



BBQ CHARGER

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JABATAN KEJURUTERAAN MEKANIKAL

JUN 2020

POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

BPC PROSTHETIC LEG

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**Laporan ini dikemukakan kepada Jabatan Kejuruteraan Mekanikal
sebagai memenuhi sebahagian syarat penganugerahan Diploma
Kejuruteraan Mekanikal**

JABATAN KEJURUTERAAN MEKANIKAL

JUN 2019

AKUAN KEASLIAN DAN HAK MILIK

TAJUK : BBQ CHARGER

SESI : JUN 2020

1. Kami, **1. MOHD SHAFEEQ IDDIN BIN MOHD AMEERUL (08DKM18F1145)**
2. SOFI FAZMY BIN MOHD FAZIL (08DKM18F1164)
3. NIDAL IMRAN BIN MD NASIR (08DKM18F1149)

Adalah pelajar tahun akhir **Diploma Kejuruteraan Mekanikal, Jabatan Kejuruteraan Mekanikal, Politeknik Sultan Salahuddin Abdul Aziz Shah**, yang beralamat di **Persiaran Usahawan, 40150, Shah Alam, Selangor**. (selepas ini dirujuk sebagai 'Politeknik tersebut').

2. Kami mengakui bahawa "Projek tersebut di atas" dan harta intelek yang ada di dalamnya adalah hasil karya/reka cipta asli kami tanpa mengambil atau meniru mana-mana harga intelek daripada pihak-pihak lain.

3. Kami bersetuju melepaskan pemilikan harta intelek 'projek tersebut' kepada 'Politeknik tersebut' bagi memenuhi keperluan untuk peanugerahan **Diploma Kejuruteraan Mekanikal** kepada kami.

Diperbuat dan dengan sebenar-benarnya diakui

Oleh yang tersebut;

a) MOHD SHAFEEQ IDDIN BIN MOHD AMEERUL)
(No. Kad Pengenalan:000715-12 -1499))	MOHD SHAFEEQ IDDIN
b) SOFI FAZMY BIN MOHD FAZIL)
(No. Kad Pengenalan: 000831-10-2009))	SOFI FAZMY
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sebagai penyelia projek pada tarikh: 20/7/2020) NAZRATULHUDA BINTI

ACKNOWLEDGEMENT

Alhamdulillah, in the name of Allah the most gracious and the most precious, first and foremost, I would like to extend our deepest praise to Allah SWT who given us the patient, strength, determination, obstacle that helpong us to think wisely in making a decision and courage to completed this project. Plus, many thanks and highest gratitude to Pn. Nazratulhuda, our supervisor, which helps, lead and guides with our project “BBQ Charger”.

ABSTRACT

According to Dossier grill and barbecue market in U.S about 1.36 billion USD worth of grills and barbecue were sold in 2019, up from 1.21 billion USD in 2009. This show how many people like to taste their food in smoking and grilling texture. About 7 out of 10 U.S. adults possess a smoker or a grill, while in Canada, the ratio is 8 out of 10, this was taken from barbecue news magazine. According to an HPBA (Hearth, Patio & Barbecue Association) consumer survey in 2017, 29% or around 1/3 of consumers planned to use their grill or smoker frequently that year. Summer holiday weekends continue to spark the highest usage with consumers: 73% of consumers grill on July 4, 60% on Memorial Day, 58% on Labour Day, and 45% on Father's Day. Spring holidays are also key grilling weekends for many consumers: Mother's Day (34%) and Easter (19%). The survey also finds that grilling is becoming a year-round passion. Chilly temperatures don't stop many consumers from grilling for the Super Bowl (23%), Thanksgiving (14%), Christmas or Chanukah (10%), and New Year's Eve/Day (9%). Beyond holidays, 49% barbecued for birthday parties, 24% on a camping trip, 21% at a vacation home party, and 11% during tailgating activities for sporting events. "Barbecuing is no longer just a pastime, but an integral part of the North American lifestyle," said Jack Goldman, president and CEO, HPBA. "We expect consumers' passion for flavourful food and entertaining their family and friends to continue to increase for the rest of 2017 and into 2018. The future for the barbecue industry looks bright. "Flavour (72%), lifestyle (52%), and entertainment (40%) were the top reasons the study found that consumers grill. Next in line were convenience (33%), hobby (19%), flexibility (18%), and health (18%). This shows that many people eager to try their food in some unique way and it's the same in Asia, according to newspaper, Asians most likely barbecue in every even and in any kind of circumstances, despite of pandemic, people still loved to barbecue even in front of houses or backyard.

As our project is combining to factors of functionality, between grilling and outdoor activities, that equates to a net gain of 1.7 million total outdoor participants and a churn rate of 8.3%. Participants went on a total of 10.9 billion outdoor outings in 2017, a decrease from 11.0 billion in 2016. 20% of outdoor enthusiasts participated in outdoor activities at least twice per week, this is all according to worldwide stats. Doing outdoors activities has been a must to all humans, as we can see around us there is always people doing outdoor activities even its in pandemic. Barbecue and outdoor activities fit perfectly combine. Whatever you are doing outside is called outdoor activities and it always best come barbecue. Example, while hiking or go to beach and maybe went to jungle, barbecue is a must after it, it becomes tradition among people.

CHAPTER 1

Prepared by Sofi Fazmy

1.1 RESEARCH BACKGROUND

Nowadays, people Malaysians are starting to be more active and they are very interested in outdoor activities such as hiking and camping. Statistics shows that Malaysians are more active now. So, we decided to make something that can ease the burden of hikers and campers. Now charging and cooking is no longer a chore in the forest as our product is made for those two things.

Research also shows that Malaysia is still experiencing power shortages and in some rural areas electricity is hard to come by. That is when our product comes to play as our product creates electricity by only using fire. So in case of a power shortage, our product can be used to power some essentials such as mobile phones, mini fans and small lights.

In this project, our product uses a thermoelectric generator to convert heat energy into electricity. We plan to make reusable power so that electricity will no longer be costly and easy to come by. It is also easy to maintain as it is not that costly and can be obtained easily. With this, a fair amount of power can be created. Safetywise, we will fit a regulator to control the power output so that no power overflow will occur while using our product.

Pollution is also a concern nowadays. Lots of fumes have been released by power plants just to create electricity. Study suggests that Malaysia is still running on coals and diesels to run power plants. Our project will be a stepping stone to a new type of power which is free power. Our products are not only earth friendly but beneficial as well. So, this product also aims to ease our use of earth source and focus more on renewable energy. With that, we started our research and went to work straight away.

1.2 PROBLEM STATEMENT

In this time, phones are important to us. We can't travel anywhere without our phones as it is crucial and important even when going hiking. Even when you bring powerbanks on your trip, it won't last the whole trip. Powerbanks can charge your phone at least 3 times. And the second problem is, let's say, your house experience a power shortage, and your powerbank is not charged, where would you get power? Or even, you live in an area where there is no electricity and to gain power is only by using diesel generators. With diesel price skyrocketing now, you can only gain access to power only for a short periods of time. So this gives us an Idea. What if we can infuse an electric component somewhere in your cooking utensils that generates power when its heat up. Imagine what we can achieve. So, we decided a barbeque grill is the best utensil to infuse our idea.

1.3 RESEARCH OBJECTIVES

1. To create a power source out of renewable energy
2. To reduce the usage of earth source
3. To help people overcome power shortage and dependability on paid electricity
4. To further understand the benefit of free and clean electricity

1.4 RESEARCH QUESTIONS

1. Is it possible to create free power?
2. Is it possible to make a small portable cooking appliance?
3. Is possible to gain electricity in any given situation and location?

1.5 SCOPE OF RESEARCH

1. This product can last long and durable
2. Electronics need good care

3. Electronics can't be exposed to water
4. Product is flame resistant
5. Very durable and shock resistant

1.6 SIGNIFICANCE OF RESEARCH

Although barbeque grills has been widely used in Malaysia but small and portable ones are hard to come by especially the one that has the features like the one we made. So we will make this for the Malaysian people. We offer a cheap and affordable price for the Malaysian audience as grills in Malaysia are somewhere between the RM 500 range. We offer our products from only the price of RM250 with RM149 cost of production plus the charging features. Moreover, I think this product will benefit Malaysians as we have many hiking and camping places plus Malaysians are more outgoing and adventurous nowadays so I think we can market this product easy.

1.7 DEFINITION OF OPERATIONAL TERMS

Thermoelectric generator: a solid state device that converts heat flux (temperature differences) directly into electrical energy through a phenomenon called the Seebeck effect

1.8 CHAPTER 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 that we can make the world a better place with free power and we can help people to create power anywhere. With this product, life can be changed. Our product can not only charge phones but we can power lights and even fans.

1) Portable grills are portable:

Perhaps the biggest advantage that portable barbecue grills have versus traditional grills is that they can be moved around. Traditional grills are usually very big, cumbersome, and hard to move, but most portable grills should be less than several kg, and are easily folded up for efficient moving

CHAPTER 2

Prepared by Nidal Imran

LITERATURE REVIEW

2.1 INTRODUCTION

In this chapter, will be shown useful material used in bbq charger in the current markets. These three materials have its own advantages and disadvantages. Hence, all the characteristics of those materials will be compared to our own product which has its own specialties and benefits. Since past couple years, bbq are made from zinc and short term of material. In term of material and build up there's some major differences between traditional grill and modern grill.

In the dark ages, the bbq charger was very useless and does not function very well. Back in those days, bbq charger only can be used throughout charcoal and used in fixed place.

In now modern days, bbq charger development has been much more useful and so the materials used in it. Plus, the bbq nowadays is lighter and more compatible compare to what it used to be. So in this chapter, it will be explained about some materials that are used to make bbq charger and the comparison between those materials and our product material.

2.2 BBQ CHARGER

2.2.1 INTRODUCTION

Charcoal grills use either charcoal briquettes or natural lump charcoal as their fuel source. When burned, the charcoal will transform into embers radiating the heat necessary to cook food.

There is contention among grilling enthusiasts on what type of charcoal is best for grilling. Users of charcoal briquettes emphasize the uniformity in size, burn rate, heat creation, and quality exemplified by briquettes. Users of all-natural lump charcoal emphasize its subtle smoky aromas, high heat production, and the lack of binders and fillers often present in briquettes.

There are many different charcoal grill configurations. Grills can be square, round, or rectangular, some have lids while others do not, and they may or may not have a venting system for heat control. The majority of charcoal grills

2.2.2 CHARACTERISTICS OF BBQ CHARGER



2) Ideal for smaller groups or the individual

One of the major issues with traditional grills is that if you're only cooking for one person you draw a lot of unused energy, and you also waste gas on the on the empty part. This is a second benefit of having a portable barbecue grill.

Because portable grills are designed to be moved around they are quite a bit smaller and the cooking surfaces are perfect for a small party. They are also designed to preserve fuel in the way they use the gas or coals so you don't need to think about wasting anything on these types of grills.

3) They are less expensive

The third advantage portable BBQ grills have over larger grills is that they are less pricey. You can easily find it is more reliable and less cost due to the usage of material and the price of item been used on it compared to traditional bbq and electrical charger

4) More compatible and multipurpose

Due to generator applied, this bbq charger contain one more advantage which is this portable bbq charger can charge your phone or anything that can be charged using this bbq charger. This is because the bbq have generator inside to provide power to charge

2.3 METHODS OF MAKING BBQ CHARGER

After we have received all of our items, we decided to carry on with the project. There are a few things that needs to be done in order to finish our project. We have no other methods so we stick with one construction that we all agreed on. Our project is quite simple actually we only need to modify a few parts by doing a bit of soldering and wiring. Thermal glue is used to stick the generator the aluminium foil. We modify a bracket by putting a magnet behind it so we can stick it to the aluminium fire pit so it can be dismantled easily. On the bracket, we put the regulator by drilling and screwing it in place for better stick and durability as it will stay in place indefinitely. As for the fire pit, we have painted it black for a more exclusive colour and absorbs more heat from the surroundings thus creating an over the top powerband for top

performance and peak power. Aluminium foil is folded and molded in the shape of the fire pit so it can stick to the fire pit. After aluminium foil is secured, then we glue the generator to the foil by using the thermal glue. Then the final product is finished and ready to be used.

2.4 MATERIAL SELECTION

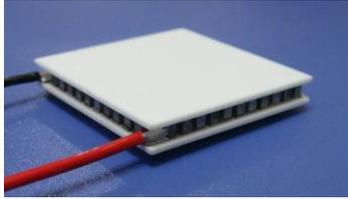
One of the most important of this project is material selection. For the base of the project we need something that can absorb heat and can dissipate heat as quick as possible. We have two items in mind which is aluminium and stainless steel. Both are easily found and both are durable. And for the electronics we have no choice but to use the product that is already on sale as it is the only option. So in this project we aim to keep the budget as tight as possible as we aim to market this product at a cheap price so that our product do not have to be so expensive.

1) Aluminium



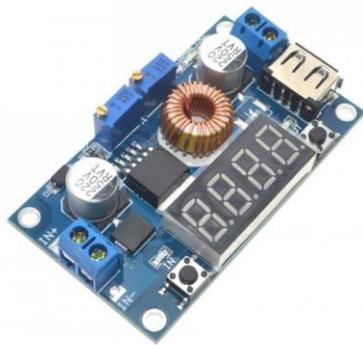
Why aluminium? It is because aluminium is best heat conductor and it can dissipate heat faster than stainless. In our research we have tested both of this materials and our research shows that aluminium is the best choice for our final year project. Aluminium is also easily found anywhere so we decided to use aluminium can for our project as it is the perfect fit for our criteria as we need something compact and portable. It is light, easy to carry anywhere and gets very hot and very cool fast enough. So aluminium was used as our base for the body of our project to handle all the heat from the burning object.

2) Thermoelectric generator



In generating electricity from heat, there are not many choices to pick from. Our first choice is a Sebeck Generator that creates a great amount of power but it is costly so we crossed it out of our selection. That leaves us no choice but to use the smaller thermoelectric generator. So our plan is to buy 9 of it and manage it in a series circuit so it can generate an amount of power similar to a Sebeck Generator but at a fraction of the price.

3) Regulator



To manage our power and to power the charged electronics we need a regulator to manage the power so electricity overflow can be avoided. In our project, we decided to use a DC-DC buck converter that equipped with a TFT display and a USB port to charge the electronics. It can be found at an electronic store everywhere and it is easily maintained when broken. A new one is also affordable and selling at a quite cheap price so maintenance is a small matter.

4) Thermal glue



In our project, thermal glue is important to stick the generator in place as it conducts heat and does not melt at high temperature.

5) Aluminium foil



Aluminium foil is used to cover the bottom part of the generator so we can cover the bottom part of the generator so it does not come in direct contact with to protect its body from breaking down and melting as it is sensitive electronic covered with plastic. So we will stick the generator to the aluminium foil as it can be dismantled from the aluminium fire pit for generator maintenance.

2.5 CHAPTER'S SUMMARY

As to conclude this chapter, literature review is important to showcase all the studies of materials and methods to enhance the knowledge on this project. Every thesis and others projects that are related to this multipurpose BBQ charger is really helpful especially for us to understand it fully.

After a lot of materials and methods were discussed and researches were done, the materials that are the most compatible for our project is aluminium. Due to its characters and advantages, meanwhile the methods that we decided to carry on is stick with one construction that we all agreed on. This is because of its easy to make and multipurpose for more than 1 usage.

CHAPTER 3

Prepared by Mohd Shafeeq Iddin

METHODOLOGY

3.1 INTRODUCTION

What is methodology? A methodology is a plan-of-attack, especially when that plan-of-attack is used repeatedly. This might be obvious, but the word methodology is related to the word method. In fact, a methodology is a system of methods followed consistently. Scientists, for example, use various methodologies as they perform experiments. It might seem like the world is nothing but chaos and disorder. But actually, sometimes there is a method to this madness. And sometimes there's a methodology.

In this chapter, there will be a lot of information about the process and journey throughout the making of our final project. There will be flow chart showing the process of us making the whole project. This flow chart will explain the processes we took. Next, is the Gantt chart, which will show the actual and planning throughout all the 13 weeks of our final year project journey.

Our methods are rather simple really. We chose the best for the production our product as we want the best for it. We start by following our flow chart and improvise along the. We did material selection carefully and we follow our timeline as much as possible and if not we improve along the way. Fabrication and material selection will be explained carefully as shown below.

3.2 FLOW CHART



3.3 MATERIAL SELECTION

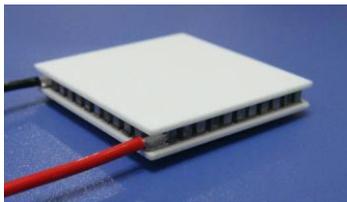
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➤ *MATERIAL PURCHASE*

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***

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➤ ***TEST RUN***

Test run is done to figure out our product strength and its peak power. So we burned coal and newspaper inside until the fire is hot enough. Our product lasted the whole burning process which we done in an hour and our product is still going strong. Screen on regulator showed that our products power is 6.5 volts. We charged a phone through the hour and the battery increased about 35% capacity. This proves that our product is very strong and lasting and easily marketable. With the shape of the product it also made a huge amount of heat.

➤ ***DATA ANALYSIS***

The process of evaluating data using analytical and logical reasoning to examine each component of data provided. This form of analysis is just one of the many steps that must be completed when conducting a research experiment. Data from the test run is gathered, reviewed and the analysed to form findings, discussions and conclusion. In this project the data collection is collected from the amount of power we created.

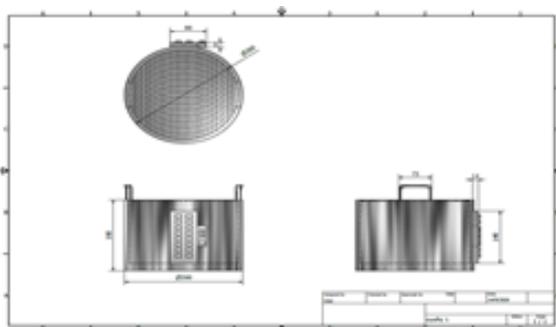
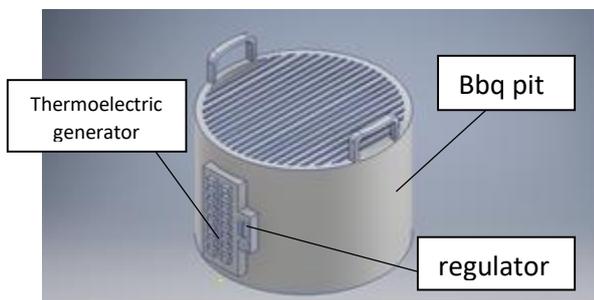
➤ **REPORT WRITING**

Report writing is one of the most crucial step in every project invented. It is important to make a report based on the project, test run and analysis so that future improvements nor expansion of knowledge could be done. Our report writing is based on the analysis and findings that we collected throughout this whole process of completing this project.

3.4 INTERVIEW AND RESEARCH

For our research we went to local camping spots and ask them about their grill. Their response are that their grills needs at least 30 minutes to be assembled and they need large space in their car for the grill. We done our research by using the internet and we found that our equipments are cheap and easily obtained. Even easily maintained.

3.5 PROJECT DESIGN



3.6 OPERATIONAL METHODOLOGY

➤ *SOLDERING*

We solder our products wire to make sure a stable connection and electricity does not short out and damaging the circuits

➤ *GLUEING*

We glue our generator by using our thermal glue to ensure that the generator is always intact, durable, longer lasting and to conduct electricity as thermal glue conducts electricity.

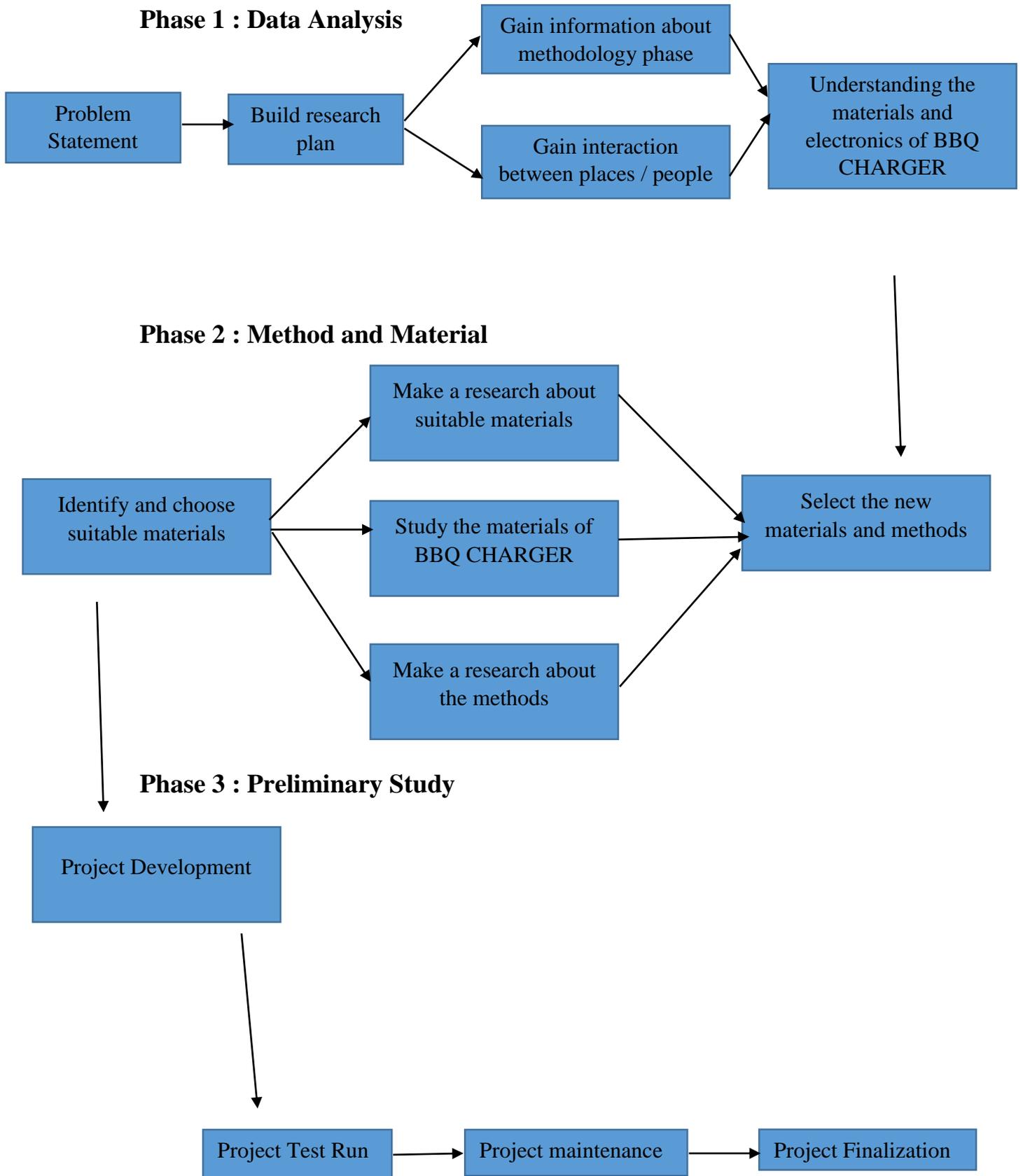
➤ *FABRICATION*

In order to get the desired shape of our product, we did a bit of grinding and hammering. Fabrication is not much needed as we only need to modify the shape a little bit to support the bracket holding the generator.

➤ *PAINTING*

Our product is painted to ensure the quality and durability of the product. The colour black is chosen as our product needs to absorb as much as heat as possible and the colour black is considered the colour of elegance. Our product is painted with 3 layers of paint starting with a white coating then painted with the colour and then finished off with a clear coat for the shine.

3.7 METHODOLOGY PHASE



3.7 BUDGET CALCULATION

No	Materials / Equipment	Amount	Price
1.	THERMOELECTRIC GENERATOR	9	RM80
2.	DC-DC USB LCD BULK CONVERTER REGULATOR	1	RM30
3.	ALUMINIUM CAN	1	RM10
4.	BRACKET AND HOLDER	1 each	RM9
5.	PAINT AND CLEAR COAT	1	RM20
Total			RM149

Table 3.7.1

CHAPTER 4

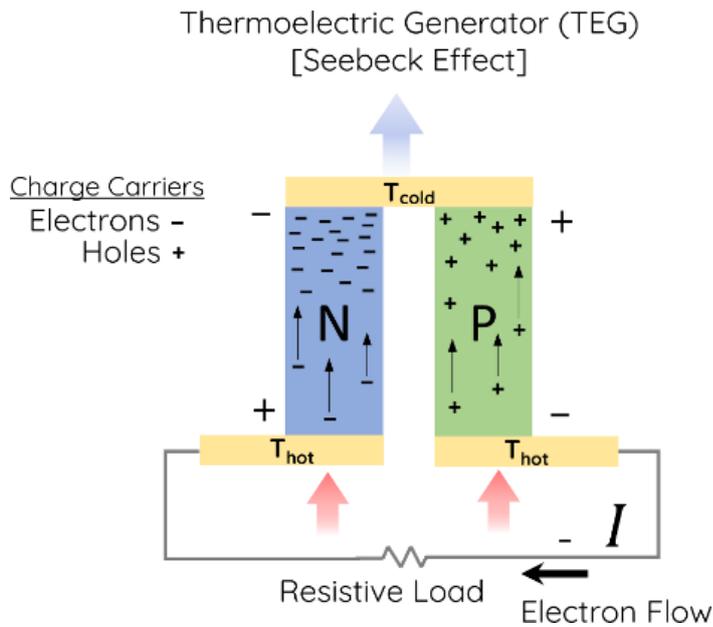
FINDINGS AND ANALYSIS

4.1 INTRODUCTION

This chapter combine data and analysis of the earth friendly and free power BBQ CHARGER and its materials calculations. This data and analysis are very important for this project to achieve the objectives and scope of the project. This data indicates the successful results of the materials testing. After getting all of this data, we analyse every single possible to make it perfect.

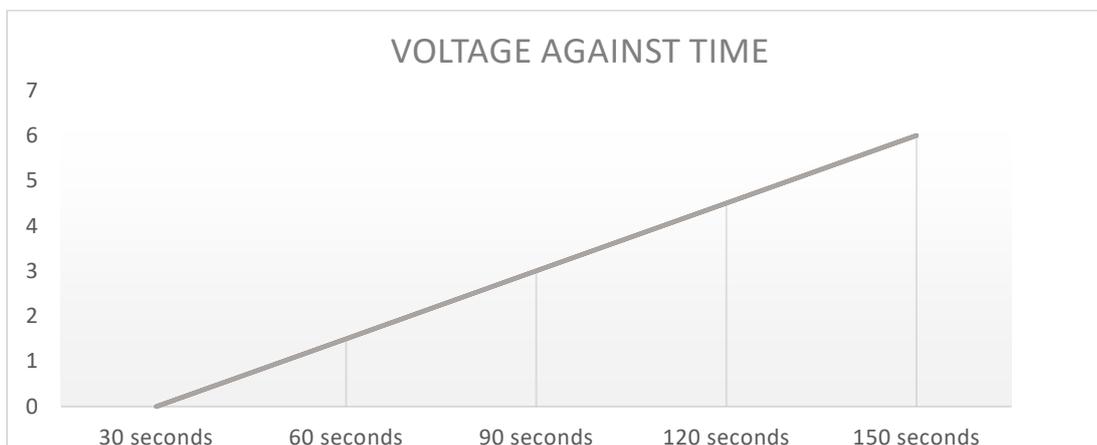
4.2 ANALYSIS

The given hypothesis, thermoelectric generators (TEG) are solid-state semiconductor devices that convert a temperature difference and heat flow into a useful DC power source. Thermoelectric generator semiconductor devices utilize the Seebeck effect to generate voltage. This generated voltage drives electrical current and produces useful power at a load. The Seebeck effect is a direct energy conversion of heat into a voltage potential. The Seebeck effect occurs due to the movement of charge carriers within the semiconductors. In doped n-type semiconductors, charge carriers are electrons and in doped p-type semiconductors, charge carriers are holes. Charge carriers diffuse away from the hot side of the semiconductor. This diffusion leads to a build-up of charge carriers at one end. This build-up of charge creates a voltage potential that is directly proportional to the temperature difference across the semiconductor. We tried it with a lighter and it turns out it actually works and we can accept the hypothesis. So we decided to make this into our project and see if not it will work out.



4.3 FINDINGS

By doing our research, we have found that the amount of power produce is directly proportional to the time it is being burnt with intervals of every 30 seconds. When the temperature gets hotter by the second the voltage increases to the maximum of 6.5 volts. Considering it is a machine running on renewable source and quite small in size, it is actually a good start and a good amount of power is created. So, for this product to work efficiently, we recommend that the pit is heated for 3 minutes and then it is good to go. We also find that our product works better at night as the Seebeck effect works more efficiently when the outer surface is cold. We don't say that our product is not efficient in the morning but our it is more efficient at night rather than when exposed to direct sunlight. But in both situations our products work well and we will continue to improve our product from time to time.



4.4 ADVANTAGE AND DISADVANTAGE

Every project has its own pros and cons, the pros will help the people and also the environment. However, the cons or the disadvantages must be improved or change for the future so that we could enhance the good and very efficient product that hardly to find disadvantage of the project.

BBQ CHARGER has a lot of advantages to help hikers and people living in rural areas and also environment. Besides of the advantages, this project also disadvantages that we must overcome it in the future for the better good.

4.5 CHAPTER'S SUMMARY

As a conclusion for this chapter, the analysis and findings have been made. This BBQ CHARGER has a lot of advantages however there are every cons to pros. Hence, the challenges are taken as a room for improvements and more developments for future generation and well as to enhance their knowledge on the project we carried out. Test run is carried out to determine the fullest potential of our product and it is proven that our product is very durable and tough and its only weakness is water contact.

CHAPTER 5

DISCUSSION, CONCLUSION AND UPGRADE PLAN

5.1 INTRODUCTION

This chapter explains about discussion, conclusion and upgrade plan all together for the project. From the data from the test run of the project, the analysis have been done. Hence, the discussion from all the results of test run and analysis will be explain in this chapter. Then, the conclusion will be made based on the discussion and upgrade plan that have been made.

5.2 DISCUSSION

Based on the data we collected our product is proved to be functioning and we have made 6.5 constant volts by burning coal and newspaper. Although 6.5 Is enough but there is room to make more power. we can fix this by using more generator or we can use more absorbent metal to produce more heat. Water damage can also be prevented with more tweak. We can use waterproof casing for the regulator and wiring but that is still being studied as waterproof casing will ruin the rate of electricity production as the cover will trap more heat and the generator will not be efficient if the top part of it is in contact with heat. So there is more room for improvement. The grill can also be improved by making new type of grills for the pit. We can create a pot bracket or even a pan holder so a variety of cooking utensils can be used rather than just grilling.

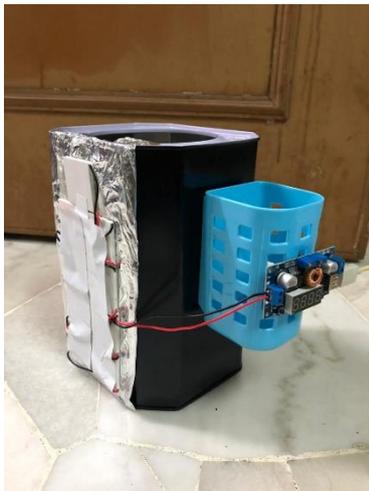
5.3 UPGRADE PLAN

For the future, we are planning to use a lighter material so it will be easier to carry around. Maybe a screen will be considered and features will be upgraded by using newer technologies such as arduino so that our product can offer much more features such as temperature information, voltage, ohms etc. For now we are only using basic chipset that will only tell the volts through the TFT screens. But in the future, with arduino and sensors, temperature controls are possible with high speed fans and sensors, resistance control is possible, safety features will

be improved and maximum power and efficiency can be obtained. With the right materials and technology, this project will be beacon of green energy and efficiency.

CONCLUSION

As for our project now, it isn't much to begin with, last minute plannings lack of materials and very poor workmanship but overall it works. A great start to a better future. Improvements can be made more and no regrets. Now, the real work starts.



Throughout our project, we are confident to say that this environment-friendly BBQ CHARGER gives a lot of benefits not to just humans, but also the environment . Plus, with all the convenient that BBQ CHARGER offers, it will help a lot especially in the price range and also people who likes outgoing activities and people living in rural areas where electricity is hard to come by. All the upgrades and improvements will be made so that this project could give more benefits and advantages. Hence, hope that this project could expand even more throughout all the upcoming generations.

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