POLITEKNIK MALAYSIA
SULTAN SALAHUDDIN ABDUL AZIZ SHAH

KEMENTERIAN PENDIDIKAN MALAYSIA

LAPORAN AKHIR

EGG STEAMER MACHINE

JABATAN KEJURUTERAAN MEKANIKAL

AHLI KUMPULAN:	NO. PENDAFTARAN
ABDUL MUKMIN BIN ABD HAMID	08DMP18F1142
MUHD IRFAN BIN MOHD MAZLAN	08DMP18F1133
MUHD ADAM MUQRIZ BIN NOR HISHAM	08DMP18F1155

SUPERVISOR:

PN. ISNURAINI BINTI KASSIM@ISMAIL

JABATAN KEJURUTERAAN MEKANIKAL

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ACKNOWLEDGEMENT

Alhamdulillah, In the name of Allah the most gracious and the most precious, first and foremost, I would like extend our deepest praise to Allah SWT who given us the patient, strength, determination, obstacle that helping us to think wisely in making a decision and courage to completed this project. Plus, many thanks and highest gratitude to Pn. Isnuraini Binti Kassim, our supervisor, which helps, lead and guides us with our project called 'EGG STEAMER MACHINE'.

ABSTRACT

Eggs Are Among the Most Nutritious Foods on the Planet, providing virtually all the vitamins and minerals needed. They can be cooked in many different ways such as boiled, poached, fried, steamed, baked and microwaved. Boiled eggs are popular all over the world normally while breakfast. Currently at buffet breakfast, chef need to do ala carte half boiled egg as ordered. It will consume time for chef to prepare orders. Most of the hotel not served half boiled eggs due to lack of manpower. This study will focus on developing and design an rotating egg steamer machine with capability of producing half-boiled and hard-boiled egg as self service at buffet breakfast. Aluminium pot is used as the container since it is a good heat conductor. A rail is installed in the aluminium pot and the movement is rotating vertically from top to bottom to transport the eggs while it's been steam. Immersion heater rod is installed as a heat transfer medium. The design was aided by Inventor design computer software according to the selected scope. As an improvement for further development is to design the steamer pot that can divided the half-boiled egg and hard-boiled egg at the end of the rail.

ABSTRAK

Telur adalah antara makanan paling berkhasiat di atas muka bumi ini. Telur memberi hampir semua vitamin dan mineral yang diperlukan untuk tubuh badan manusia. Telur boleh dimasak dengan pelbagai cara seperti rebus, goreng, kukus, bakar dan menggunakan gelombang mikro. Telur rebus sangat terkenal di seluruh dunia dan menjadi makanan utama untuk sarapan. Semasa sarapan bufet, Chef perlu membuat telur rebus ala carte mengikut pesanan yang diterima. Ini akan memakan masa Chef untuk membuat pesanan penting yang lain. Sebahagian besar hotel juga tidak menghidangkan telur separuh masak, ini kerana pihak hotel kekurangan tenaga kerja. Kajian ini akan menumpukan pada reka bentuk dan fabrikasi mesin pengukus telur berputar dengan kemampuan menghasilkan telur separuh masak sebagai alternatif layan diri baharu semasa sarapan bufet. Pemilihan periuk aluminium digunakan sebagai bekas ialah kerana aluminium adalah konduktor haba yang baik. Rel juga dipasang di bahagian dalam periuk aluminium dan pergerakannya berputar secara menegak dari atas ke bawah sambil mengangkut telur ketika dalam proses stim. Rod pemanas rendaman juga dipasang di dasar bekas sebagai medium pemindahan haba yang sekata. Reka bentuk ini juga dibantu oleh perisian komputer reka bentuk Inventor mengikut skop yang dipilih. Sebagai penambahbaikan untuk pembangunan seterusnya , mekanisma yang dapat mengasingkan telur separuh masak dan telur rebus di hujung rel adalah dicadangkan.

CONTENT

5 DISCUSSION , CONCLUSION AND UPGRADE PLAN

5.1 Introduction

5.2 Discussion

CONCLUSION

CHAPTER 1

INTRODUCTION

1.1 RESEARCH BACKGROUND

Boiled eggs are commonly eaten all over the world. Regularly they eat when breakfast but rarely at other time. There is several way to cooked egg such as boiling water immersion, cooked below the boiling temperature, i.e. coddling or they can be steamed. So our product is use steam method to cook eggs.

About million years ago, at first people eat their eggs raw, but once people begin to use fire, they often roasted eggs in the coals. With the invention of pottery, about 5000 BC, boiling eggs gradually became more common. Back in the day, in ancient Rome, hard boiled eggs were discovered and became common as an appetizer to the local. People also began to use eggs in breads, cakes, and custards.

Fast forward, when the technology is evolved, people start to cook eggs using steamer. That is because steam is high in temperature that can cook eggs more efficiently than boiling the eggs.

1.2 PROBLEMS STATEMENT

To produce a half-cooked egg, in order to get the desired result, the exact temperature and time need to be controlled. Moreover the hotel's buffet breakfast also lacks the labor to produce half-cooked eggs. This allows the planning of other instructions to be a little slower.

1.3 RESEARCH OBJECTIVE

1) To design and develop an egg steamer machine with capability of producing half-boiled egg.
2) To ease producing half boiled egg at buffet breakfast.

1.4 SCOPE OF RESEARCH

1) This product use steam, which the maximum temperature is 160 Celsius.
2) Suitable for hotels and restaurants

1.5 RESEARCH QUESTIONS

This study will answer the following research questions:

1) It is possible egg steamer machine to be a self-service machine?

1.6 CHAPTER'S SUMMARY

In this chapter, the studies was explained about its origin of ideas and inspirations. All the objectives were made out of all the problem statements. The objective for this project along with the importance will be possibility egg steamer machine to become a self-service machine, and even the scope of this project only focusing at suitability for hotels and restaurants. Thus, this new egg steamer machine could be used for daily routine with a really good care for a longer lifetime.

CHAPTER 1 DONE BY,
ABDUL MUKMIN BIN ABD HAMID (08DMP18F1142)

CHAPTER 2

LITECURE REVIEW

2.1 INTRODUCTION

This chapter will explain how the egg steaming machine (ESM) works and what the difference is with the egg steaming available on the market.

Chicken eggs, fried with unbroken shells, are normally immersed in boiling water. Boiled eggs are cooked until egg whites and egg yolks become thick, while boiled eggs can leave egg yolks, often white, at least partially melted and raw. In addition to soaking in boiling water, there are many common ways of producing boiled eggs. Eggs can also be cooked by steaming. Eggs may be put in a complete steamer, basically for the steam system. Eggs would not crack due to the pressure changes in temperature. At full steam, the boiled egg can be ready in around 6 minutes, and the boiled egg can be ready twice that time. Depending on the starting temperature and size of the egg.

Chef Heston Blumenthal, after a "relentless experiment" published a recipe for "perfect boiled eggs" that suggests boiled eggs in water in a pot that starts to cool and cover the eggs no more than a millimeter, removing the pan from the heat as soon as the water starts to boil. Half-boiled eggs will be ready after six minutes.

Nowadays, in addition to boiling eggs in water, it is better to use an egg steaming machine. Therefore, it will be stated in this chapter how this EMS is more successful and what is the difference with the egg steamers available in the market.

2.1 METHOD

2.2.1 METHOD USED TO COOK EGG

- BAKING

Eggs cooked in the oven bowl, also known as chopped. Break and place 2 eggs in an oiled 10-ounce cup of custard, a shallow baking dish or ramekin. Spoon 1 tablespoon or half of the milk over the egg. Bake in a preheated 325 F (163ºC) oven until white and egg yolks begin to thicken but do not harden, around 10 to 12 minutes, depending on the number of servings you bake.

- HARD-BOILED / HARD-COOKED

Place the eggs in a big enough pot to keep them in one layer. Then at least 1 inch above the egg, apply sufficiently cold water. Heat until boiling, over high heat. Switch the heat off. Remove the pan from the burner if necessary to avoid further boiling. Close this pot. For large eggs, leave the eggs in hot water for about 12 minutes (about 9 minutes for the big eggs, about 15 for the big eggs). Put cold water over the eggs immediately or place in ice water until cooling is complete. Never microwave eggs in shells and, at an altitude of more than 10,000 feet, boiled eggs are almost impossible.

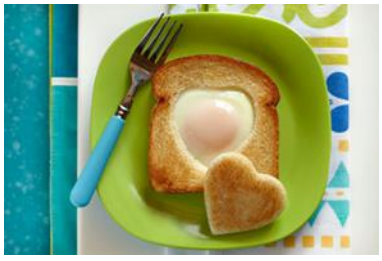
• EGGS EYE

For Sunny Eggs-Side-Up: In a nonstick pan over medium-high heat, heat a small amount of butter until hot. Put the eggs in the pan, one by one and break them. Reduce your heat to low immediately. Cover the pot and cook slowly, 5 to 6 minutes, until completely white and yellow begins to thicken but not thicken. Use salt and pepper to sprinkle.

Too fast or too hard for Eggs: Cook like Sunny-Side-Up, but do not cover the pot. Cook the second portion until desired softness, 30 seconds to 1 minute.

For Basted Eggs: Cook as for Sunny-Side-Up, but use 2 tablespoons butter and do not cover pan. Cook until edges turn white, about 1 minute. Begin basting eggs with butter from pan. Cover pan between bastings and continue cooking until whites are completely set and yolks begin to thicken but are not hard, 4 to 5 minutes.

For Steam-Basted Eggs: Cook as for Sunny-Side-Up, but use 1 teaspoon butter or a light coating of cooking spray. Cook until edges turn white, about 1 minute. Add 1 teaspoon water to pan. Cover pan tightly. Continue cooking until whites are completely set and yolks begin to thicken but are not hard, 4 to 5 minutes.



- POACHED

Heat 2 to 3 inches of water, milk, broth, tomato juice, wine or other liquid in a large saucepan or deep skillet to boiling. Adjust heat to keep liquid simmering gently. Break cold eggs, one at a time, into a custard cup or saucer. Holding the dish close to the liquid's surface, slip the eggs, one by one, into the water. Cook until the whites are completely set and the yolks begin to thicken but are not hard, about 3 to 5 minutes. Do not stir. With a slotted spoon, lift out the eggs. Drain the eggs in the slotted spoon or on paper towels. Trim any rough edges, if you like. Adding vinegar or salt to the water to enhance coagulation is not necessary and can flavor the eggs. Use very fresh eggs for poaching. They hold their shape better and form fewer wispy threads or "angel wings" in the water.

• SCRAMBLEED

Beat 2 eggs, 2 tablespoons of milk or water, salt and pepper together, if you like, until well mixed. Heat a small amount of butter or a cooking spray in a 7-8-inch omelette pan or pan over medium heat until hot. Pour in the mixture of eggs. As the eggs begin to set, gently pull the eggs over the pan with an inverted cup, creating a big, soft curd. Continue cooking-pull, raise and fold the eggs until they are dense and the eggs have not been melted. Do not stir continuously.

2.2.2 METHOD TO MAKE HALF-BOILED EGG

PLACING IN WATER

Time left in water after being brought to a boil Left 5 minutes Right: 6 minutes. There are various ways to place the eggs in the boiling water and remove: one may place the eggs in the pan prior to heating, lower them in on a spoon, or use a specialized cradle to lower them in. A cradle is also advocated as reducing cracking, since the eggs do not then roll around loose. To remove, one may allow the water to cool, pour off the boiling water, or remove the cradle.

Figure 2.2.1 – placing in water

STEAMING

Eggs can be taken straight from the refrigerator and placed in the steamer at full steam. The eggs will not crack due to sudden change in temperatures. At full steam, "soft-boiled" eggs can be ready in about 6 minutes and "hard-boiled" eggs in about twice that time. However due to variations in the starting temperature and the size of the egg as well as the altitude of the location (longer needed for higher altitudes), these times can only be an approximation.

Figure 2.2.2 – steaming

BAKED EGGS

Baking eggs in an oven instead of boiling in water. Baked eggs (350 °F (177 °C) for 1/2 hour in a muffin tin, cool in ice water) are identical to boiled eggs but the shells peel more easily.

2.2.3 CURRENT STEAMER MACHINE TO MAKE HALF/HARD-BOILED EGG

It's shaped like an egg, or perhaps a very tiny space ship. Handles on the side make it easier to lift the lid, but oven mitts are a good idea, since it does get hot during cooking. This will steam-cook eggs to hard-, medium-, or soft-boiled, and can cook up to ten eggs at a time in two tiers.

But this isn't just for steaming eggs in their shell. It also includes removable trays so you can poach four eggs or make 3-egg omelettes. The cooking time is controlled by the amount of water added, using the included measuring cup. There's a simple on-off switch and a blue LED light, audible alert, and standby mode to help keep the eggs from overcooking. This also comes with a piercing pin to poke a small hole in the egg shell for easier peeling

2.3 MATERIAL SELECTION

- **Immersion Water Heater Rod**

To use an immersion heater, one simply fills a bucket of water and places the immersion rod into the bucket either directly or with an aid like a clothes hanger. Then they connect the plug into the socket and switch it on. Some models come with an indicator to show that they are working well.

- STAINLESS POT

Stainless pot are the kind of kitchen utensils used for boiling, frying and steaming. It is typically made of metal or clay. It is an important cooking tool. Pots have several forms, such as pans, rice pots, pressure pots, soil pots, and so on. It does not leave harmful substances or particles and therefore does not contaminate or alter food. This makes stainless steel a top choice to ensure high hygiene standards in the food and beverage industry are adhered to.Stainless steel does not absorb bacteria and does not dilute chemicals, so storing your food in stainless steel containers can give you peace of mind while maintaining your health. Stainless steel is colorless and has no pores. This container is safe in the refrigerator, making it the best choice for leftover food or lunch

- IRON ROD

Iron rods are lengths of iron used mainly in heavy construction projects. Reinforced concrete is attached to iron rods, also called rebar, to strengthen the building tension. . Iron is usually mined in the form of oxidized iron ore or sulfide.

- SWITCH

is to turn off or turn on the product work path and it also uses to connect and disconnect current in the circuit. where something is very important for daily life.

2.4 CHAPTER'S SUMMARY

As conclusion, this data and information allow us to choose the best way and method of making egg steamer machine depends on the size, range and so on. Furthermore, we also know the fastest method to make half or hard-boiled eggs with the help of the information about steaming condition, conveyer belts and so on. We want to design and develop an egg steamer machine with capability of producing half-boiled and hard-boiled egg at high rate with the helps from other develop equiments.

CHAPTER 3

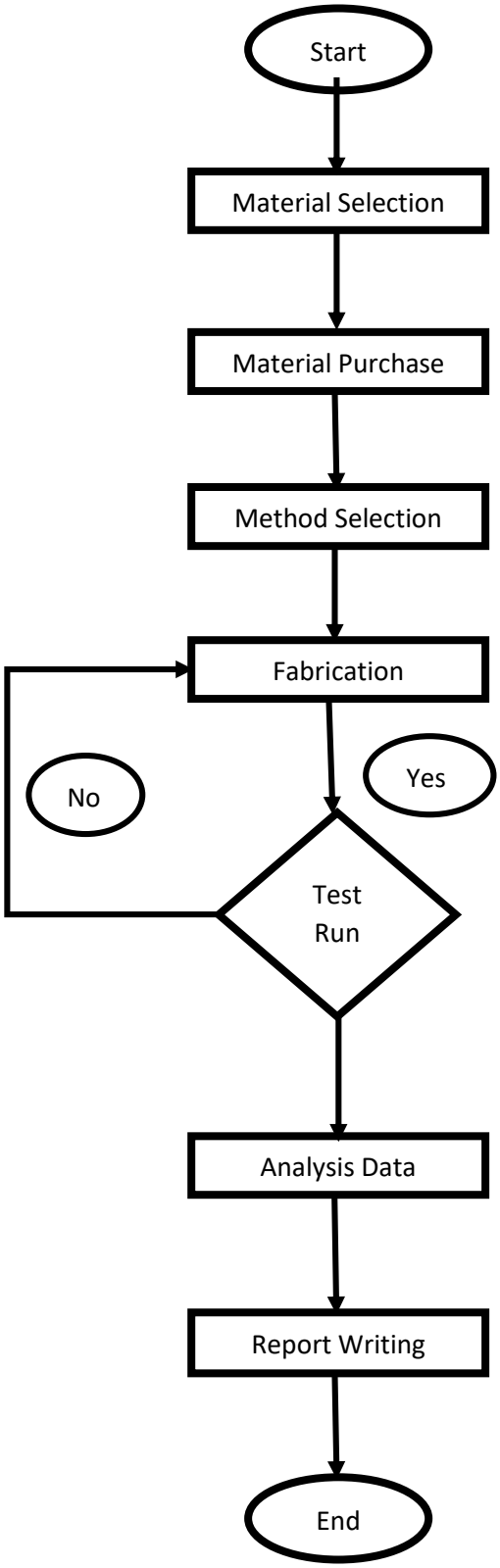
METHODOLOGY

Prepared by MUHD IRFAN BIN MOHD MAZLAN

3.1 INTRODUCTION

To produce this product, we have done detailed research to ensure the product implementation process runs smoothly and the product will benefit consumers. We started the study by making a questionnaire to the public to find out the innovations they need. Next we do a study on the materials that need to be used to produce this product. The material used to produce the exterior and interior of the product is stainless steel as this material is suitable for use for food products.

3.2 FLOW CHART



3.3 FLOW CHART EXPLAINATION

- **Material selection**

The process of material selection is one of the most important process in this final year project. The main factor of material selection is to discuss and finalized which materials that will be use in the project in order to avoid wasting of money and time. The material selection need to be done precisely so that the risks could be avoided.

1) Stainless Steel pot

Stainless steel has become one of the most popular products used in the kitchen and food industries today. From food processing plants to big commercial kitchens to your own kitchen at home, stainless steel is always present. Its corrosion and oxidation resistance combined with toughness, and how easy it is to clean, has made stainless steel one of the safest products in the food processing and storage industries. In addition to the tolerance of various acids present in meat, milk, fruit and vegetables.

There are also no chemicals in form 304 stainless steel that can transfer to your food, making it a safe, powerful and durable option for appliances, dishes, utensils, food storage and more.

2) Stainless Steel rod

Stainless steel[1][2][3]:276 is a category of iron-based alloys containing at least 11 per cent of chromium,[4]:3[5][6] a structure that prevents iron from rusting,[7] as well as having heat-resistant properties.[4]:3[8][9][10][11] Different types of stainless steel include carbon elements (from 0.03 per cent to more than 1.00 per cent), nitrogen, aluminium, silico, etc.

3) Immersion water heater

To use an immersion heater, one simply fills a bucket of water and places the immersion rod into the bucket either directly or with an aid like a clothes hanger. Then they connect the plug into the socket and switch it on. Some models come with an indicator to show that they are working well.

4) Switch

Control the power supplies by turn it on or turn it off.

- ## Material purchase

The process of materials purchasing is crucial to collect and obtains all the materials needed. In this process a lot of research on the places and suppliers that the materials are going to be purchase is done. This step is important so that the risk of material wasting or money-loss will not happen. However, to carry out material purchasing, a well-made purchasing plan needed to be made. First, the suppliers will be contacted to make sure the availability of the materials. Then, the calculation of the amount of materials needed and also the price of the materials. After that, surveys of price must be carried out to determine the better selling prices. Then finally, the purchases could be made.

- ## Method Selection

DREMEL

Dremel is an American brand of power tools known mainly for its rotary tools. The rotary tools of Dremel are similar to the pneumatic die grinders used by tools or mold manufacturers in the metalworking industry. The idea of the original Dremel Moto-Tool was to rotate a bit at high speed, a bit held in a collet. Variable-speed models can range from 3,000–37,000 RPM. In contrast to the high torque of the traditional power drill, the Dremel concept relies on high speed. The tool can perform drilling, grinding, sharpening, cutting, washing, polishing, sanding, routing, carving and engraving by inserting an appropriate bit (or burr). There are both battery-powered and corded versions available.

WELDING

Welding is a manufacturing process that combines materials, usually metals or thermoplastics, by using high heat to melt the parts together and allow them to cool, resulting in fusion. Welding is distinct from low-temperature metal joining methods such as brazing and soldering, which do not melt the base metal.

STEAMING

For the method to make half or hard-boiled eggs, we use steaming. After doing research and comparison to the others method, we find steam is high in temperature so that can produce the half or hard-boiled eggs fastest. Eggs can be taken straight from the refrigerator and placed in the steamer at full steam. The eggs will not crack due to sudden change in temperatures. At full steam, "soft-boiled" eggs can be ready in about 6 minutes and "hard-boiled" eggs in about twice that time. However due to variations in the starting temperature and the size of the egg as well as the altitude of the location (longer needed for higher altitudes), these times can only be an approximation

- **Fabrication**

I. First, we use three pots for cutting process. We cut the bottom of two pots according to the measurements that already made on the pots. Then the last pot, we make a hole ln lower part of the pot.

II. With the use of the stainless steel rod, we bend and shaped it to become an egg passage rail.

III. Then, we started the welding process where we weld all the three pots in a vertical position together except the lids. After that, we weld the rail inside pots.

IV. We use an immersion heater to be install in our egg steamer in the lower part that we make hole before, then we seal it by welding the hole.

V. For the switch, we combine it with the immersion heater wires.

3.4 PROJECT SURVEY

- **QUESTIONNAIRE**

MECHANICHAL ENGINEERING DEPARTMENT

POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

QUESTIONNAIRE

1) This survey is carried out to fulfil the requirement of our final year project. This survey is to identify the needs to design and upgrade an egg steamer machine with capability of producing half-boiled and hard-boiled egg. Feel free to give feedback on the questionnaire.

SECTION A

AGE: _____ years old

GENDER: ☐ MALE ☐ FEMALE

OCCUPATION: _____

SECTION B

PLEASE TICK (/) FOR THE AGREED ANSWER ON THE QUESTIONS.

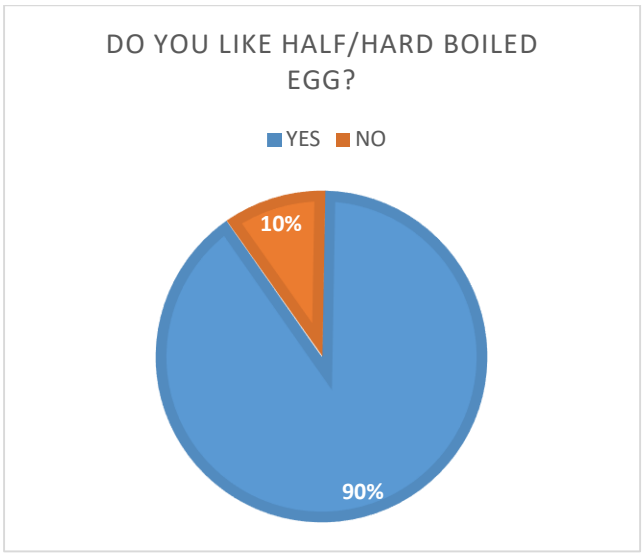
NO	QUESTION	YES	NO
1.	Do you like half/hard boiled egg?		
2.	Do you ever having buffet breakfast?		
3.	Do you agree on upgrading the current egg steamer?		
4.	Do the development of an egg steamer machine is needed?		

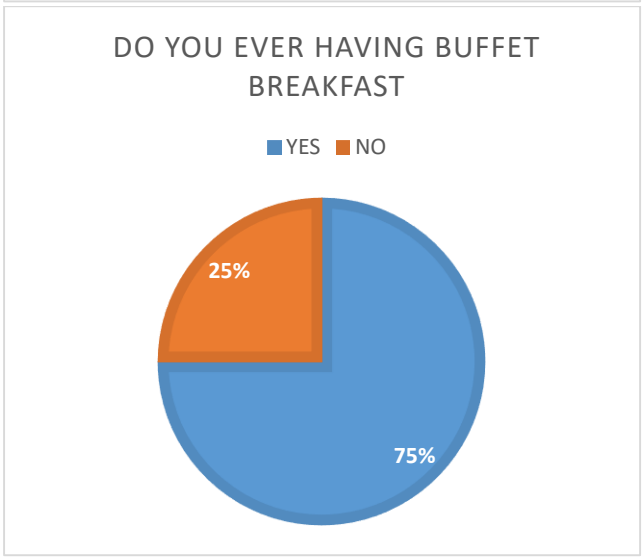
Thank you for your cooperation ….

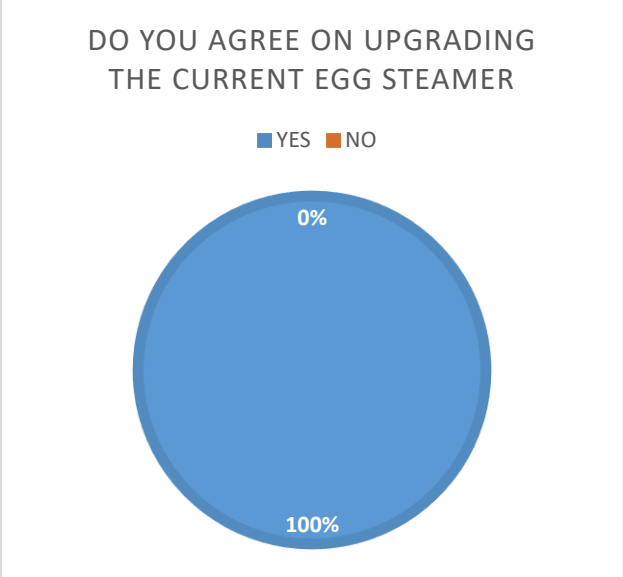
- **SURVEY RESLUT**

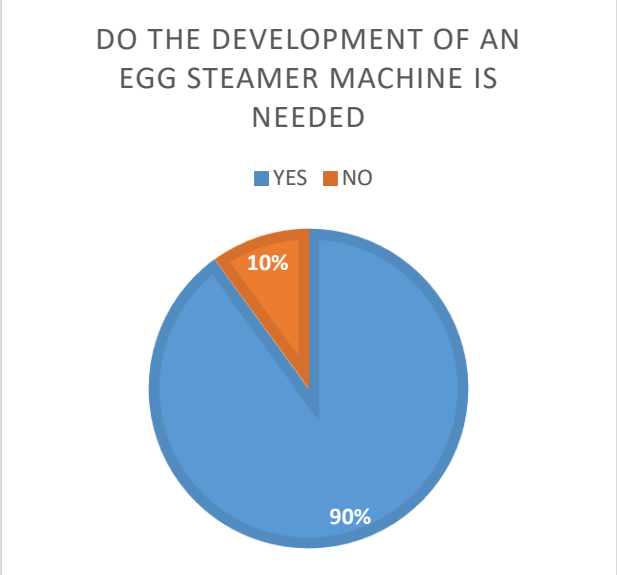
After doing the survey for our project, we collect the result from 20 respondents. The data represented in the pie chart.

Questionnaire Result

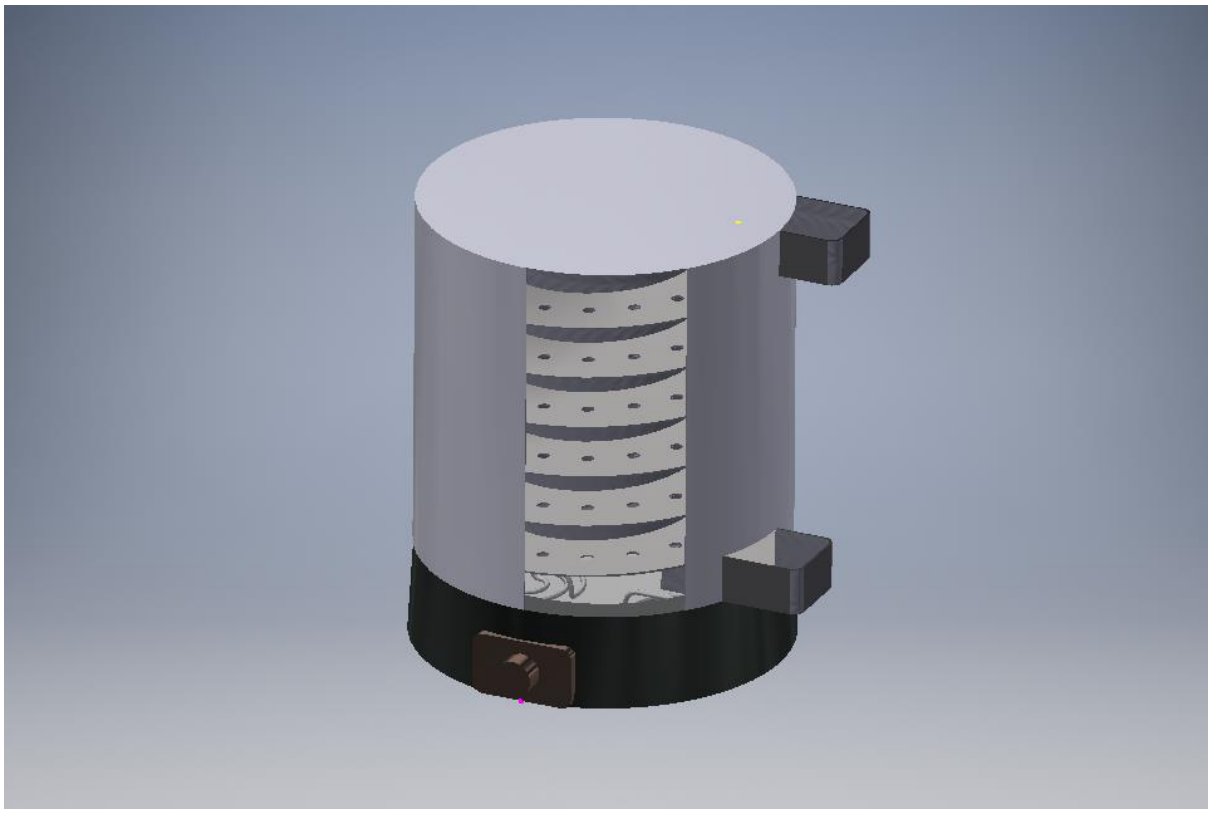


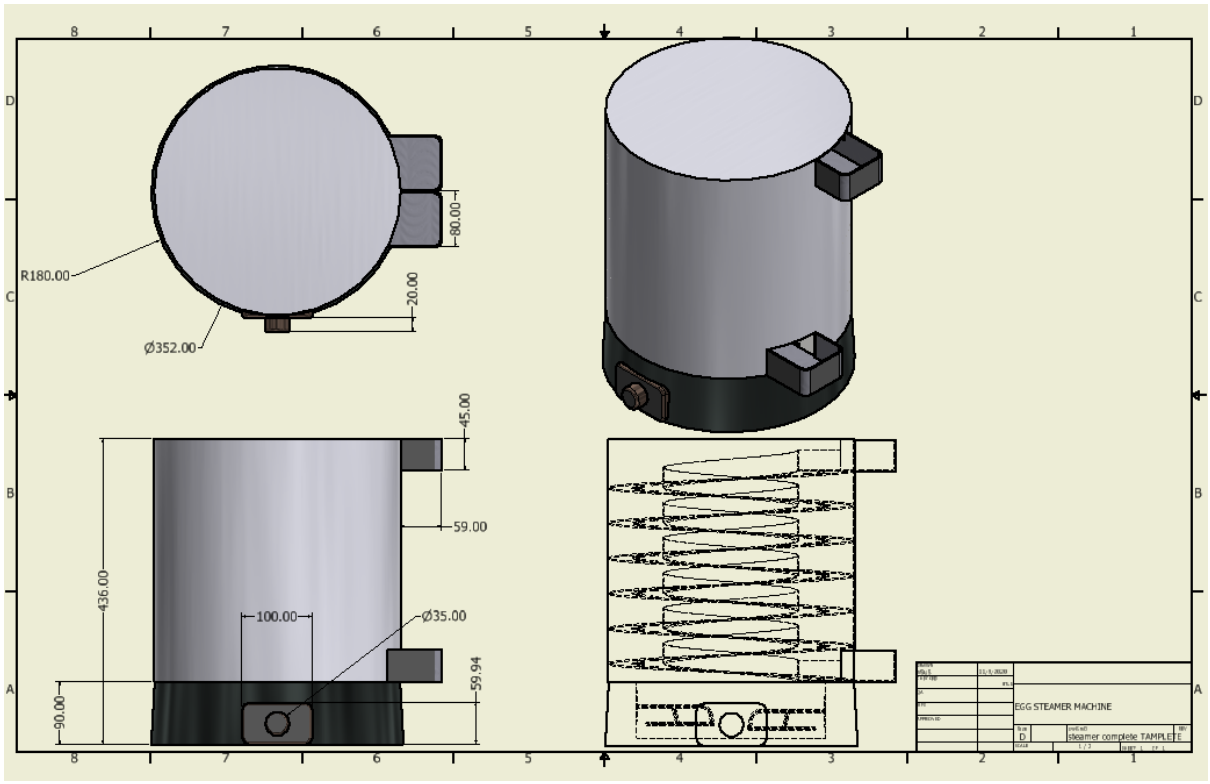



DO YOU AGREE ON UPGRADING THE CURRENT EGG STEAMER
YES
NO
0%
100%


DO THE DEVELOPMENT OF AN EGG STEAMER MACHINE IS NEEDED
YES
NO
10%
90%

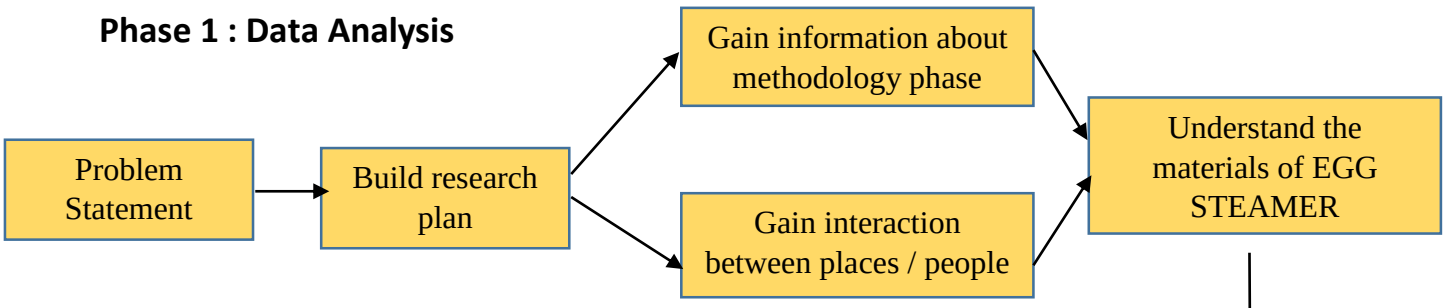
3.5 PROJECT DESIGN



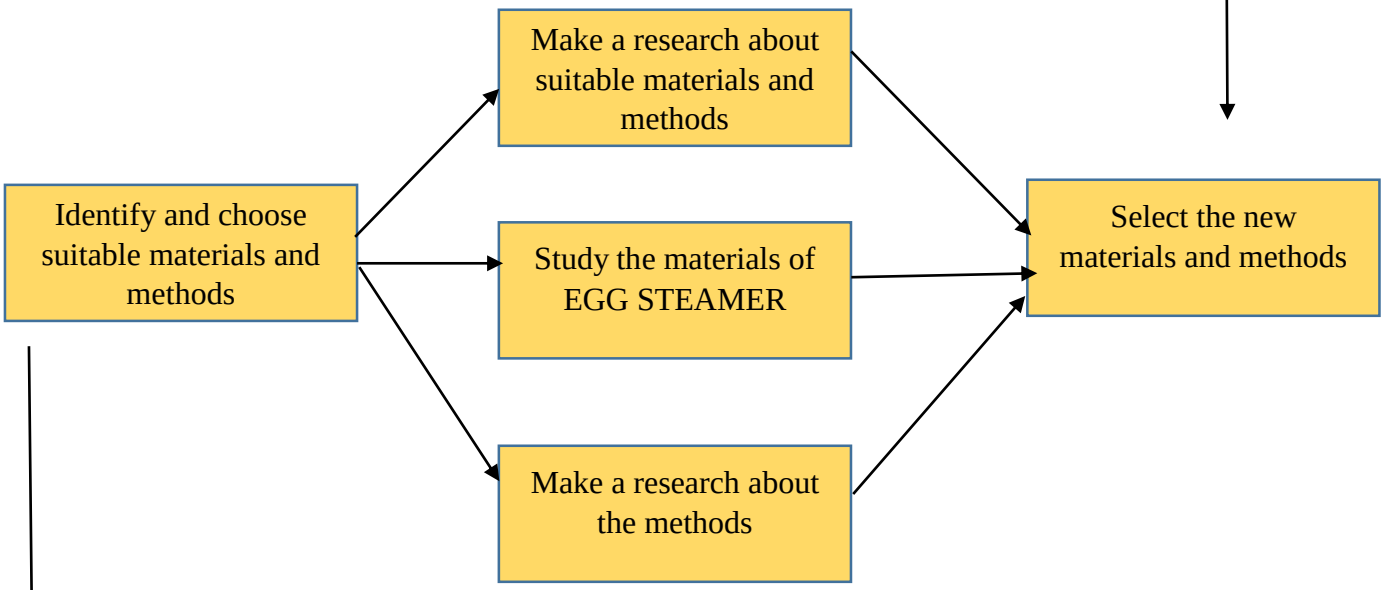


3.6 METHODOLOGY PHASE

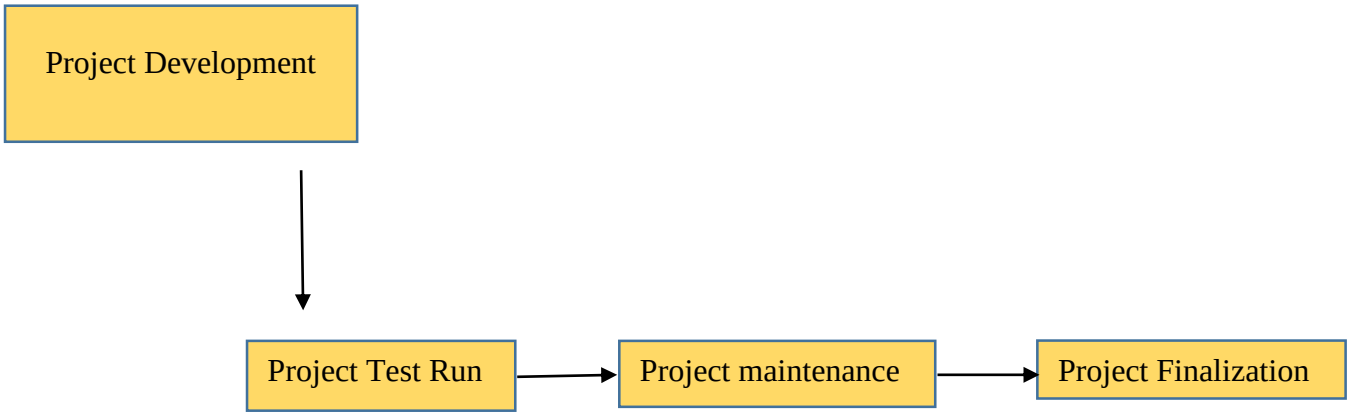
Phase 1 : Data Analysis



Phase 2 : Method and Material



Phase 3 : Preliminary Study



3.7 BUDGET CALCULATION

NO.	MATERIALS/EQUIPMENT	AMOUNT	PRICE
1.	STAINLESS STEEL POTS	3 UNIT	RM75
2.	STAINLESS STEEL ROD(2mm)	4m	RM80
3.	IMMERSION HEATER	1 UNIT	RM30
4.	SWITCH	1 UNIT	RM8

3.8 PROJECT ACTIVITY

Project Activity	Weeks													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Briefing and Project Planning -egg steamer - To ease producing half boiled egg														
Project Design -using AutoCad and Autodesk Inventor -sketch and design project														
Material Selection -thermostat -immersion heater														
Materials Purchase -buy aluminium pot because its cheap and didn't rust -used immersion heater to boil water and create stim efficiently														
Method Selection - high in temperature so that can produce the half or hard-boiled eggs fastest.														
Fabrication														
Test Run														
Analysis Data														
Report Waiting														
Video and Slaid Making														
PITEX Preparations														
PITEX Presentions														

3.9 SUMMARY

As a conclusion, the methods implemented in this project are very crucial and important to complete the project. Thus, this project is agreed and accepted by Madam Isnuraini Binti Kassim @ Ismail, our team supervisor. The materials used in the project will create a benefit for chef, housewife or anybody who had a hard time to make hard boiled egg. If we use the high quality manufacturing in the future, we sure that this project will be even more greater in all aspects. However, this method will affect the result totally if one of the method is change.

CHAPTER 3 DONE BY,
MUHAMAD IRFAN BIN MOHD MAZLAN (O8DMP18F1133)

CHAPTER 4

FINDINGS AND ANALYSIS

4.1 INTRODUCTION

The data and analysis obtained during the development of the egg steamer machine are combined in this chapter. It is very important for the data collected to determine whether the resulting project achieves the set objectives.We were able to recognize the benefits and drawbacks of this project after gathering and analyzing all the data.

4.2 ADVANTAGE AND DISADVANTAGE

There are pros and cons to any project made. The disadvantages found may however, be used in the future as ideas or guidelines for change. The downside of this project is that the user needs to use it to allow water to heat and steam to fill the egg steamer inside. This is because the heating rod, which takes time to heat the water, is relatively long and large in size. The second downside of this project is that the rate at which the egg is cooked is slightly inconsistent, as the acceleration of the egg inside is uncontrollable and depends solely on gravity.

This product, however, gives the chef an advantage because it is not necessary to constantly check the condition of the egg while cooking and can concentrate on preparing other dishes. This product is also a self-service machine and can be use by customers who want half a boiled egg.

4.3 CHAPTER'S SUMMARY

An analysis of this product has been made as a result of this chapter and it turns out to be able to give the consumer an advantage. However for future improvements, problems in this product should be carefully analyzed and examined.

CHAPTER 5

DISCUSSION , CONCLUSION AND UPGRADE PLAN

5.1 INTRODUCTION

Based on the information gathered and the research carried out this chapter will discuss the conclusions and recommendations for improving this project. This improvement proposal was made after all the disadvantages and potential of this egg steamer machine were identified.

5.2 DISCUSSION

We decided, after careful observation, to make improvements to the product's exterior. Since the body part of this product is made of stainless steel and hot steam is generated inside the product, heat can be felt on the outside of the product. This, if not noticed and touched on the outside of this egg steamer, endangers the user. We therefore plan to make improvements by covering the outside of this egg steaming body with thermal insulation materials such as polypropylene that can insulate and withstand high temperatures of up to 275 F.

The next improvement is that the movement of the egg in the egg steamer can be controlled. Uncontrolled movement of eggs and depending fully on gravity resulting in inconsistent results. Our suggestion is to create an automated inside barrier. This barrier will stop the movement of the egg giving some time to cook, and the barrier will be opened at the appointed time. This improvement is not only designed to produce reliable results, but the size of this product can also be decreased because it does not take a long rail to ensure enough movement of eggs until cooked. This improvement also can make the functionality of this egg steamer more useful, because it can produce hard boiled eggs.

5.3 CONCLUSION

In conclusion, this project proves that the egg steamer can be a self-service machine and make the preparation of half-cooked eggs easier. Pursuant to the objective of this project, which is to provide benefits and help users. This egg steamer machine would also encourage the development of more useful innovation products in the future.

CHAPTER 4 AND 5 DONE BY,
ABDUL MUKMIN BIN ABD HAMID (08DMP18F1142)