



AUTO GRILL WITH SMOKE FILTER

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**DEPARTMENT OF MECHANICAL ENGINEERING
POLITEKNIK MUKAH**

SESSION: DECEMBER 2016

**AUTO GRILL WITH SMOKE FILTER AT POLITEKNIK MUKAH
SARAWAK**

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This report is submitted to the Department of Mechanical Engineering in partial fulfilment of the requirements for graduation Diploma in Mechanical Engineering

PERPUSTAKAAN POLITEKNIK MUKAH

PROJECT REPORT VERIFICATION

This report entitled "Auto Grill Satay" has been submitted and reviewed as to meet the conditions and requirements of project writing.

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ACKNOWLEDGEMENT

Alhamdulillah and greatest thanks to Allah Almighty for giving us strength while doing this project. Finally we have completed our Final Project report and research to fulfil one of the requirement for Diploma in Mechanical Engineering. We would like to take the opportunity to thank the people who have supported and help us to completing this Auto Grill Satay project. Without their generous supports and kind helps, it is difficult for us to finish this work. This project could not have been done without Mdm. Syarfadila Ezurida binti Shaari who not only served as our supervisor but also encouraged and challenged us throughout our academic program. Her patiently guided me through the study process, never accepting less than our best efforts. We also want to express our gratitude to our family, whose supports and gods have kept us going through the project. Also, biggest thanks go to friends and colleagues, who always gave moral support in our difficult time. During the slow and often interrupted evolution of this project we have accumulated many debt, only a proportion of which we have space to acknowledge here. Therefore, we were and are grateful to many people for the help either direct or indirect in writing this technical report.

Thank you,

ABSTRACT

The "Auto Grill with Smoke Filter" is designed to be able to grill satay automatically. Not limited to Satay, this grill can also be used to grill various types of barbecued skewers. In addition, the grill is equipped with smoke filter for the smoke coming that was released due to combustion when grilling. Smoke filter for the grill has 5 parts filter consists of 3 parts that have water and 2 parts again have dry filter. By using water as a filter, all the dirt on the burnt smoke will be left in the air filter, right after the smoke will go through a dry filter and trap impurities that still left in the smoke even after it goes through the first filters. Through the data collected, it is proven that the dirt on the grilling smoke is indeed able to be cut down with its impurities. This grill also comes with a hose to suck all the smoke entrapped inside the cover and is channelled into the filter system. The smoke resulting from the grilling is guided in to the hose and through the smoke filter. In addition, the project "Auto Grill with Smoke Filter" also used a motor to automatically grill the skewers. This grill, measuring by 1.4m x 2.04m x 0.54m, is portable because it has the perfect size and the grill is also equipped with wheels move this grill anywhere easily. This grill will be using charcoal for its source of fire and can accommodate as many as 40 skewers to be roasted at the same time, the skewers will be held by a hole each is designed to suit every size of the food to be grilled fully depending on the user's requirement. In conclusion, the project "Auto Grill with Smoke Filter", is equipped with filters to reduce the emission of smoke into the air that one factor of air pollution and also reduced the energy wasted by the manpower as it is powered fully by motor.

ABSTRAK

Projek “Auto Grill Satay with Smoke Filter” ini direka khas untuk memanggang satay kerana alat pemanggang ini dapat memusingkan lidi pencucuk yang digunakan untuk satay secara automatic. Namun, alat pemanggang ini juga dapat digunakan untuk memanggang pelbagai jenis makanan berbeku yang menggunakan lidi pencucuk. Selain itu, alat pemanggang ini dilengkapi penapis asap yang keluar daripada hasil pembakaran ketika memanggang. Penapis asap bagi alat pemanggang ini mempunyai 5 bahagian penapis yang terdiri daripada 3 bahagian yang mempunyai air dan 2 bahagian lagi mempunyai penapis kering. Dengan menggunakan air sebagai penapis, semua kotoran yang ada pada asap pembakaran akan tertinggal pada penapis air tersebut setelah itu asap tersebut akan melalui penapis kering dan memerangkapkan kotoran yang masih ada pada asap tersebut. Melalui data yang diambil, kotoran pada asap pemanggang dapat dikurang setelah asap tersebut melalui penapis asap. Alat pemanggang ini juga dilengkapi hos untuk menyedut asap dan disalurkan kedalam penapis asap. Oleh yang demikian, asap yang terhasil daripada pemanggang dapat dikawal melalui hos dan melalui penapis asap daripada bebas ke udara. Selain itu, projek “Auto Grill With Smoke Filter” ini juga dilengkapi “Power Window Motor” untuk memusingkan lidi pencucuk secara automatic. Alat pemanggang ini berdimensi 1.4m x 2.04m x 0.54m. Oleh yang demikian, alat pemanggang ini boleh digunakan dan dibawa kemana sahaja kerana mempunyai dimensi yang sesuai dan alat pemanggang ini dilengkapi roda untuk memudahkan pengguna membawa alat pemanggang ini kemana sahaja. Alat pemanggang ini menggunakan arang untuk memanggang dan alat pemanggang ini mempunyai sebanyak 40 lubang dan memuatkan sebanyak 40 lidi pencucuk bagi setiap pemanggangan. Kesimpulannya, projek “Auto Grill with Smoke Filter” ini terdapat ciri-ciri ergonomik kerana dilengkapi motor untuk memusingkan lidi pencucuk bagi mengelakkan pembaziran tenaga kerja pengguna. Selain itu, alat pemanggang ini dilengkapi penapis asap bagi mengkurangkan pembebasan asap ke udara yang menjadi salah satu faktor terjadinya pencemaran udara.

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CHAPTER 1

INTRODUCTION

1.1. Synopsis

The project is called "Auto Grill with Smoke Filter" as the project is designed to focus on grilling satay, however it is open for other various food which has the same bamboo skewered. This grill used a motor as the key component to drive the pulley attached and rotate the skewers automatically using the belt installed. This grill also has a filter in the back, to filter the smoke fumes released when grilling the foods which has five stage of filters to fully ensure the smoke release will be free from impurities as well as the smell. This grill also has a build in vacuum to vacuum the fumes released through an installed hose into smoke filter and the impurities contained in the smoke will be left inside the filter which will reduced the content of impurities in the smoke. The material used for this innovative grill are mainly metal and aluminium. Aside from using a direct current, this grill can also can use a 12 volt battery to power up the skewers revolvers, therefore this tool can easily be used anywhere.

1.2. Problem Statement

Problems faced by consumers prior to this is that consumers often face the problem of grilling 'Satay' in larger number of quantities and it often takes a long time to grill it. Not only faced by time consuming grilling, consumers also have trouble in grill itself and usually requires a lot of manpower to keep the coal burning whilst keeping the temperature right in which will cook the 'Satay' as well as maintaining the coal's. the method used to grill these 'Satay' are by fanning the coal, thus resulting the combustion fumes to be released freely in the air hence will cause air pollution. In addition, the grilled 'Satay' often have scorched marks on its surface most likely due to negligence often made by the griller.

Even in this time of age, most consumers still prefer to grill 'Satay' manually, using charcoal and in open areas. This will not only produce pen aired smoke, the dust and splash of oil too can be considered as a possible pollution threats to the environment and users. Consumers who wished for a 'Satay' often resolved on buying them due to the time consuming of grilling the 'Satay' and the hassle of clean up for the griller and even the mess produced from the grilling. The time it took to light up the coal, keeping it burning and maintaining the temperature is too long compared to the time it's used for consumers to actually consume the 'Satay' itself. In addition, consumer who is a commercial users, uses a lot of energy to grill the 'Satay' due to the number of sticks sellers need to produce to fulfil their customer's request. There's also the energy used for flipping the satay constantly to avoid it from too burnt, the oil spatter and also fanning the embers of charcoal.

Grilling 'Satay' manually has a negative impact to customers as well as the environment due to the amount of smoke and dust released. It is a known fact that the dust and smoke from the grilling can and will affect human health mainly the lungs. The dirty smoke that release from grill that can cause damage globalisation such as green house. The smoke that throughout from the grill will produce bad smell that cause shirt smells.

1.3. OBJECTIVES.

- a) To create Auto Grill Satay
- b) To create Smoke Filter
- c) To guide the smoke released from the grilling
- d) To reduce the impurities from the grilling smoke

1.4. SCOPE.

- a) Using charcoal for grilling
- b) Using a motor to rotate the skewers automatically
- c) Size of the project 1.4m x 2.04m x 0.54m
- d) Can accommodate up to 15 to 25 skewers of barbecued according to user requirements
- e) Have Smoke Filter

CHAPTER 2

LITERATURE REVIEW

2.1 History of Grill.

Grill or roasting is a cooking method that uses dry heat, whether through open flames, oven or other heat sources. It usually results in caramelization or mallard browning on the surface of the food and it is considered as the addition of flavour. Meat and vegetables are mostly tubers and bulbs can be baked vegetables. The food that we grilled is good for health. Meat especially red meat, cooked in this way is known as roasts. Lastly, cost roasting it will be more economical depend from normal cooking.

2.2 Introduction of Grill.

The history of grilling begins shortly after the domestication of fire, some 500,000 years ago. The backyard ritual of grilling as we know it, though, is much more recent. Until well into the 1940s, grilling mostly happened at campsites and picnics. After World War II, as the middle class began to move to the suburbs, backyard grilling caught on, becoming all the rage by the 1950s. (FoodNetwork, 2011)

In suburban Chicago, George Stephen, a metalworker by trade and a tinkerer by habit, had grown frustrated with the flat, open brazier-style grills common at the time. Once he inherited controlling interest in the Weber Bros. Metal Spinning Co, a company best-known as a maker of harbor buoys, he decided the buoy needed some modification. He cut it along its equator, added a grate, used

the top as a lid and cut vents for controlling temperature. The Weber grill was born and backyard cooking has never been the same. (Network, 2011)

If man has been grilling since the Stone Age, he had to wait a good long time before he got his first taste of 'barbecue.' Just how long is a matter of debate, but the word's etymology has been traced via the Spanish ('barbacoa') to a similar word used by the Arawak people of the Caribbean to denote a wooden structure on which they roasted meat. (The Arawak's other contribution to the English language is the word 'cannibal'.) Only the sense of a wooden framework survived the word's transition to English; the context was lost. So, in the 17th century, you might use a 'barbecue' as shelving, or you might sleep on a 'barbecue' — but you definitely weren't cooking with one. (Network, 2011)

Like so many of the most recognizably "American" of foods and foodways — hot dogs, Thanksgiving dinners, even milk on breakfast cereals — barbecue goes back to 18th-century colonial America, specifically the settlements along the Southeastern seaboard. The direct descendant of that original American barbecue is Eastern Carolina-style pit barbecue, which traditionally starts with the whole hog and, after as many as fourteen hours over coals, culminates in a glorious mess of pulled pork doused with vinegar sauce and eaten on a hamburger bun, with coleslaw on the side. (Network, 2011)

2.3 Introduction of Auto Grill.

A commercial barbecue typically has a larger cooking capacity than traditional household grills, as well as featuring a variety of accessories for added versatility. End users of commercial barbecue grills include for-profit operations such as restaurants, caterers, food vendors and grilling operations at food fairs, golf tournaments and other charity events, as well as competition cookers. The category lends itself to originality, and many commercial barbecue grills feature designs unique to their respective manufacturer.

Commercial barbecue grills can be stationary or transportable. An example of a stationary grill is a built-in pit grill, for indoor or outdoor use. Construction

materials include bricks, mortar, concrete, tile and cast iron. Most commercial barbecue grills, however, are mobile, allowing the operator to take the grill wherever the job is. Transportable commercial barbecue grills can be units with removable legs, grills that fold, and grills mounted entirely on trailers. Trailer mounted commercial barbecue grills run from basic grill cook tops to pit barbecue grills and smokers, to specialized roasting units that cook whole chicken, ribs, corn and other vegetables.

2.4 Grill vs Auto Grill.

Users can also see the advantages and disadvantages compared to auto toaster oven manual. Usually design auto grill is large and difficult to carry compared with manual toaster is smaller and thus easier to car. Besides that, auto grills will be costly to maintain than in normal grills. Here too, we discuss the advantages of auto grills among them it will cook faster, meat cooked perfectly adequate, the infrared grill one types of auto grill reduces gas. Besides auto grills are also pleased at the clean compared to normal bake for auto grills habit does not use charcoal or hard burning. The improvements we made was to combine the two existing systems to build a project better quality of which took the kind of attractive design and simple at first carry to ordinary toaster is not user friendly because not everyone is skilled in grace, is now the auto grill everyone can bake itself. This prove improvement of common grill to grill auto is enhanced.

2.5 Existing product.

2.5.1 Gas grill (Autogrill).



Figure 2.1. Gas Grill (AutoGrill)

A single-burner propane gas grill that conforms to the cart grill design common among gas grills. Gas grills are available in sizes ranging from small, single steak grills up to large, industrial sized restaurant grills which are able to cook enough meat to feed a hundred or more people. The majority of gas grills follow the cart grill design concept: the grill unit itself is attached to a wheeled frame that holds the fuel tank. The wheeled frame may also support side tables and other features.

A meat item (whole chicken, beef roast, pork loin roast) is placed on a metal skewer that is rotated by an electric motor. Smaller cuts of meat can be grilled in this manner using a round metal basket that slips over the metal skewer. A small metal "smoker box" containing wood chips may be used on a gas grill to give a smoky flavour to the grilled foods. Although, barbecue purists would argue that to get a true smoky flavour (and smoke ring) the user has to cook low and slow, indirectly and using wood or charcoal. Gas grills are difficult to maintain at the low temperatures required (~225-250 °F), especially for extended periods.

2.5.2 Infrared Grill

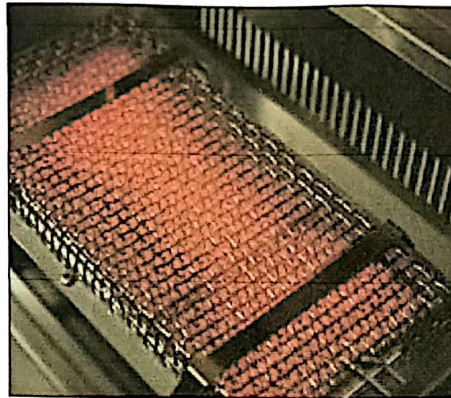


Figure 2.2. Infrared Grill

Infrared grills work by igniting propane or natural gas to heat a ceramic tile, causing it to emit infrared radiation by which the food is cooked. The thermal radiation is generated when heat from the movement of charged particles within atoms is converted to electromagnetic radiation in the infrared heat frequency range. The benefits are that heat is uniformly distributed across the cooking surface and that temperatures reach over 500 °C (900 °F), allowing users to sear items quickly.

Infrared cooking is different from other forms of grilling, which uses hot air to cook the food. Instead of heating the air, infrared radiation heats the food directly. The benefits of this are a reduction in pre-heat time and less drying of the food. Grilling enthusiasts claim food cooked on an infrared grill tastes similar to food from char-grills. Proponents say that food cooked on infrared grills seems juicier. Also, infrared grills have the advantages of instant ignition, better heat control, and a uniform heat source. This technology was previously patented, but the patents expired in 2000 and more companies have started offering infrared grills at lower prices.

2.5.3 Kettle grills (Manual Grill)



Figure 2.3. Kettle Grills (Manual grill)

The kettle grill is considered the classic American grill design. The original and often-copied Weber kettle grill was invented in 1951 by George Stephen. It has remained one of the most commercially successful charcoal grill designs to date. Smaller and more portable versions exist, such as the Weber Smokey Joe. The kettle grill is composed of a lid, cooking grid, charcoal grid, lower chamber, venting system, and legs. Some models include an ash catcher pan and wheels.

The lower chamber that holds the charcoal is shaped like a kettle, giving the grill its name. The key to the kettle grill's cooking abilities is its shape. The kettle design distributes heat more evenly. When the lid is placed on the grill, it prevents flare-ups from dripping grease, and allows heat to circulate around the food as it cooks. It also holds in flavour-enhancing smoke produced by the dripping grease or from smoking wood added to the charcoal fire.

2.5.4 Charcoal Grill



Figure 2.4. Charcoal grill

Charcoal grills use either charcoal briquettes or all-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 the reasons they prefer it: subtle smoky aromas, high heat production, and lack of binders and fillers often present in briquettes.

There are many different charcoal grill configurations. Some grills are square, round, or rectangular, some have lids while others do not, and some may or may not have a venting system for heat control.

2.6 Types of Filter.

2.6.1 Air Filter

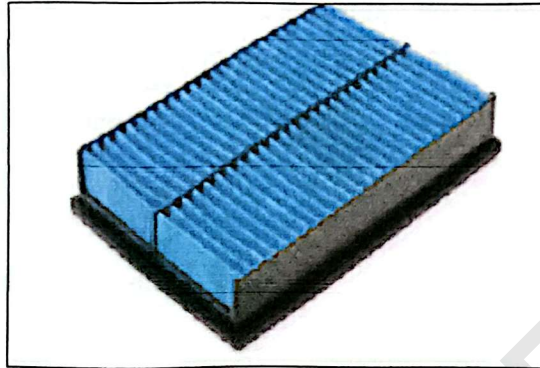


Figure 2.5. Air Filter

Air Filters are systems or components that remove particulates from air as it passed through filtering elements and can be complete systems or replacement elements alone. Key specifications include the intended application, physical size, filter type, filter media, and air flow rate. Air filters are used in systems that require particulate-free air. They used also clean the air before exhausting it. An air filter systems usually consists of an element and the housing that contains the elements.

2.6.2 Fluid Filter

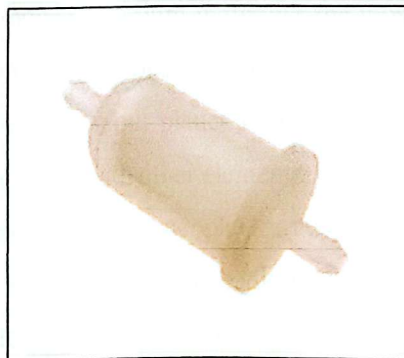


Figure 2.6. Fluid Filter

Fluid Filter are devices or systems that remove unwanted substance from fluids as they pass through the filtering elements. They may include complete systems or replacement elements alone. Key specifications include the intended application, filter type, filter media, filtrate and filtrand, particulate size, and flow rate. Fluid filters are used primarily in any system that requires the fluid to be free of particulates or debris, either to protect the equipment or to clean the fluid before it is discharged into environments.

2.7 Type of Material Used.

2.7.1 Aluminium

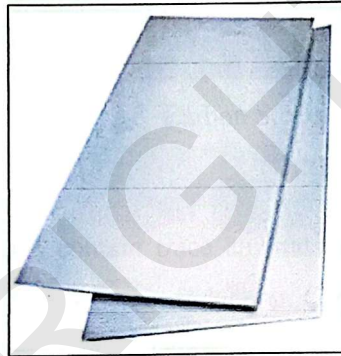


Figure 2.7. Aluminium

Aluminium is a silvery-white metal, the 13 element in the periodic table. One surprising fact about aluminium is that it's the most widespread metal on Earth, making up more than 8% of the Earth's core mass. It's also the third most common chemical element on our planet after oxygen and silicon. At the same time, because it easily binds with other elements, pure aluminium does not occur in nature. This is the reason that people learned about it relatively recently. Formally aluminium was produced for the first time in 1824 and it took people another fifty years to learn to produce it on an industrial scale. The most common form of aluminium found in nature is aluminium sulphates. These are minerals that combine two sulphuric acids: one based on an alkaline metal (lithium, sodium, potassium rubidium or caesium) and one based on a metal

from the third group of the periodic table, primarily aluminium. Aluminium sulphates are used to this day to clean water, for cooking, in medicine, in cosmetology, in the chemical industry and in other sectors.

2.7.2 Steels.

a) Carbon Steels.

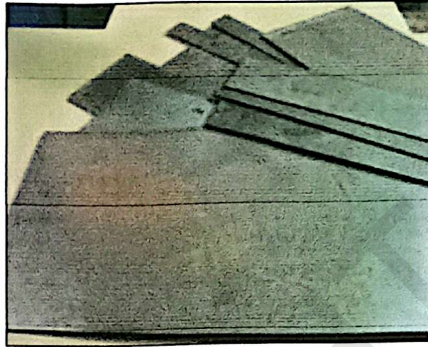


Figure 2.8. Carbon Steels

Carbon steels contain trace amounts of alloying elements and account for 90% of total steel production. Carbon steels can be further categorized into three groups depending on their carbon content:

- *Low Carbon Steels/Mild Steels* contain up to 0.3% carbon.
- *Medium Carbon Steels* contain 0.3 – 0.6% carbon.
- *High Carbon Steels* contain more than 0.6% carbon.

b) Stainless Steels:

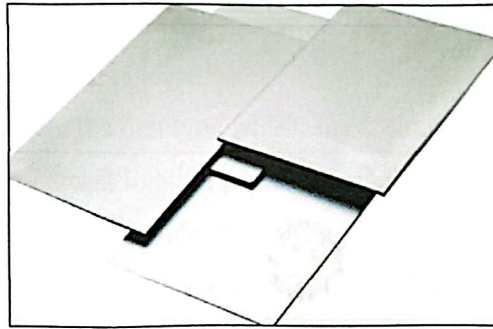


Figure 2.9. Stainless Steels

Stainless steels generally contain between 10-20% chromium as the main alloying element and are valued for high corrosion resistance. With over 11% chromium, steel is about 200 times more resistant to corrosion than mild steel.

2.8 Part Used

2.8.1 DC Motor

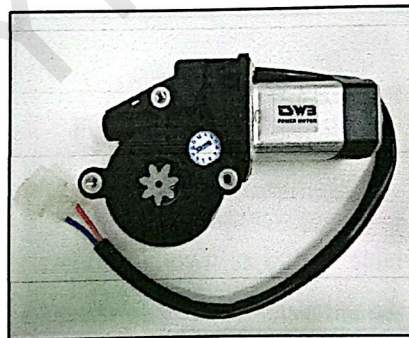


Figure 2.10. DC Motor Power Window

A DC motor is any of a class of electrical machines that converts direct current electrical power into mechanical power. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically

change the direction of current flow in part of the motor. Most types produce rotary motion; a linear motor directly produces force and motion in a straight line.

DC motors were the first type widely used, since they could be powered from existing direct-current lighting power distribution systems. A DC motor's speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight motor used for portable power tools and appliances. Larger DC motors are used in propulsion of electric vehicles, elevator and hoists, or in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

2.8.2 Heat Shield.

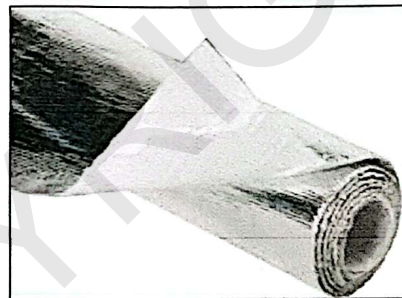


Figure 2.11. Heat Shield

Heat shields are also known as burner shields, heat plates, heat tents, radiation shields, or heat angles. They serve the same purpose as a rock grate and rock, protecting the burner from corrosive meat drippings and dispersing heat. They are more common in newer grills. Heat shields are lighter, easier to replace and harbour less bacteria than rocks. (Parts, 2014)

2.8.3 Cover.

A barbecue cover is a textile product specially designed to fit over a grill so as to protect it from outdoor elements such as sun, wind, rain and snow, and outdoor contaminants such as dust, pollution, and bird droppings. Barbecue covers are commonly made with a vinyl outer shell and a heat resistant inner lining, as well as adjustable straps to secure the cover in windy conditions. The cover may have a polyester surface, often with polyurethane coating on the outer surface, with polyvinyl chloride liner.

CHAPTER 3

METHODOLOGY

3.1 Introduction.

Methodology is the systematic, theoretical analysis of the methods applied to a field of study, or the theoretical analysis of the body of methods and principles associated with a branch of knowledge. It typically, encompasses concepts such as paradigm, theoretical model, phases and quantitative or qualitative techniques.

A methodology does not set out to provide solutions but offers the theoretical underpinning for understanding which method, set of methods or so called “best practices” can be applied to a specific case. In other word, methodology can be defined as the process used to collect information and data for the purpose of making business decisions. The Methodology may include publication research, interview, survey and other research techniques, and could include both present and historical information.

The method of studies can be divided into several levels. First of all, a first meeting were carried out to identify topic as been told by other lecturer and the topic have been informed earlier.

3.2 Project Flow.

This section will explain on how this project flow or the steps involved in finalizing the project.

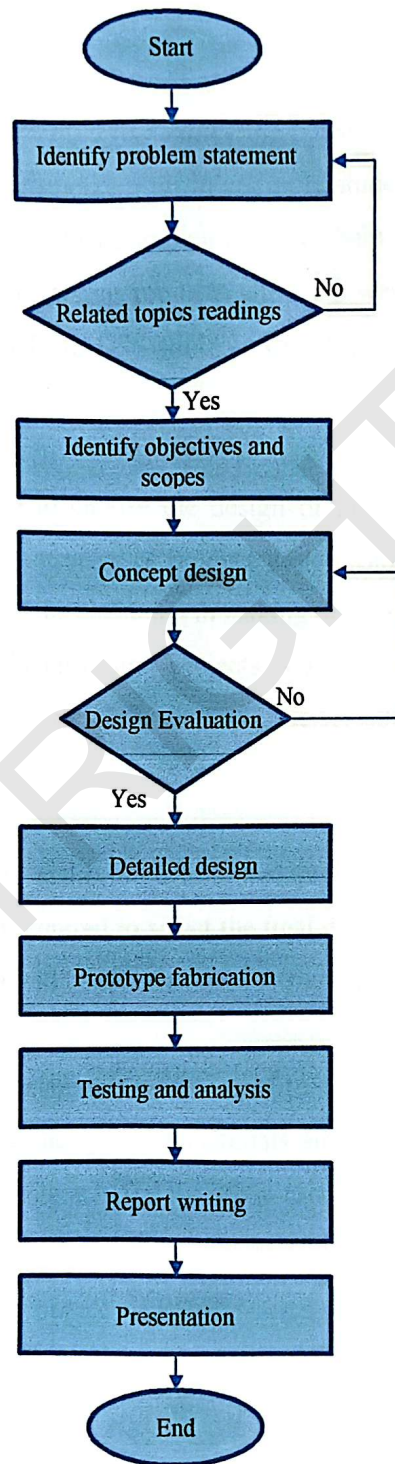


Figure 3.1. Project Flow

In the literature review, students explained about the history and background of the original project, which is already available in the market nowadays. Students have been studying about the types of grills available in the market and at the same time students can also learn about the parts that are important on the grill already existing and making comparisons between types grill commercial nowadays.

Students are required to identify the objectives and scope to solve the problems faced by consumers grill. In addition, students are required to select the size of the projects to be implemented to help students make informed decisions when implementing projects. Students were also asked to identify objectives more closely to help students to achieve the goals of the project objectives.

Students were to choose the design of projects that will be built to facilitate the selection process of product design. Students are asked to make some sketches early as the beginning in making the selection of the design. After making the initial sketch design projects, students are required to select an appropriate project design of all aspects in the selection of appropriate project design.

After students make more informed project design and selecting the design project, learn required to select the final design of the project. The final design of the project will be taken as final design before starting the project.

In identifying materials will be used to create design projects, students are required to study the types of materials and material durability in every aspect to select a suitable material for use in carrying out the project.

3.2 Design Concept Plan

3.2.1 Functional Analysis.

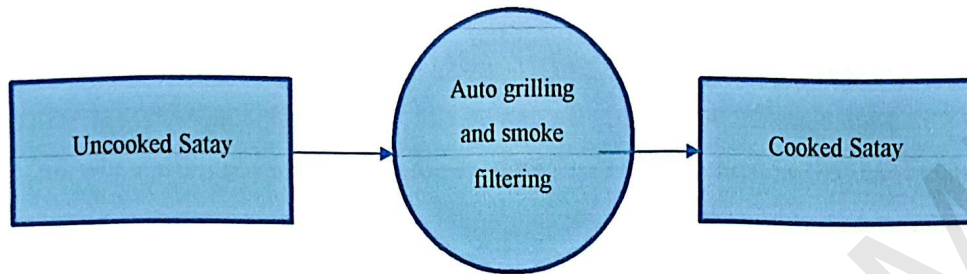


Figure 3.2. Functional Analysis

Based on figure 3.2 above, student want to create satay grills that can reduce the smoke when using the grill. Beside, same student have doing smoke filter but did not function well because they not use vacuum to attack the smoke. Next, producing design suitable as a grill capable of grill satay and can reduce emissions by using the right methods.

3.3 Design Process

Based on figure 3.3 below, auto grill can reduce the smoke produced when using the grill. The main function of creating grill with smoke filters is to grill without using manpower and can save users time to grill in terms of turning coals and grilling satay in an automatic using the motor. Additional functions on the grill that is created is a smoke filter that attempts to reduce the release smoke into the air when grilling. Finally, with the existing functions on the grill that has become better at innovation and additional functions that reduce the smoke is created, this has made a satay grill, which can grilling the right way and can reduce the release smoke when grilling.

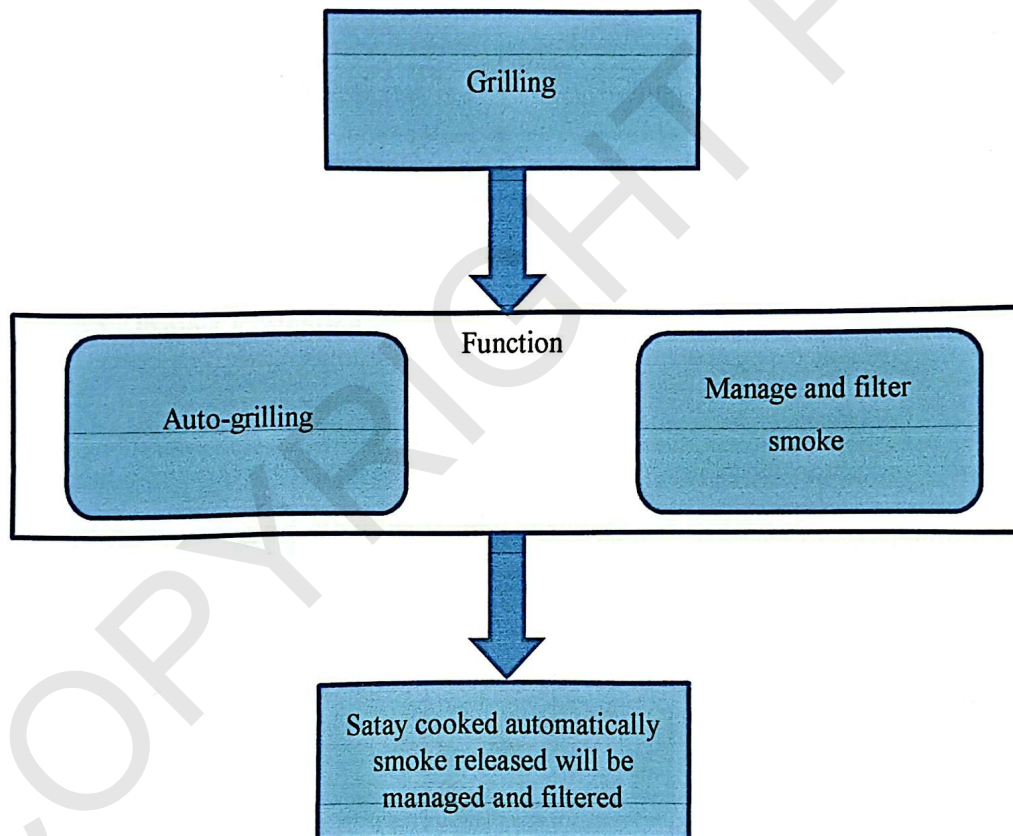
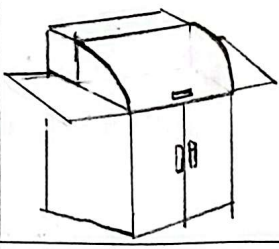
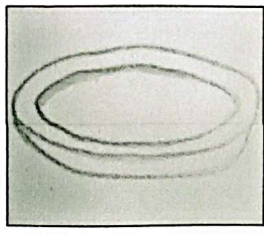
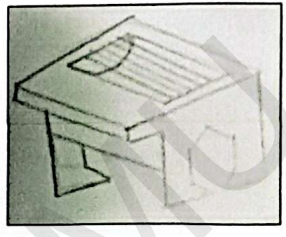


Figure 3.3. Design Process

3.4 Concept Generation.

Table 3.1 Concept Generation

Concept	Design 1	Design 2	Design 3
Main Body			
Power Supply	Current	Battery	Solar
Energy Supply	Charcoal	Gas	Electric
Gear	Normal gear	Belting	Chaining Gear
Material	Aluminium	Steel	My Steel

3.5 Project Evaluation.

Table 3.2 Project Evaluation

	Cost	Reusable	Uniform geometry	Self-adhering	Clean Up Needed	Model Resilience	Testability	Total
Main Body	2	1	1	2	1	1	3	11
Power Supply	3	2	2	2	2	1	4	16
Energy Supply	1	2	4	1	3	2	1	14
Gear	4	2	4	2	4	4	2	20
Material	1	1	3	1	3	3	1	13

Table 3.3 Project Evaluation Remarks

4	3	2	1
Best			Worst

3.6 Selecting Project Design

The next stage after selecting the right material is selecting the right design use for this project. Before we start this project, we already select design from various design that we create to choose which one is better. The factor that we use for the project design is the safety for the user, cost that is not too expensive and referring to our project. Design that we use is the design that referring this factor and will finish within the time period.



Figure 3.4 Front view of Auto Grill with Smoke Filter



Figure 3.5 Side view of Auto Grill with Smoke Filter

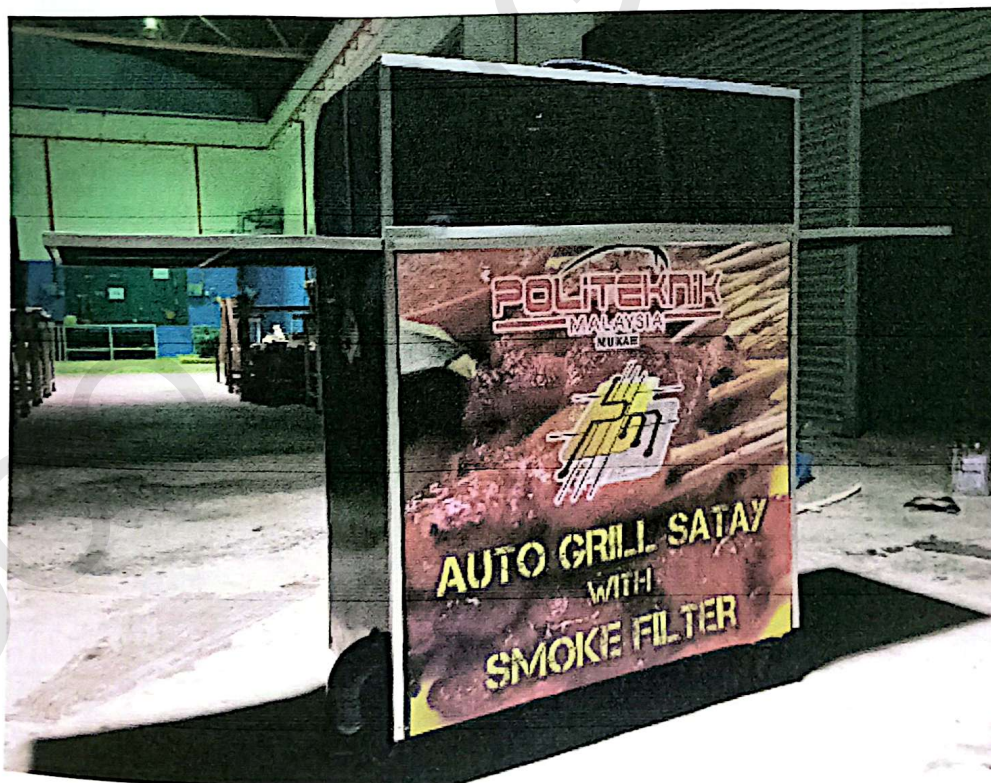


Figure 3.6 Back view of Auto Grill with Smoke Filter

3.7 Budget Estimation

3.7.1 Budget for Items

Table 3.4 Budget for Items

No	Material	Quantity	Unit Price(RM)	Total (RM)
1	Hollow bar (inch)	12	RM 20-60/m	RM300
2	Motor Power window	1	RM 30-90	RM90
3	Vacuum	1	RM 60-100	RM100
4	Wheels 4"	4	RM 10-15	RM60
5	Flexible hose 1 inch	4 meter	RM6/meter	RM24
6	Perspex 3mm	1	RM20/sheet	RM20
7	Belting	1	RM 40-60	RM60
8	Adaptor	1	RM 70-100	RM100
9	Car battery 12v	1	RM 60-80	RM80
10	Bearing	10	RM 5	RM100
11	Banner	1	Rm50-70	RM70
12	Spray	4	Rm10	RM40
				RM934

3.7.2 Budget for Materials Used

Table 3.5 Budget for Materials

No.	Material	Quantity	Unit Price(RM)	Total (RM)
1	Aluminium2-3mm	1 m ²	RM 30-100/ m ²	100
2	Steel 2-3mm	1 m ²	RM 30-100/ m ²	100
3	Copper ½ - 1 inch	3 m	RM 10/ m	30
				230

3.8 Fabrication Process

The Auto grill with Smoke filter can be functioned for barbeque. This auto grill with smoke filter working by rolled the skewer of satay. The auto grill with smoke filter can rolled only 15 skewers of satay. This auto grill can only working for 1 hour. Besides, this auto grill are built by hollow bar for the frame body. For main or major parts, there are power window motor, smoke filter, and vacuum and rotary chain pulley to make this auto grill with smoke filter perfect functioning. This auto grill can also attached by tyre for make this auto grill portable. This auto grill can be moved from one place to another place.

3.8.1 Introduction

Project fabrication is working step or working flow while doing the work in order to finish one project, where the working flow must have the following step depend on the characteristic of the project. The following step is the process that is needed for this project:

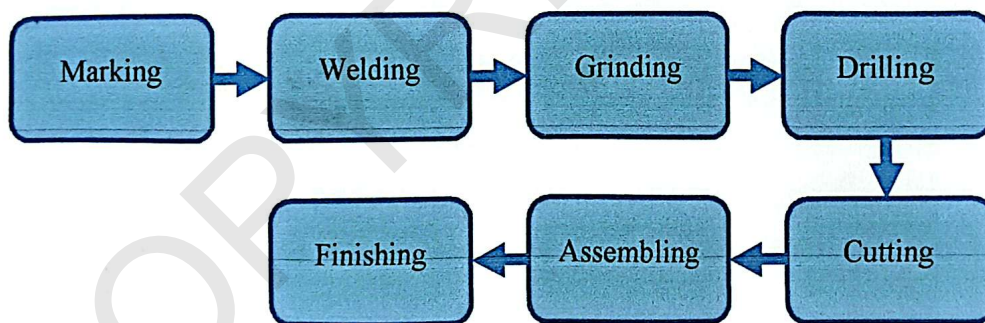


Figure 3.6 Project Fabrication Flow

To ensure that the quality of our project has reached or not, we created a system such as strategic planning and quality control for each stage of work. With the strategic flow system, project will achieve the desired quality. The importance of the fabrication process is done so that there are no irregularities in the project and the quality can be prevented or repaired in the event of damage

or irregularities on the quality of the project in order to meet the desired standard at the end of the creation of this project.

3.8.2 Marking and labelling process

Fabrication process of this project started with the first step which is measuring process. Measuring process is a process where correct measurements required marked on to the material before cutting it to a desired length. After done measuring the desired length, labelling process must be done before proceed with the next step. Measuring and labelling the project material is important so that there will be no error and mistake can be avoid. The following are the equipment for this process:

- L ruler
- Measuring tape
- Steel chalk
- Long ruler

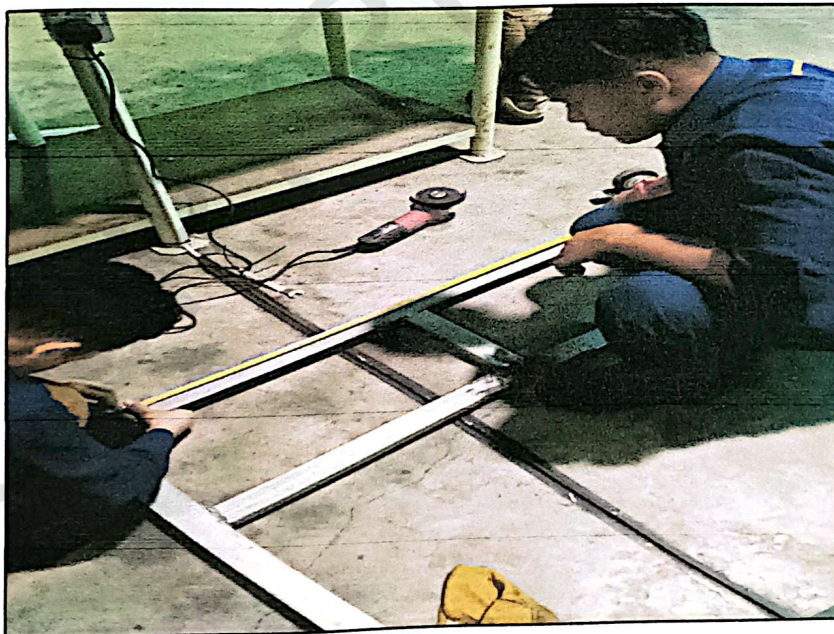


Figure 3.7 Marking and Labelling Process

3.8.3 Joining process (Welding)

Welding is a fabrication that joins materials, usually metals or thermoplastics, by causing fusion, which is distinct from lower temperature metal joining technique. To join some of the components together, welding process is applied to the joint is a must. There is two type of welding method that is applied in order to accomplish the joining process. There are stick welding which also known as Shielded – Arc Welding (SMAW) and Metal Inert Gas welding (MIG). SMAW is the 26 electric arc generate by touching the tip of coated electrode against the work piece and then with drawing it quickly to a distance sufficient to maintain the arc. It same goes to MIG, but this welding method do not use electrode, it use metal wire for the medium for joining. This method is used for joining the blade to the shaft of machine. This joining process also used to join some GI pipe for the frame of project to ensure the stabilization of the sand mixer. Some of the treat of the pipe are not fit to each other so that used welding method to make sure it joined together.

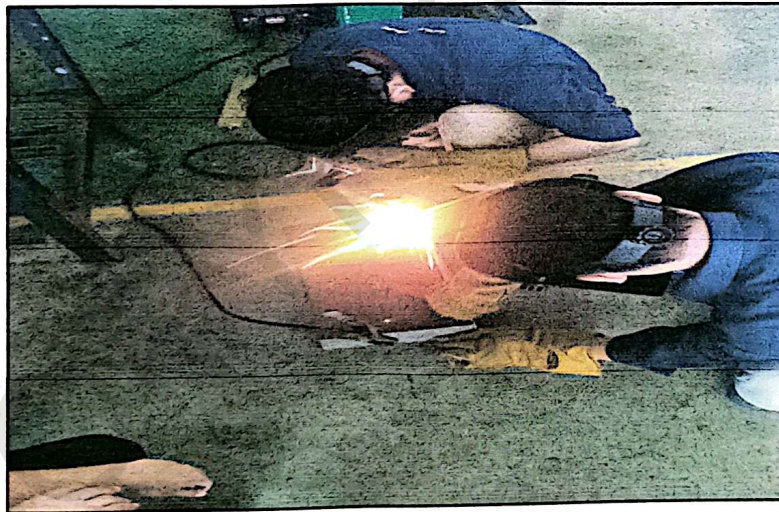


Figure 3.8 Joining Process (Welding)

3.8.4 Grinding process

A grinding machine is any of various power tools or machine tools used for grinding which is a type of machining using an abrasive wheel as the cutting tool. Each grain of abrasive on the wheel's surface cuts a small chip from the workpiece via shear deformation. This method used for grind the welding part at the shaft so that it more clean and smooth.



Figure 3.9 Grinding Process

3.8.5 Drilling process

Drill is a tool or machine with a rotating cutting tip or reciprocating hammer or chisel that is used for making holes, and drilling process is a process or method to make a holes on some work piece or metal using a drilling cutter. This method used for make holes at some GI pipe to connect the frame of motor engine with barrel. Barrel also drilled at the side of the barrel to make some holes so that the frame of the barrel can be install to the barrel. The holes for put the shaft of the motor to the bottom of the barrel was drilled in 3.4 cm measurement. The angle bar also used drilling method to connect each other for easy the joining process of the motor frame.



Figure 3.10 Drilling Process

3.8.6 Cutting process

Cutting process using a power tool grinder and power shear machine to cut some component of the sand mixer such as GI pipe, metal plate, cylindrical bar, angle bar and hollow bar.

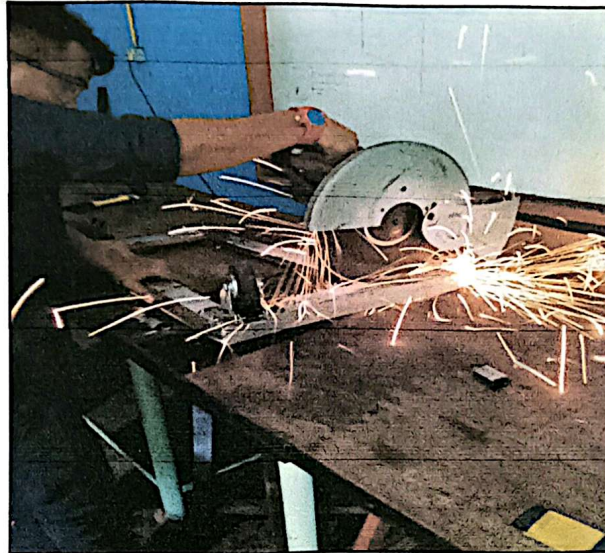


Figure 3.11 Cutting Process

3.8.7 Assembling process

Assembling process is a process where the assembling of a small part of the project to a larger part of the project. This process must be done on a plain surface and with the help of a label to the part so that small error can be avoided and great precision can be obtain. The following are the equipment that are require to assembling process before proceed to the next process.

- a) Angle L ruler - to measure a 90 degree in angle to a certain part that need to be assembly for example the body frame.
- b) Measuring tape - to measure a certain length to avoid error such as the material is too long or short that need to be measure at all part.
- c) Water scale - to measure the part is balance with the ground surface this apply to the body frame.

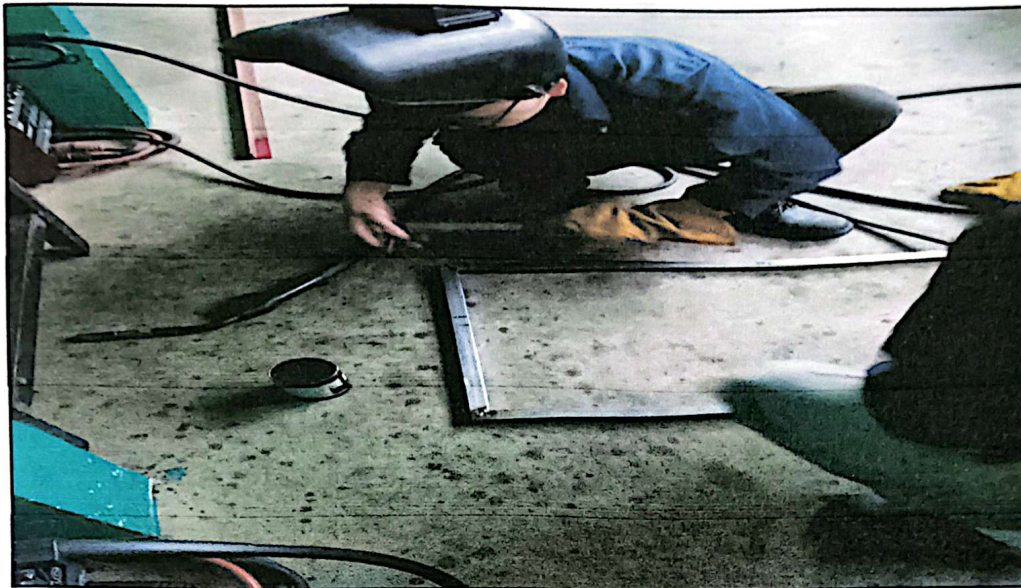


Figure 3.12 Assembling the body fram

3.8.8 Finished body frame

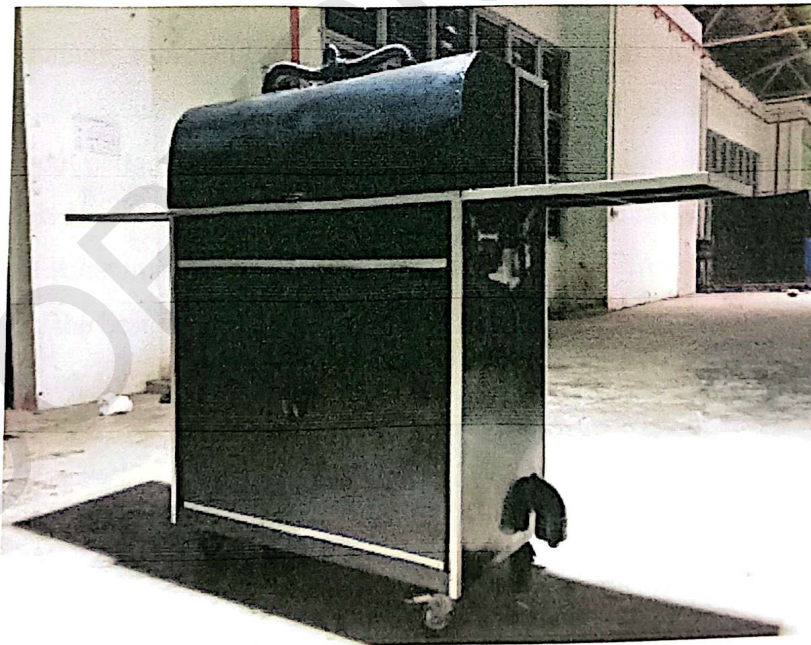


Figure 3.12. Finished body frame

CHAPTER 4

RESULT AND DISCUSSION

4.1 Introduction

This chapter discusses the results of the analysis and the findings of the investigate. The investigation was conducted to study about our project that was “Auto grill with smoke filters”.

4.2 Purpose of analysis

The purpose of analysis is to show the audience about recent findings obtained from research. To convince the audience of the importance of the new findings, especially when formerly a controversial and inaccurate. For the purposes of analysis. Analysis with clear, detailed and accurate information about certain issues, comments, findings and related proposals should be done based on studies or research. The importance of the study for this project is to get some improvements to the performance of transformer based on core design and the best materials to design the best core. This will help to reduce the losses of the transformer core and improve the efficiency of the transformer. In addition, to find changes in the use of the material in the design of the transformer and to find alternative ways to replace the transformer Design materials materials not provided incase. More or less the economy should focus on as a basic factor for the design of transformer core. Now, people are looking for low-cost transformer but have high performance and minimal maintenance requirements.

4.3 Conducting Reference

Conducting reference is done through reading resources, research, theory and via Wikipedia and web. As the addition, the opinion of those that experience in the fields of engineering is also important to ensure the project can be done and successfully operation as our targets. Through his analysis and study of the project, there are downsiders as well benefits on the following projects.

4.4 Procedures

1. Set up smoke filter with moist cotton and perfume in each box.
2. Make sure the vacuum and auto grill is function.
3. Put the embered charcoal inside places available.
4. Switch on vacuum and make sure its functioned.
5. Put the satay inside the slot of the auto grill set.
6. Switch on auto grill set dan make sure functioned.
7. Close the lid of the auto grill set, so the smoke will not release in the air.
8. Finally, wait until the satay are cooked.

4.5 Analysis and data

4.5.1 Time Taken to Complete Satay Grilling

Project has been completed as new products. The test run had been carried out to our projects. There is the data that had been collected during the test run completion.

Table 4.1 Time taken to grill satay

Grill satay process	Time taken to grill satay	
	Manual grill	Auto grill
Time to grill satay	15 minute	10 minute

1. Manual grill

- The time taken that has been taken with the time to grill satay.

2. Auto grill

- The time taken that has been took with the time to grill satay.

2.5.2 Results From Test Run

Table 4.2 Result from test run

Test run	Result and finding
Test run 1	1.Skewer cannot rotate because of belting loose 2.motor power window broken 3.smoke filter flow leaking
Test run 2	1.test run 2 was successfully when grilling satay

2.5.3 Problem Faced

For the first problem, we found found out the motor is loose. So, we bought a new motor to rotate the skewer. We found out that the motor power window is broken.

Next problem is, the position of the belting that used to rotate the skewer is not fixed. This is because of the nut that we use to fixed it to the belting is loose and the impact of the belting on the base cause the belting loose. To avoid the belting from loose, we install bearing as a guide to ensure the belting to rotate the skewer.

2.5.4 Advantages and weakness of Project

Table 4.3 Advantages and Disadvantages of Auto Grill with Smoke Filter

Advantages	Disadvantages
Reduce burden for the user	Only can 25 skewer
Reduce risk of injury	Requires constant maintenance for the filter
Can grill satay with same time	

4.6 Discussion

In our discussion group to launch a project to be desired. We begin with a discussion of the measures required for “Auto Grill Satay with Smoke Filters” and created design for the shape required by our colleagues to set up the project.

After obtaining the size and shape of the project, our group began to think about the materials to be used to make projects look like of the desired shape. In addition, we also offer suggestions to make the project become automatic by using a motor that can turn the skewers of satay during grilling occurs.

Furthermore, we also participated in discussing the smoke filter to the shape of the smoke they filter. besides, we also think of ways when the smoke released by the smoke filter the smoke will be filtered. We also need to provide the materials that are used to filter the smoke fumes filtering “Auto Satay Grill with the Smoke Filter”.

Finally, we also discuss ways to guide the smoke emitted during grilling by using a fan. Smoke will flow with the tide of the route to be discussed through the smoke filter. after that, we also think and expect further capital required for a project that required them.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter will present the findings of studies that have been reported and conformance to answer the objective that have been set. Discussions will take place with compare result meet the objectives of the study hypothesis. Through discussion, conclusions about the study and obtained through a number of proposals can be developed for management action in mechanical department and recommendation the study will come especially in related fields.

5.2 Conclusion

In conclusion, for our project that has been done by my group members was successfull according with our planning. The project title was "Auto Grill Satay with Smoke Filter". There have three type of objectives that contain in our project such as to create Auto grill satay, to create smoke filter and to guide smoke that has been release from the grilling.

Firstly, we have done doing to create Auto grill satay by using with our own design. For example, we create the design by using sketch and inventor softway and also provide the design with our own dimension. Then, we also used power window motor to make the skewers for our satay movement become automatic in rotated.

Secondly, we also have done in create the smoke filter by using perspex to make the smoke filter in shaping by according to our own design. In our smoke filter also contain water, span and perfume to filtered the smoke that release from the grilling. By using that contain in the smoke filter will decrease some dirty smoke that release from the grilling.

Third, we also thinking some way to guide the smoke that release from the grilling. For example, we create some way of flow of smoke release when the Auto Grill Satay has been used.

Lastly, we also have some knowledge in our project to think the best way to prevent or to save our environment from pollution. Then, we also have higher innovation to make some new thing beyond of our ability and our project done successful by my group members shows a collaboration in the team.

5.3 Recommendations

Our view in terms suggestion, if given a chance and more time we want to add more improvement in the project by adding more quantity of skewers. In addition, we also need to improve our skills in making some innovation for something more better.

In addition, auto grill can also be converted to manual grill. Between good reason grill manual is to save electricity usage and also can save costs in terms of consumption spending to pay the costs of electricity that will be used during grilling. In addition, can also grilling satay in greater quantity compare to "Auto Grill satay with smoke filter" made or designed by our groups.

The advantages of using auto grill also ease the burden and stress faced by consumers when making a grilling in large quantities. If using a manual grill can affect the health of consumers in terms of ergonomics.

Finally, smoke filter designed by us also need to be repaired or recovered to improve the smoke filter by giving more granular filtering to further reduce the emission of fumes released during grilling.

5.4 Summary

The "Auto Grill with Smoke Filter" is designed to grilling satay because it can rotated skewers in automatic. Furthermore, the Auto grill was equipped filter the smoke coming out from the grilling by using water. By using water as a filter, all the dirty come from combustion smoke will linger in the air filter after the smoke is going through a dry filter and trap impurities that still exist in the smoke from that. Moreover, the Auto grill also have a hose to guide smoke and channeled into the filter smoke. The smoke resulting from the toaster can be controlled through a hose and through the smoke filter of the free to air.

Therefore, the grill can be used and carry only for having the appropriate dimensions and grill is equipped with wheels for easier carrying this grill where sahaja. In conclusion, the project "Auto Grill With Smoke Filter" was there because of the characteristics ergonomik equipped motor to rotated the skewers to reduces the waste of manpower. In addition, the grill is equipped with filters to reduce the emission of smoke into the air that one factor of air pollution.

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APPENDIX 1

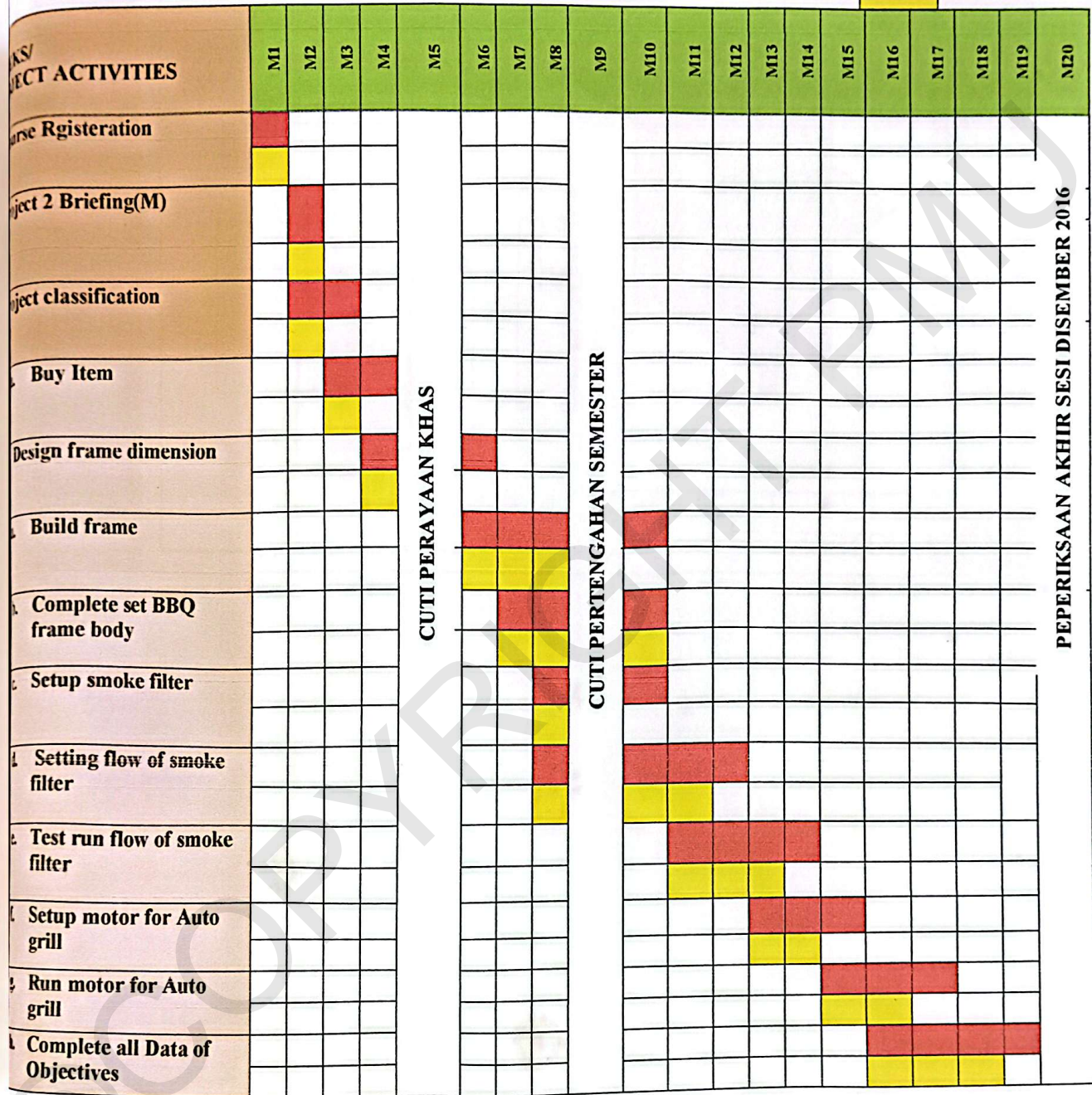
Cost

No	Material	Quantity	Unit Price(RM)	Total(RM)
1.	Hollow bar 1 inch	2 (12 m)	Rm25	Rm 50
2.	Motor Power Window	1	Rm 40	Rm 40
3.	Vacuum	1	Rm 60	Rm 60
4.	Wheel 4"	4	Rm 6	Rm 24
5.	Flexible hose 1 inch	4 Metre	Rm 6.50	Rm 26
6.	Perspex 3mm	1	Rm75/sheet	Rm75
7.	Belting	1	Rm40-60	Rm60
8.	Adaptor	1	Rm68	Rm68
9.	Bearing	10	Rm5	Rm50
10.	Banner	1	Rm50-80	Rm80
11.	Spray	4	Rm10	Rm40
12.	Car battery 12v	1	Rm120	Rm120
13.	Aluminium 2-3mm	1	Rm40-80	Rm80

CARTA GANTT PROJEK PELAJAR

SESI : DISEMBER 2016
JABATAN : KEJURUTERAAN MEKANIKAL
KOD/KURSUS : DJJ6143 PROJEK 2

LEGENDS
Plan
Actual



APPENDIX 3

