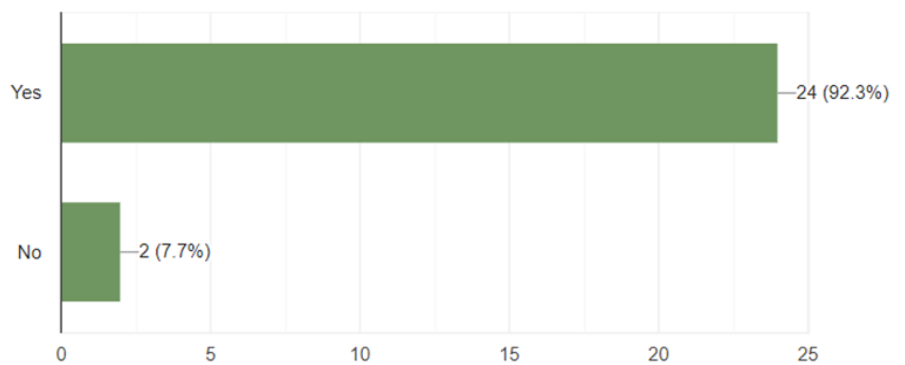


**Figure 4.2 v**

All users (100%) agree that the solution we made is eco-friendly and helps solve the sewage obstruction problem, based on the results of our analysis.

6. Is the direction of usage for this product is easy to understand and effective?

26 responses



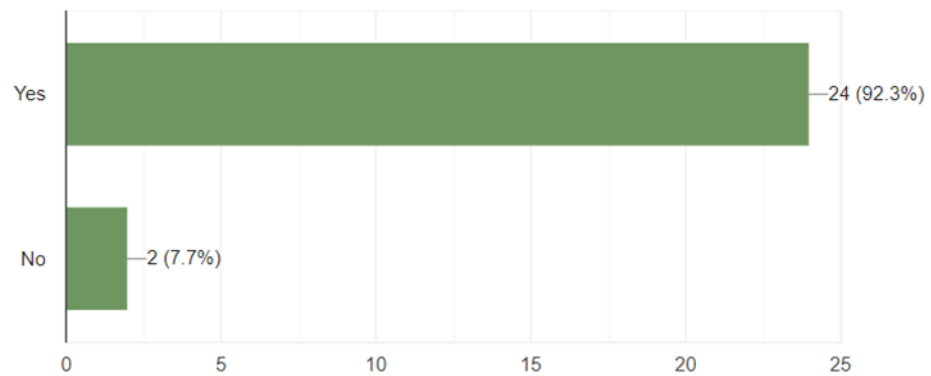
**Figure 4.2 vi**

92.% of users agree that this product is easy to understand and effective, so this product can guarantee that all communities can use our product which is a candle maker machine

7. Do you think this product can help children learn more about environmental problem/business?



26 responses

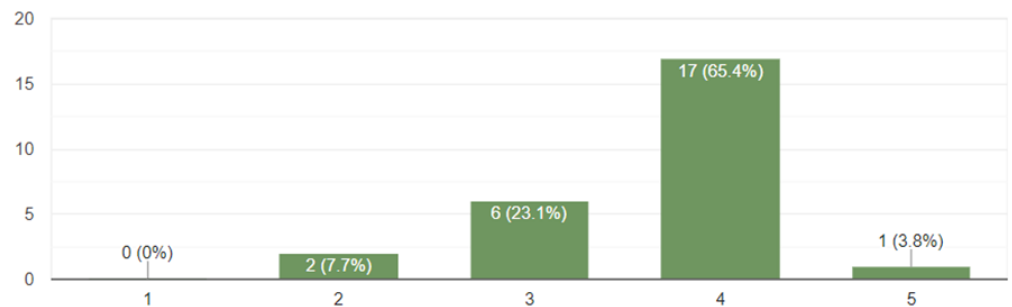


**Figure 4.2 vii**

92.3% of respondents believed that this product can assist children in learning more about environmental issues and businesses. This product has the potential to influence society at all levels.

8. How many time have you use this product averagely?

26 responses

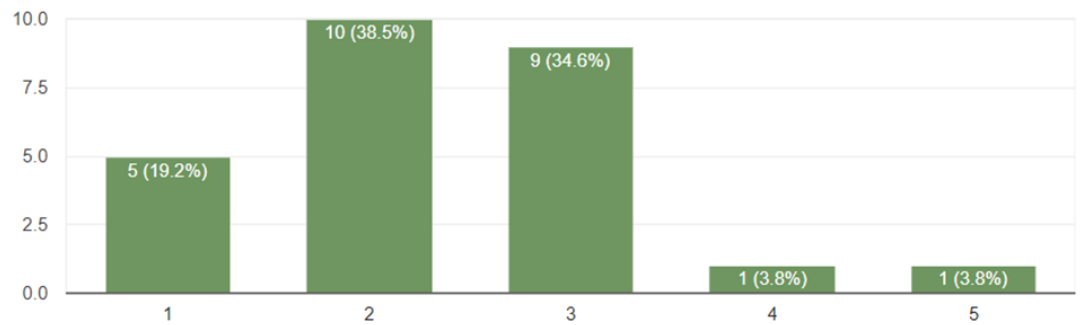


**Figure 4.2 viii**

From this analysis we can know how much the average product is used by users, it is found that users use this product often. 65.4% of them use this product regularly

9. How would you rate the difficulty of using this product?

26 responses



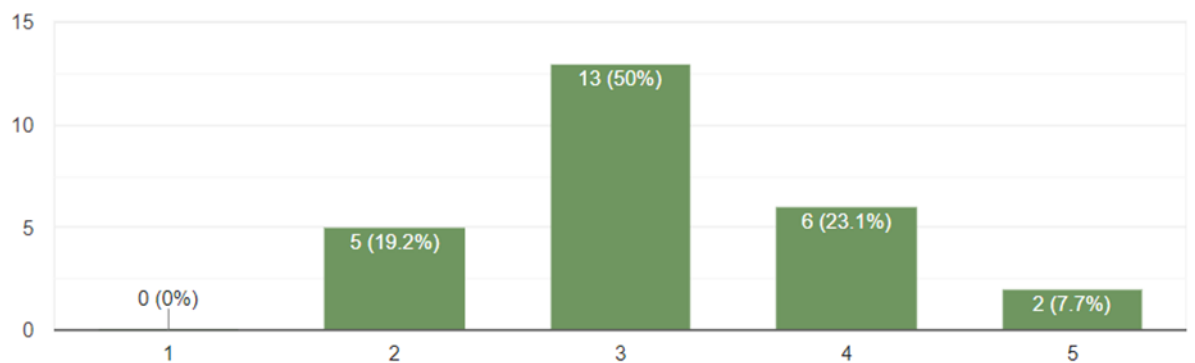
**Figure 4.2.ix**

From this graph we can see how difficult it is to use our product. Here we have got some views from each user of the difficulty rate according to their respective opinions. 19.2% with rating 1, 38.5% with rating 2, 34.6% with rating 3, 3.8% with rating 4, and 3.8% with rating 5. This means many choose easier to use than difficult to use this Candle Maker Machine.

10. How many attempts it take to make the perfect candle by yourself?



26 responses



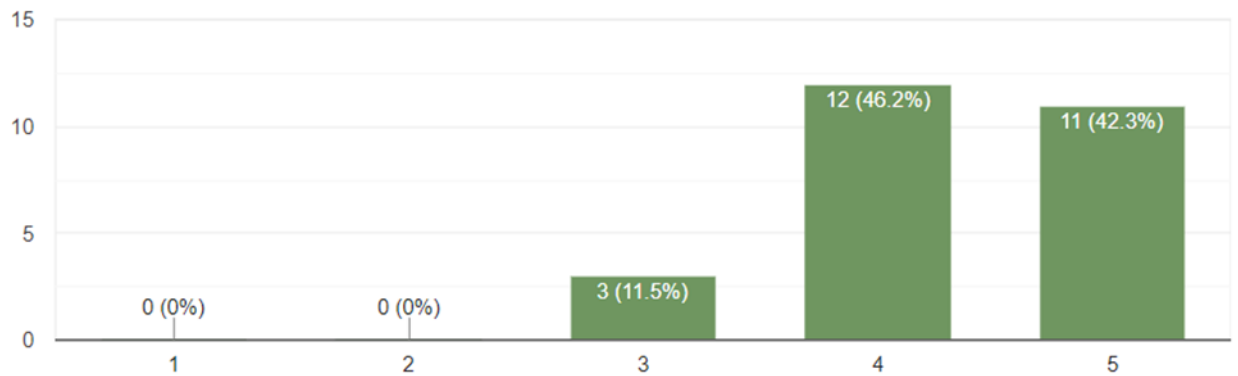
**Figure 4.2 x**

From this data we found 50% of users try 3 times to get the perfect candle using this candle maker machine.

11. Overall, are you satisfied with the product?



26 responses



**Figure 4.2 xi**

From this graph almost all vote yes for the intended question which is the question about satisfied for this product.

12. Any further suggestion on how to improve our product?

2 responses

None

Nope. Overall the product is awesome

**Figure 4.2 xii**

For the last analysis question, it can be observed that there is no negative feedback from the respondents. In fact, it was found that all users are satisfied with the product produced by us, which is the Candle Maker Machine.

### 4.3 COST COMPENENT

| <b>Bil</b>        | <b>Equipment</b>             | <b>Quantity</b> | <b>The Unit Price (RM)</b> | <b>Total (RM)</b> |
|-------------------|------------------------------|-----------------|----------------------------|-------------------|
| 1.                | Wet Area Speed Seal Clear    | 1               | RM 11.00                   | RM 11.00          |
| 2.                | BOSH 6MM HSS-G DRILL BIT     | 1               | RM 4.20                    | RM4.20            |
| 3.                | 1/4 R.O Tubing-Meter         | 1               | RM 3.30                    | RM3.30            |
| 4.                | Samurai S.Paint Metallic Red | 1               | RM 14.50                   | RM 14.50          |
| 5.                | Warmer pot                   | 1               | RM 19.92                   | RM 19.92          |
| 6.                | Welding rental               | Per day         | RM 80.00                   | RM 80.00          |
| <b>TOTAL COST</b> |                              |                 |                            | <b>RM 132.92</b>  |

**Table 4.2.1: Component cost list**

**Figure 4.2.1** shows the cost of materials allocated to implement the Candle Maker Machine project. The total cost used is RM 132.92.

## 4.4 TESTING RESULT

### Candle Maker by Tanjirou.

Testing design table

| Type of Candle      | Description  | Mass (g) | Time (to harden) | Time (to burn) |
|---------------------|--|----------|------------------|----------------|
| Soy wax candle      | Formed from soybean oil, soy wax candles are natural and renewable, making them a safe and sustainable option. The natural material is biodegradable so wax spills can be easily washed out. Soy wax also boasts a lengthy, clean burn   | 480      | 4 hours          | 3-4 hours      |
| Paraffin wax candle | As one of the most common types of wax, paraffin wax is used less so in luxury candles as it produces more soot in comparison to other wax types.  | 250      | 4 hours          | 3-4 hours      |
| Beeswax candle      | This natural product boasts a honey-like fragrance and creates a warm glow when lit. As a result, dyes and scents aren't necessary, as beeswax candles can be enjoyed in their purest form. Beeswax candles are thought to be a beneficial option for people with allergies and, due to its high melting point, the wax is less prone to dripping. | 250      | 4 hours          | 3-4 hours      |

Temperature: 70-75 degrees Celsius

Machine power: 100W (220-240V-50/60Hz)

Time taken to melt wax is estimated to be 15 minutes.

Volume of wax that can be produced is 500ml.

Tealight candle weight is estimated to be 17g.

**Table 4.2.2:** Testing Result

This product is safe to use by all communities. The material used to make the candle maker machine has guaranteed safety. The performance of this candle maker machine. The temperature used is 70-75 degrees Celsius. The product has a technical machine power which is 100W (220-240V-50/60Hz). Time taken to heat the used cooking oil was ½ hour. The material used is paraffin wax, used cooking oil and aroma therapy oil. The product provides machines that are guaranteed safe to use by all communities.

# **CHAPTER 5**

## **CONCLUSION**

### **5.1 CONCLUSION**

Throughout this project, the product was a progress from the rough draft to the polished product. It encourages creativity in creating the project and improve the existing project to be more affordable and user-friendly with new fabrication methods. The Innovation Candle Maker Machine is to encourage people to take care of the environment. The product can give experience to each community to make their own candles. The Candle Maker Machine positively tested to avoid polluted river for effect cause by improper dispose of used cooking oil. This Candle Maker Machine has a good reason for renew reusable source like used cooking oil into something new. This project has the potential to create environmentally friendly and useful machines for every community and commercialization is recommended to help reduce cooking oil waste.



## REFERENCES

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- 4) **Hidalgo-Crespo, J., Coello-Pisco, S., Crespo-Vaca, T., Amaya, J., Soto, M., Jervis, F., & Moreira, C. (2020). Hemispheric Cooperation for Competitiveness and Prosperity on a Knowledge-Based Economy. (1). <https://doi.org/10.18687/LACCEI2020.1.1.485>**

## **ATTACHMENT**

**ATTACHMENT A**

**QUESTIONNERES**

**ATTACHMENT B**


**GANTT CHART (Project 1)**

**ATTACHMENT C**

**GANTT CHART (Project 2)**



## ATTACHMENT A

<https://forms.gle/iPvgjTsMW5bX4JRk6>



### CANDLE MAKER MACHINE– CUSTOMER SATISFACTION SURVEY

This questionnaire seeks to obtain feedback on the Candle Maker machine provided by the group Tanjirou.

 intannastiana22@gmail.com (not shared) [Switch accounts](#) 

**\*Required**

Respondent category \*

Male

Female

Respondent age \*

Under 18 years old

19-35 years old



