DEVELOPMENT DESIGN OF A MINI SATAY SKEWERING MACHINE

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DEVELOPMENT DESIGN OF A MINI SATAY SKEWERING MACHINE

MOHD NADZRIZAL BIN MOHAMAD GHAAZALI

A report submitted in partial fulfilment of the requirements
for the award of the
Diploma of Mechanical Engineering

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NOVEMBER 2008

SUPERVISOR'S DECLARATION

We hereby declare that we have checked this project and in our opinion this project is satisfactory in terms of scope and quality for the award of Diploma in Mechanical Engineering

Signature
Name of Supervisor: MUHAMMAD AMMAR BIN NIK MU'TASIM
Position: TUTOR
Date:

To all my beloved family

ACKNOWLEDGMENTS

I would like to express my gratitude and appreciation to all those who gave me the possibility to complete this report. Special thanks are due to my supervisor Mr Muhammad Ammar Bin Nik Mu'tasim whose help, stimulating suggestions and encouragement helped me in all time of completing the project. I am very grateful to her patience and his constructive comments that enriched this project. His time and efforts have been a great contribution during the preparation of this thesis that cannot be forgotten for ever.

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ABSTRACT

See the problem machine satay concept now, not have yet satay machine where using skewering concept can easy to carry. Now the product have the same concept just have bigger machine, cannot to carry and can make more the satay quantity. This skewering concept, easy to the customer rotate the satay and protected the hand from burn heat and kill time to burn satay process. For make the conformability for the customer, new machine satays have make it and produce. To make sure this ability from comfortable and safe, these machines have development and modified from satay machine now at the market from observer and experiment. This machine, have the skewering concept where it is kill time the burn process to burn the satay and not have to rotated the satay but have the rotated the skewer table machine. And, it is having to lock to lock the moving the rotation skewer table machine. This machine can to carry anywhere for the picnic or like another place. These projects have successfully although it is difficult to carry but that still have can to carry.

ABSTRAK

Melihat masalah mesin pembakar sate sekarang belum lagi wujud mesin sate yang menggunakan konsep putaran yang boleh dibawa. Produk sekarang yang mempunyai konsep yang sama hanya mempunyai mesin yang besar, tidak boleh dibawa dan boleh menghasilkan kuantiti yang banyak untuk menghasilkan sate. Konsep putaran ini memudahkan pengguna membalikkan sate dan tidak terdedah tangan kepada kepanasan api dan mempercepatkan proses pembakaran sate. Untuk menghasilkan keselesaan kepada pengguna, sebuah mesin pembakar sate telah direka dan dihasilkan. Untuk memastikan penggunaannya yang selesa dan selamat, mesin ini diubahsuai daripada mesin pembakar sate yang sedia ada di pasaran sekarang hasil penelitian dan kajian. Mesin inimempunyai konsep putaran dimana ia mempercepatkan proses pembakaran dan tidak perlu dibolak-balikkan. Ianya juga mempunyai pengunci, untuk mengunci pergerakan putaran tersebut. Mesin ini boleh dibawa kemana-mana untuk berkelah atau sebagainya. Projek ini mencapai objectif walaupun ianya sukar dibawa tetapi ianya masih boleh dibawa.

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CHAPTER 1

INTRODUCTION

1.1 PROJECT SYNOPSIS

The purpose of the project is to development design of a mini satay skewering machine. This machine would be different from another machine. In this study, the mini skewering machine will be design and fabricated and ensure this machine comply with customer needs. As a Diploma final year project allocates the duration of 1 semester, this project is need skills to handle several machine such as turret punch machine, bending machine, shearing machine, welding machine, drilling machine and grinding machine.

Title this project is ”Development Design of a Mini Satay Skewering Machine”. This project involves the fabrication of mini machine with a specifification regarding strength, material and cost. Overall, this project will be acquire the skills of design and fabrication.In this project, the machine can might easy to carry and use Solid Works design software.

1.2 PROBLEM STATEMENT

The problems are common faces by customer who want barbecue at the special place, like beach, jungle and others. Firstly is barbecue machine hard to carry. Other that, satay machine not have rotated system yet where this is kill time to cook. This machine know at the market have much material to assembly. And lastly, mini satay now not have system skewering machine yet.

1.3 PROJECT OBJECTIVE

The main objectives of this project are:

i. To develop an easy carry satay skewering machine

ii. To develop new design and fabricate mini satay skewering machine because before this, mini skewering design not have yet in market.

1.4 PROJECT SCOPE OF WORK

Scopes of the projects are limited to the equipment and materials. Firstly, the product must use the skewering machine method. After that, modified skewering machine to easy rotated. The design of product is assisted by using solid works software. Fourthly, fabrication process will use all necessary manufacturing process including punching, bending, threding, cutting and joining are welding and. And lastly, material selection come from stainless steel and steel

1.5 PLANNING PROJECT

According to the gantt chart from Table 1.1, project briefing started followed by briefing final year project. These include know how to write the report and final year project procedures. The planning process at week 1.

After that, this project was continued with got the tittle final year project with supervisors at week 2. Then, continued with gathering objectives project from supervisor at week 2. Then, continued with collecting literature review at week 2 to week 5. These include gathering raw data via internet, book and other source.

Then, design begin at week 3 to 8. This is started with sketching 6 types of mini skewering machine and then identify the best from analysis. Next, design the mini skewering machine and then identify the best product from analysis with matrix chart. Next, design the mini skewering machine that was chosen, using solidwork software withactual dimension.

Material to be used must be suitable and easy to get. The specification when choosing a material is includes strength, durability, corrosion resistane, light and thermal heat . This is important to fabrication process. Before that, static analysis will be find to gathering information from material use and force at table skewer.

After that, mid semester presentation at week 7 for know the progress report of the project. Evaluation stage has been implemented after fabrication stage. The evaluation is to consider the strength, safety, workability of the table. During the evaluation, if problem occur such as malfunction, modification will be done. And project can will be done.

Next task is the final report writing and final presentation preparation. The report is guided by UMP Thesis writing guided and also guidance from my supervisor.

Project Activities		Weeks													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Briefing the Final Year Project by Lecturer	Plan														
	Actual														
Got the Title for Final Year Project from Supervisor	Plan														
	Actual														
Objective	Plan														
	Actual														
Literature Review	Plan														
	Actual														
Design with Sketching	Plan														
	Actual														
Matrix Chart	Plan														
	Actual														
Design with Solid Works	Plan														
	Actual														
Preparation of Material	Plan														
	Actual														
Mid Semester Presentation	Plan														
	Actual														
Static Analysis	Plan														
	Actual														
Fabricate Process	Plan														
	Actual														
Report writing	Plan														
	Actual														
Presentation Final Year Project	Plan														
	Actual														

Table 1.1: Gantt Chart

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter is present about literature review of satay and satay machine such as origin, description and the other else.

2.2 SATAY

Satay (spelt sate in Malaysia) is made of cubed meat, skewered kebab-fashion, then grilled and eaten with a peanut sauce dip. Tracing its origins to the Arabs, the satay has adapted to the multi-cultural palates of Asians with various spicy sauces and different ways of marinating the meats.

2.2.1 Origins

Arabs were known to skewer their meat on swords before roasting and Middle Eastern nomads would barbecue their meat on metal skewers known as kebabs or sharwarma. The spice trade which brought Arab traders to Southeast Asia led to the spread of Arab culinary culture to the Indonesians and eventually to Malaysia and Singapore. Similarly, during the Turkish invasion of Cyprus, kebabs or sharwarma were adopted by the locals and is today a popular dish amongst the Greeks and the Cypriots besides the Turks, the Egyptians and the Arabs. The dish spread beyond to Northern India with even Beijing residents savouring fiery flavoured kebabs today. The

uniqueness of satay in Asia is that wooden skewers are used unlike metal in their Arab counterpart.

The satay sauce, made up of ground peanuts and other spices, was first introduced in the Philippines by the Spanish from South America. Used to marinate the pieces of meat, the remaining sauce is used as a dip after the meat of the satay is grilled.

2.2.2 Description

The meats used are beef, mutton, lamb, or chicken, and amongst non-Muslims pork. The small cuts of meat are marinated in various spices which also works to tenderise the meat. They are then skewered through wooden sticks. Satay sticks were originally dried, thin stems of the coconut leaf but today, factory-generated bamboo sticks are used. The satay is barbecued over a flaming charcoal fire, whilst constantly brushed with oil for a tantalising glaze, until well-browned. The stick of grilled meat is then served with a bowl of peanut dip and cuts of cucumber and onions. The small cuts of meat means up to 20 sticks can be eaten in one go and is often served as a complete meal accompanied with *ketupat* or steamed rice wrapped in woven leave packets.

2.3 BARBECUE MACHINE

2.3.1 Electric Barbecue Grill

Figure 2.1: Type of electric barbecue grill machine.

Product Description

1. Voltage/Power:230V~ 50Hz/2000W
2. Unit Size:560X370X100mm
3. Adjustable thermostat
4. Indicator light
5. Adjustable to 3 different height to grill
6. Micro-switch for safty lock
7. Portable for indoor and out door use
8. Easy to clean

2.3.2 Four-head Environmental Roaster (gas0)

Figure 2.2: Type of four head environmental roaster.

Product Description

Type: ET-K22 (Luxury), ET-K222 (Standard)

Size : 580x400x180mm ;

Configuration : Stainless steel shell ,quartz glass cover, sprayed shell,standard cover

- ETON most newly design product.
- Elegant shape.
- Wide application,hygiene,safe and easy to operate.

2.3.3 Gas BBQ

Figure 2.3: Gas bbq machine.

Product Description

Model No. : B401SR

Product size: 1650 X 620 X 1230 mm

Carton Size: 920 X 690 X 585 mm 880 X 590 X 700mm

Construction:

1. Stainless steel hood with chrome steel handle

2. Stainless steel cart doors with side burner on right side and control panel with e electronic ignition

3. Built-in insulated ice bucket with stainless steel lid

4. Stainless steel storage drawer

5. Slide out propane tank drawer

6. Deluxe removable grease tray

7. 4 cast iron bar burners;12,000 BTUs each;48,000 BTUs total

8. 10,000 BTU cast iron side burner with brass insert

9. 10,000 BTU rotisserie burner and rotisserie set

10. Plating wire warming rack

11. Cooking surface:810x500mm

12. 4 heavy-duty steel casters

2.3.4 Sell Barbecue Grill

Figure 2.4: Sell barbecue machine.

Product Description

1) Elegant appearance design; with desk top and stand feature;
2) Precise temperature control;
3) Firm grill for stuff placing;
4) Compact package for economic freight;
5) Flexible dismiuntability provides cleaning convenience;
6) Adjustable grill height creates temperature selection for different stuff to be roasted.

2.3.5 Barbecur Machine

Figure 2.5: Barbecur machine.

Product Description

We use health as premise and environmental idea as concept. We specially develop infrared ray automatic turning skewer with less oily smoke, less scorched and without pollution. This machine is good product in field of barbecue and sharp weapon for starting an undertaking and becoming rich. It is also your only and the best choice. Their features detailed as bilow:

1. Do not need personal care and save the expenses of labor force.

2. The skewing food is not easy to scorch, so it can keep the best flavor, will not lose the nutrition and cannot cause the cancer.

3. Make use of theory of infrared ray to have well-distributed heat, fully burned, less oily smoke.

4. Save the source of power.

5. The roller grill is fixed to this unit for barbecue of all kinds of food, fish, meat, etc.

6. The device comes in various sizes, or by use of infrared or carbon to bake or electric quartz heater to select your specific demand.

2.3.6 Barbecue Grill Netting

Figure 2.6: Barbecue grill netting.

Product Description

Process barbecue grills wire netting according to customers specific requirements. Barbecue grill wire netting is mainly used in camping, tenting, military,travel etc. Barbecue grill wire netting is based on crimped wire mesh, surface treatment with zinc coated or chromium plated. Barbecue grill wire netting enjoys bright color and good structure.

Detail description as follows:
Material: Crimped iron wire netting
Finish: Zinc coated or chromium plated
Characteristics: Bright color, good structure, export standard .

2.3.7 Portable Barbecue

Figure 2.7: Portable barbecue machine.

Spectation: 26 x 26 x 13.2 cm
Net.Weight: 990g
Burns: Charcoal
Suitable: Outdoors / In room

The oven body is the double-decked design, the oven structure succinct is easy to cleaning, Provides 1.5 V cell battery blower,can fast carries on bakes; Free dismantable grill handle; the adjust air inlet, facilitates to adjust firepower.
Includes: one oven body/one handle/two grill pans/two grill trays/one blower/carrying bag

CHAPTER 3

METHODOLOGY

3.1 PROJECT FLOW DIAGRAM

In fabrication of the mine skewering machine, there is a planning of the overall progress to assure the project can be on a schedule.

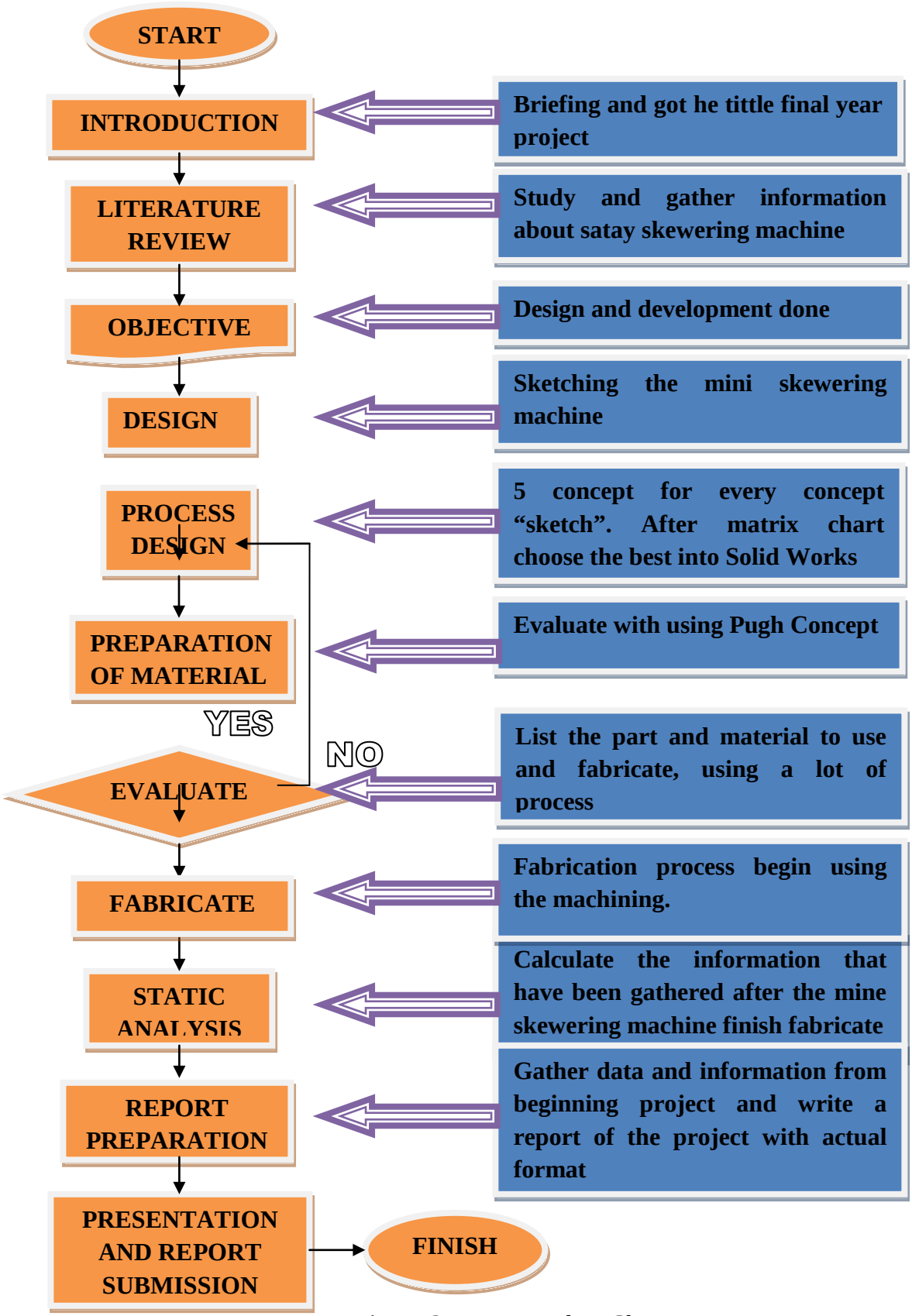

Figure 3.1: Project Flow Chart

From the flow chart above, this project started with introduction while briefing the final year project and got the tittle for final year project. Then, find the literature review and then study and make a lot of investigation about mini satay skewering machine. This include a study about concept of mini satay skewering machine, process to fabricate and material. These task have been done through study on the internet, books and other sources.

Then the information gathered and the project is continued with the objective this project. It is important to know how to make the project and to design and development done. After that, project is continued with the design process. After several design sketched, design consideration have been chosen by using Pugh concept selection method. The selected sketch is then transferred to detail drawing by using Solid Works software.

After all the enginnering drawing finished, the drawing has been used as a reference for the next process, which is list part material use and fabrication stage. This process will consist fabrication to all parts that have been designed by follow the dimension using various type of manufacturing process. The manufacturing process include in this process are welding, cutting, drilling, bending and others.

After fabrication has been finished, static analysis begin. Using calculation the information that have been gathered after the mine skewering machine finish fabricate.

Then, after all the processes mentioned above is done, all materials for report writing are gathered. The report writing process will be guided by the UMP final year project report writing. Preparation for final presentation is also being made by finished the slide show. The project ended after the presentation and submission of report.

3.2 DESIGN

3.2.1 Introduction

The design of the mini satay skewering machine must be compliance to several aspects. The design consideration must be done carefully, so the design can be fabricated and the mini satay skewerig machine be functioning. The aspect that must be considered in designing the mini skewering machine are:

- Durability : The table satay must be durable when rotation begin.
- Material : The material that will be high thermal conductivity and corrosion resistance
- Cost : It depends on material and manufacturing process should reduce the cost to the minimum.

3.3 CONCEPT SELECTION METHOD

The design of mini satay skewering machine must through process of concept selection method. It includes sketching five types of mini satay skewering machine that have certain characteristic and advantages. The sketches design of mini satay skewering machine are:

3.3.1 Concept A

There are several advantages at concept A. It has a lock key, heavy, stabilize, rotational system and easy to finish this product.

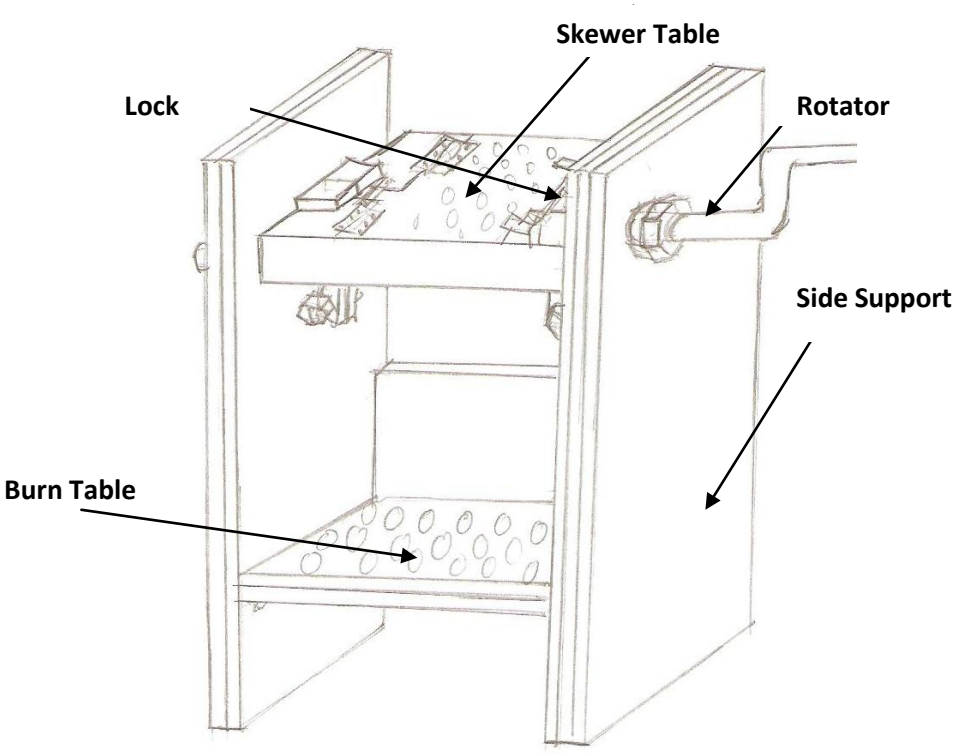

Figure 3.2: Show a concept of stabilize

3.3.2 Concept B

There are several advantages at concept B. It has a net wire, sliding moving, rotation system and open burning place..

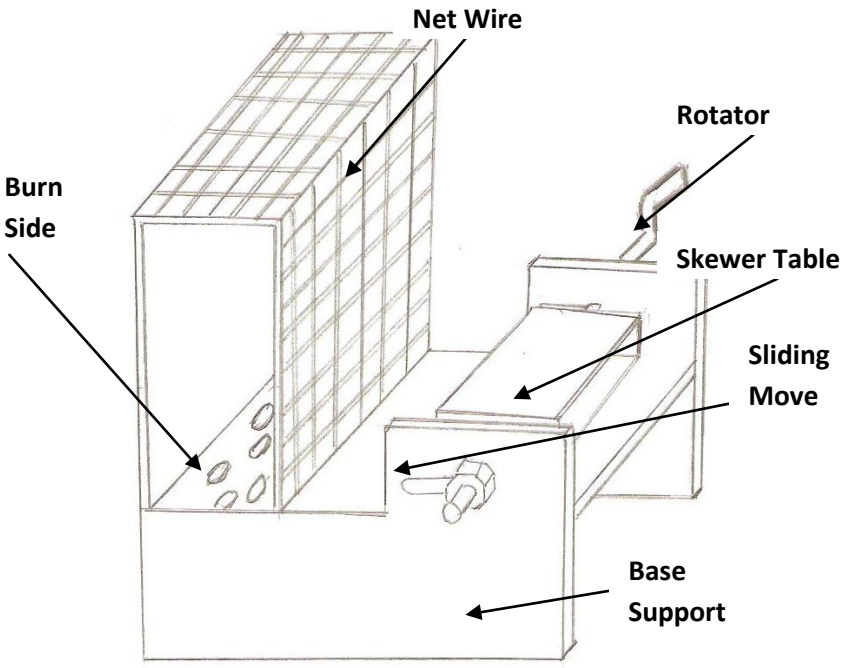

Figure 3.3: Show a concept of sliding moving

3.3.3 Concept C

There are several advantages at concept C. It is simple product then have three table side, net wire, rotational system and roof.

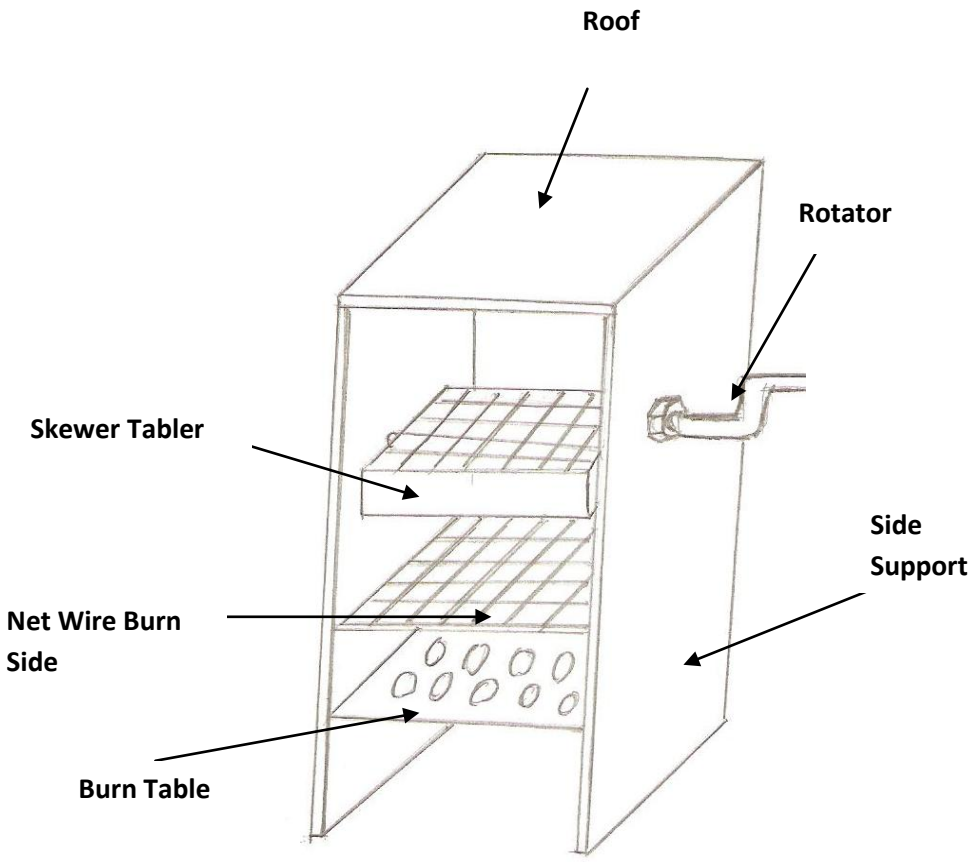

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Figure 3.4: Show a concept of three layer.

3.3.4 Concept D

There are several advantages at concept D. It is simple product then have three table side, not roof, have rotational system and open side.

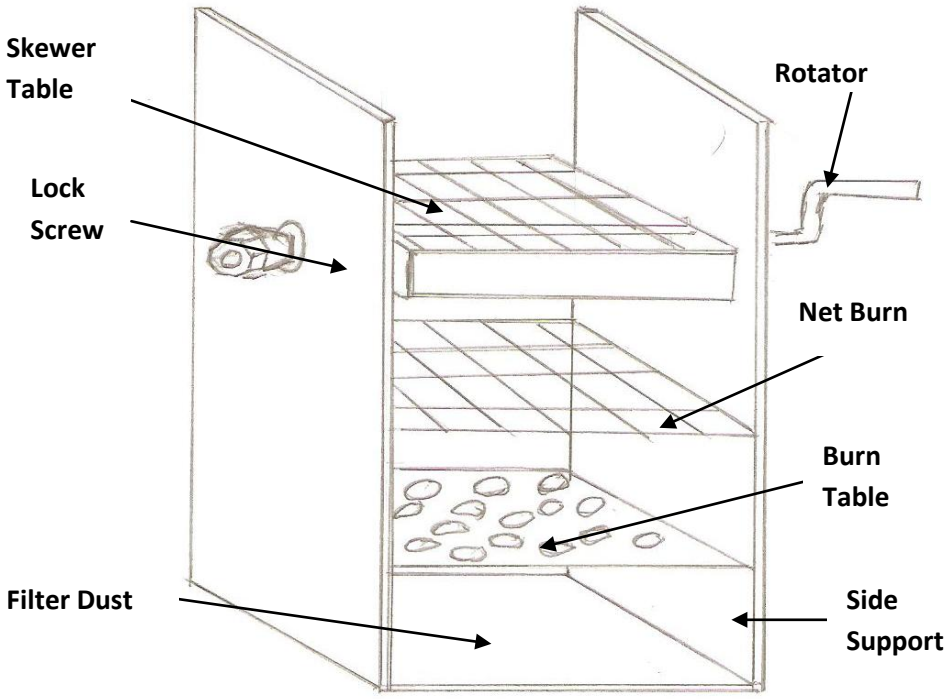

Figure 3.5: Show a concept of open side.

3.3.5 Concept E

There are several advantages at concept E. It is simple product then have three table side, not roof, have rotational system, high support basement and open side.

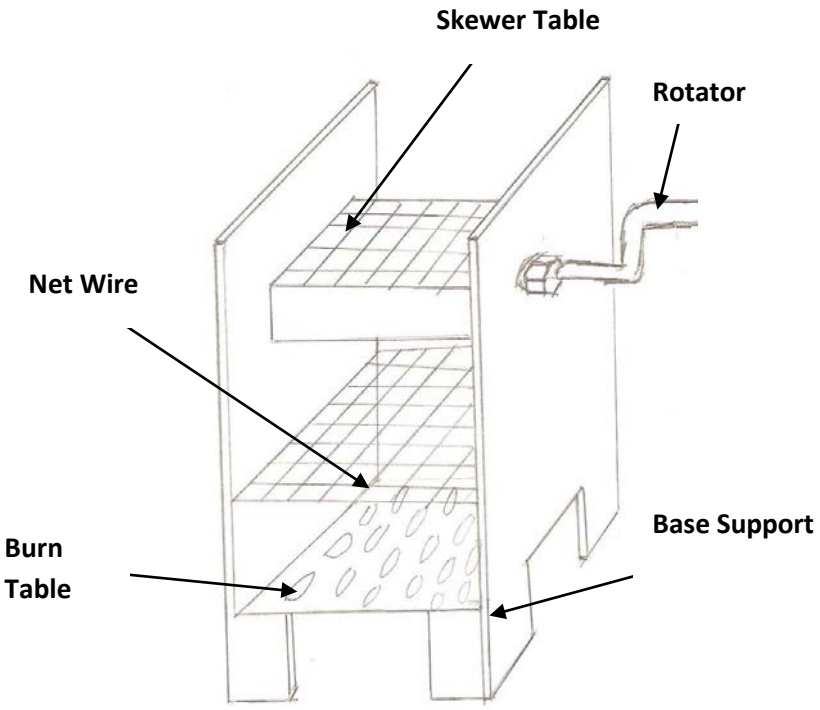

Figure 3.6: Show a concept of high support basement.

3.3.6 Concept F

There are several advantages at concept F. It is simple product then have two layer side, have system skewering, open-closed roof for killtime to process burning, front cover to protect heat.

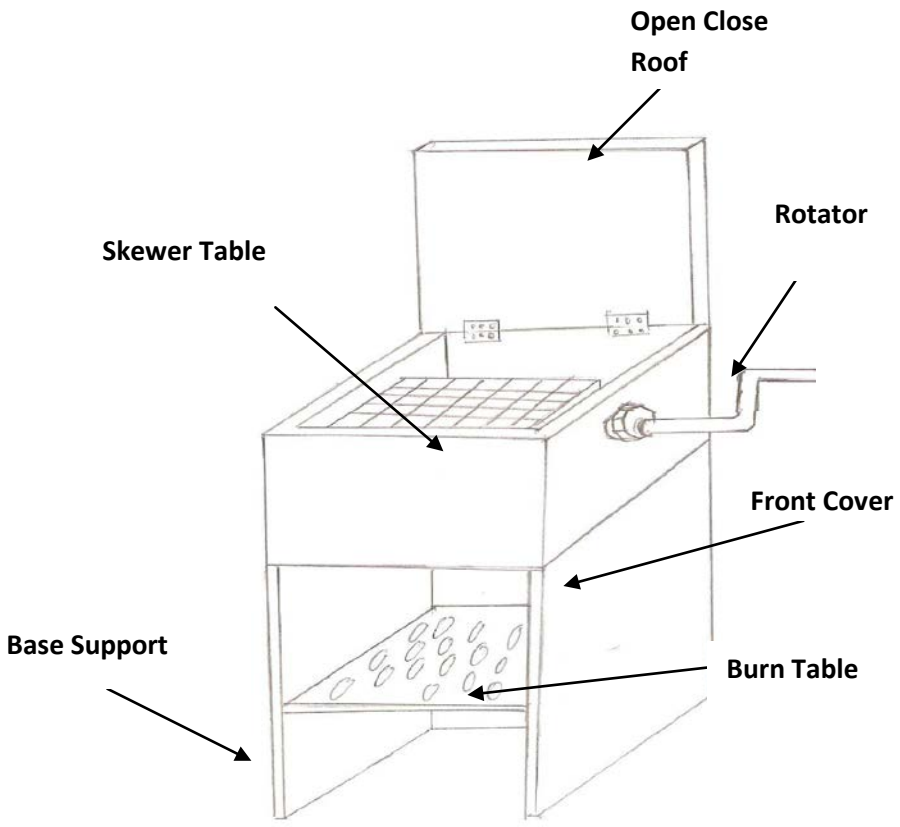

Figure 3.7: Show a concept of skewering machine function.

3.3.7 Concept Generation and Evaluation

This is table to determine the best concept for fabricate mini skewering machine.

Table 3.1: Matrix Chart selection method

Criteria	Concept A	Concept B	Concept C	Concept D	Concep E	Concept F	Best Concept
Light weight	*	***	*****	*****	*****	*****	B,C,D,E,F
Good looking	**	*****	*****	*****	***	*****	B,C,D,F
Easy to manufacture	***	*****	**	****	****	****	B,D,E,F
Easy to handling	***	*****	*****	*****	*****	*****	B,D,E,F
Easy to use	**	******	******	****	*****	******	B,C,D,E,F
Material usage	*	***	*****	*****	***	*****	B,C,D,F
Material cost	**	*****	***	*****	****	****	B,D,F
Protection	*	**	***	*	*	*****	F
Strength	*****	***	***	***	**	***	A
Easy to carry	**	*****	****	*****	****	****	B,C,D,E,F

* very bad	CONCEPT	A	B	C	D	E	F
** bad	TOTAL						
*** medium	BEST	1	7	5	6	5	9
**** good	CONCEPT						
***** very good	SELECT	X	X	X	X	X	√

3.4 RESULT

The Table 3.8 shows the method to evaluate concept that have been designed to determine the best concept mini satay skewering machine that most ideal to be produced. It can be evaluated through several selection criteria suitable for it function. From this table, 10 selection criteria have been chosen.

The first criteria is light weight. It is important to might easy to carry to the another place. Next selection criteria is good looking at machining. It can evaluate the choice of the customer request in selection product.

Beside that, ease to manufacture also has been considered as the selection criteria. It is include a process to fabricate a concept, a material to be used, and other else. The handling and uses when using the concept also the important.

After that, material usage and cost of manufacture also has been considered as selection criteria. When concept enter to market, cost is very important to interest customer to buy a concept. Lastly the selection criteria that have been choosen is safety and strength. It can testing with full satay at skewer table and safe using the satay machine.

According from the table, analysis of the concept selection shows that Concept F score the highest the positive signs. There is not having negative sign of 10 selection criteria in the Concept F. Therefore Concept F is the best concept to be produce.

3.5 PRODUCT DESIGN SPECIFICATION

After select the selection concept, it shows that F is the best and must be fabricated. The product design specification is like below.

3.5.1 Box Skewering Machine

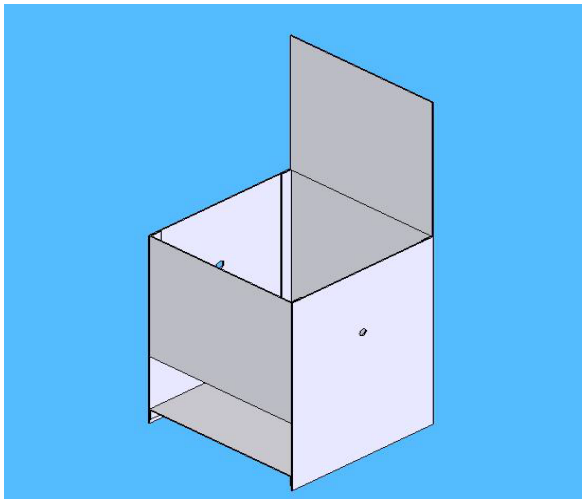

Figure 3.8: Show a box of skewering machine.

i. The material is stainless steel sheet metal.

ii. Using tungsten innert gas (MIG) for process joining to fabricate the box skewering machine.

iii. Specific dimension

- Front cover (340 mm x 250 mm)
- Side cover (420 mm x 300 mm , 2 pieces)

- Open closed cover (300 mm x 300 mm)
- Burn table (340 mm x 250 mm)

3.5.2 Skewer Table

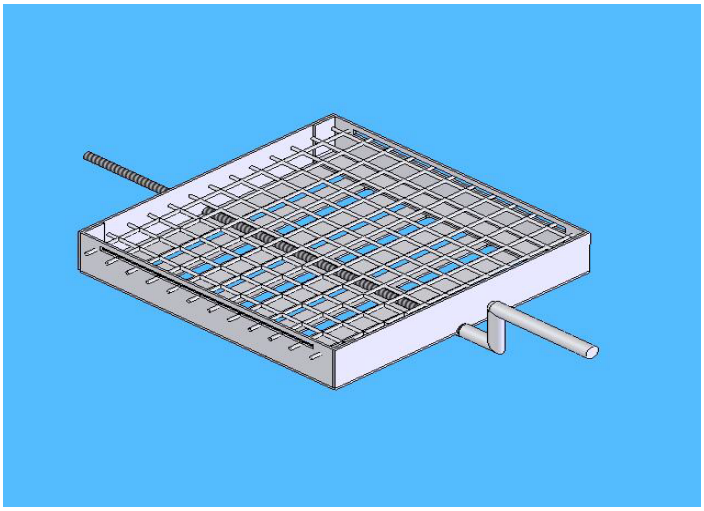

Figure 3.9: Show a skewer table part.

i. The material is stainless steel sheet metal, rod steel and net wire

ii. Fabricate process using tungsten inner gas (TIG), tapping process, shearing process and bending process.

iii. Specific dimension

- Rod steel : Ø12 mm, 560 mm width.
- Stainless steel : 4 pieces (250mm 250 mm)
- Net wire : 270 mm x 250 mm

3.5.3 Full Assembly Mini Satay Skewering Machine

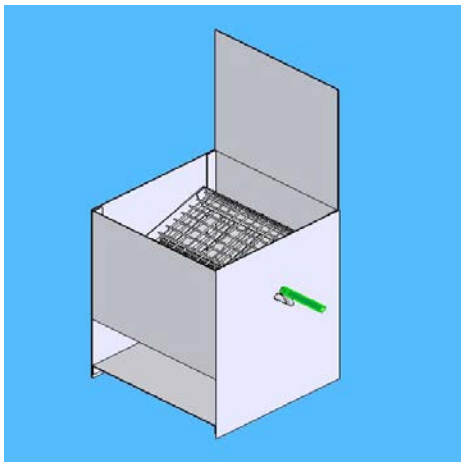

Figure 3.10: Show a full assembly skewering machine

3.6 FABRICATION PROCESS

In the fabrication, there are many process involve to develop the product such as cutting, joining, drilling and others.

3.6.1 Instrument

Instrument that below was used in fabrication process mini skewering machine:

i. Drilling machine

ii. Hammer

iii. Vertical Band saw

iv. Steel ruler

v. Flexible ruler

vi. File (smooth and bastard)

vii. TIG weld machine

viii. Cold chisel

ix. Grinder

3.6.2 Process Involve

i. Selecting material:

Process select type of material is such as rod steel and stainless steel sheet metal.

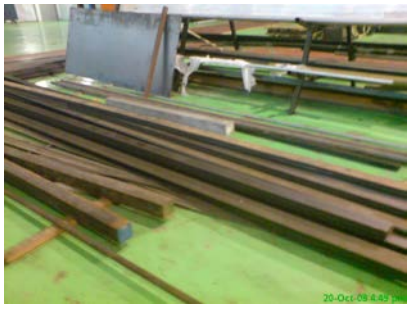

Figure 3.11: Selecting of material.

ii. Measuring:

Process to measure the length, width and height of the product. Use measuring tape or ruler.

Figure 3.12: Measuring process using measuring tape ruler.

iii. Cutting material:

Process to cut material using the Ben saw and grinding machine then cutting rod steel with cutter machine.

Figure 3.13: Cutting process using ben saw.

iv. Lathe process:

Process to less the diameter rod steel using lathe machine to make tapping process.

Figure 3.14: Less the diameter using late machine.

v. Threading process:

Process to make tread using the tapping tool , Ø10 mm

Figure 3.15: Threading process using tapping tool.

vi. Shearing process:

Process to cut the stainlees steel using the shearing machine.

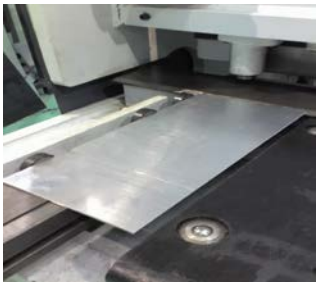

Figure 3.16: Cut the sheet metal using shearing machine.

vii. Drilling process:

Process to make hole for center rotation sewer table ratator drilling machine.

Figure 3.17: Drilling process using drill machine.

viii. Punching process:

Process to make difficult shape by using hammer and cold chisel to remove the material and make shape nuts.

Figure 3.18: Make hexagon shape using cold chisel and hammer.

ix. Grinding process:

Process to remove the mould and make shape using grinder.

Figure 3.19: Remove the mould using grinder machine.

x. Joining process:

Process using the tungsten inner gas (TIG). First, joining the box skewering machine, then the skewer table. And lastly joining box and skewer table using nuts and TIG joining.

Figure 3.20: Welding process.

xi. Finishing process:

Process to exchange aesthetic value; painting, surface sharp edges to make sure it safe to use.

Figure 3.21: Painting process.

3.7 ANALYSIS

3.7.1 Stress

The stress analysis is done by throwing the product to the ground by measure the height as parameter. we can see the product is good to put at height area and good quality when it go down freely.

3.7 BILL OF MATERIAL

Table 3.2: Bill of materials

Material	**Number of material**	**Price**
Stainless steel sheet metal	1 (2300 mm x 340 mm)	RM25.00
Sand paper	1 (560mmx420mm)	RM1.50
Screw and nuts	16	RM4.00
Net Wire	1 meter	RM3.50
Hasp	2	RM1.70
Paint	1	RM6.00
Holder	3	RM2.50
TOTAL		RM44.20

CHAPTER 4

RESULT AND DISCUSSION

4.1 INTRODUCTION

This chapter will disscuss about the project. It includes the completed fabrication, types of defects, product specification and cause of problem of the project. The analysis also was helped to give improvement of the satay machine. It is also will show the product defected and how to troubledshoot the defects. At the same time, this analysis also to compare between of the product specification was target and product specification when completed fabricate.

4.2 RESULTS

4.2.1 Introduction

After finish fabrication process, the product has been analyzed. At this stage, all information about this product is collected and gathered. It is important to classify the product before it can used. The complete fabrication mini satay skewering machine is like below.

Figure 4.1: Product of mini satay skewering machine.

Figure 4.2: Isometric top view

4.2.2 Strength To Product

Table 4.1: Strength analysis

Height (meter)	Repetitive time
0.2	5
0.3	4
0.4	3
0.5	2

This is a strength analysis result done by throwing the product to the ground by measure the height as parameter.

4.2.3 Product Specification

This is another example of analysis process. The product is classify to several category such as weight, colour, wide, height, and other else. The product specification like below.

Table 4.2: Table of product specification

CATEGORI	TOTAL
1. Weight	16 kg
2. Color	Black
3. Wide	300mm x300mm
4. Height	420mm
5. Convenience	Easy to use and rotated, has a cover to kill time the cooking and have 10 satay can put one time

4.2.4 Product Testing

This below is flow process to testing new product, mini satay skewering machine.

1. Preparation the ingredients and material.
2. Put life the fire and put down the satay at skewer table.
3. Rotated the skewer table before satay cook.
4. Put up the satay and put down at dish.
5. Satay finished burn.

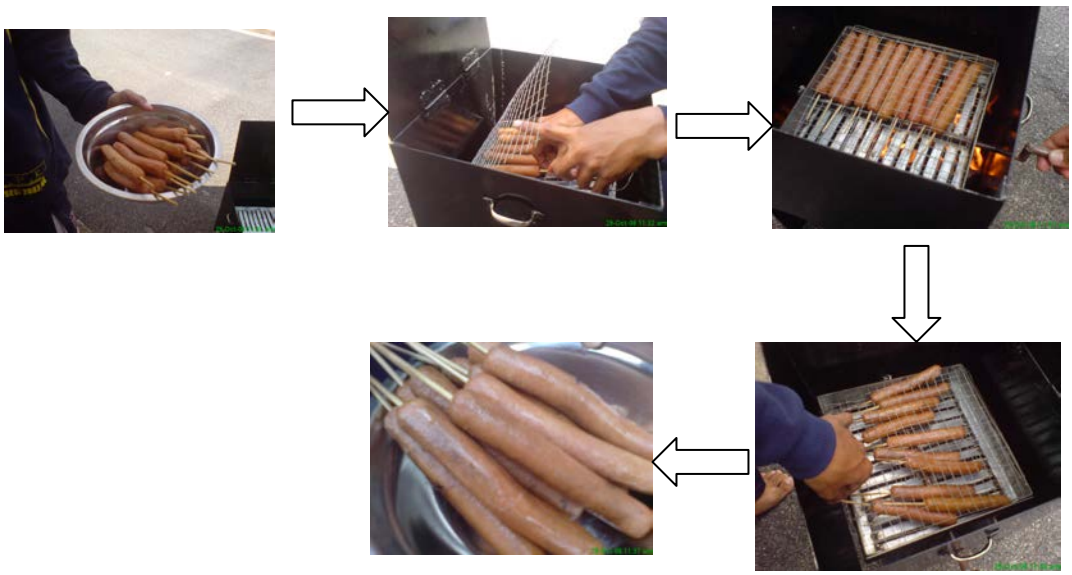

Figure 4.3: Flow to burn satay

4.3 TYPE OF DEFECTS

There are so many things happen in fabrication such as defect. This defect happens because lacks of skill to operate a machine such as when handling TIG welding machine. Although these problems happen, its can gives an experience to avoid the same problem to be repeat again at the future. There are some of defect happen on the product bellow:

4.3.1 Weld Uncompleted

The figure 4.4 is weld not complete. It is because the material selection to join with two parts is important. In this case one material is slim and hollow bar is thick. It have not perfect weld.

Figure 4.4 Weld uncompleted

4.3.2 Gap

Figure 4.5 is problem about gap between open closed cover and front cover. This because effect from welding process where misswelding.

Figure 4.5: Gap

4.4 DISCUSSION

After finish fabrication process, many types of defect are datected. Have a many point to create a defected such as selection material. The materials that have been select are not suitableto fabricate a certain part such as box. It is because this material is not have dimension origin choice such as thickness of stainlees steel is 1 mm but at lab just have 2 mm thickness. Than it make two time weight than origin. The defect is also from fault when chosen the material. It is happening from material in UMP mechanical lab is limited and many students will use it.

The machine that was used also is point to create a defected. For example is bending machine. It can’t be form a sheet metal into U shape and not have enough tools to make complex shape. It takes difficult to redesign the product and take a long time for improvement.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 INTRODUCTION

This chapter is about problems the project encounter before, during and after project. This chapter also will discuss about the conclusion of the whole flow of the project from the planning project, literature review, and design of the product, analysis and fabrication of the product.

5.2 PROJECT PROBLEM

5.2.1 Literature Review

The concept and ideas review for this project is same design. Students should come with their ideas on the project.

5.2.2 Designing & Sketching:

Because of the idea were from the student directly, so there are no references that can be referred. All the drawing and dimension need to generate by student itself.

5.2.3 Fabrication Process:

Fabricating process of the product facing some problems because of slackness of training, machine problem, the joining finishing was not so god but yet can still reliable.

5.3 CONCLUSION

As the conclusion, development design of mini satay skewering machine objective is achieved. This because satay machine can build new design and can to carry to other place. This project was done around thirteen week included almost all steps of the report such as literature review, design, fabrication process and others.

5.4 RECOMMENDATION

After complete this task, this machine look more intresting and more reliable if give improvement or add several part for more effective. Box skewering macine should be change from stainlees steel sheet metal to steel. At box skewer machine, add more holes for more oxygen to complete burning process. Finally, upgrade with adding the bearing at the rotator and upgrade the lock the rotator

5.5 FUTURE WORK

Future planning for this satay machine can add a new design and more light weight. This project can be use by the student to gain knowledge and understanding of mechanical process of machining such as bending, drilling and other. In the future this satay machine has a light weight, easy to use and more safety to use.

REFERENCES

(1) http://satayskeweringmachine.com/ dated on September 08th 2008

(2) Welding Skills Third Edition by B.J. Moniz and R.T. Miller, publisher by American technical publisher. Inc

(3 http://en.wikipedia.org/wiki/Satay dated on September 09th 2008

(4)http://www.etonmachine.com/catalog/router/htm/cid_1025/liid_698/catid_534/food-machinery dated on September 24th 2008

(5)http://www.mardi.gov.my/main.php?Content=sections&SubSectionID=480&SectionID=549&CurLocation=443&DC= dated on September 29th 2008

(6) Manufacturing Engineering and Technology Fourth Edition by Serope Kalbakjian and Steven R. Schmid.

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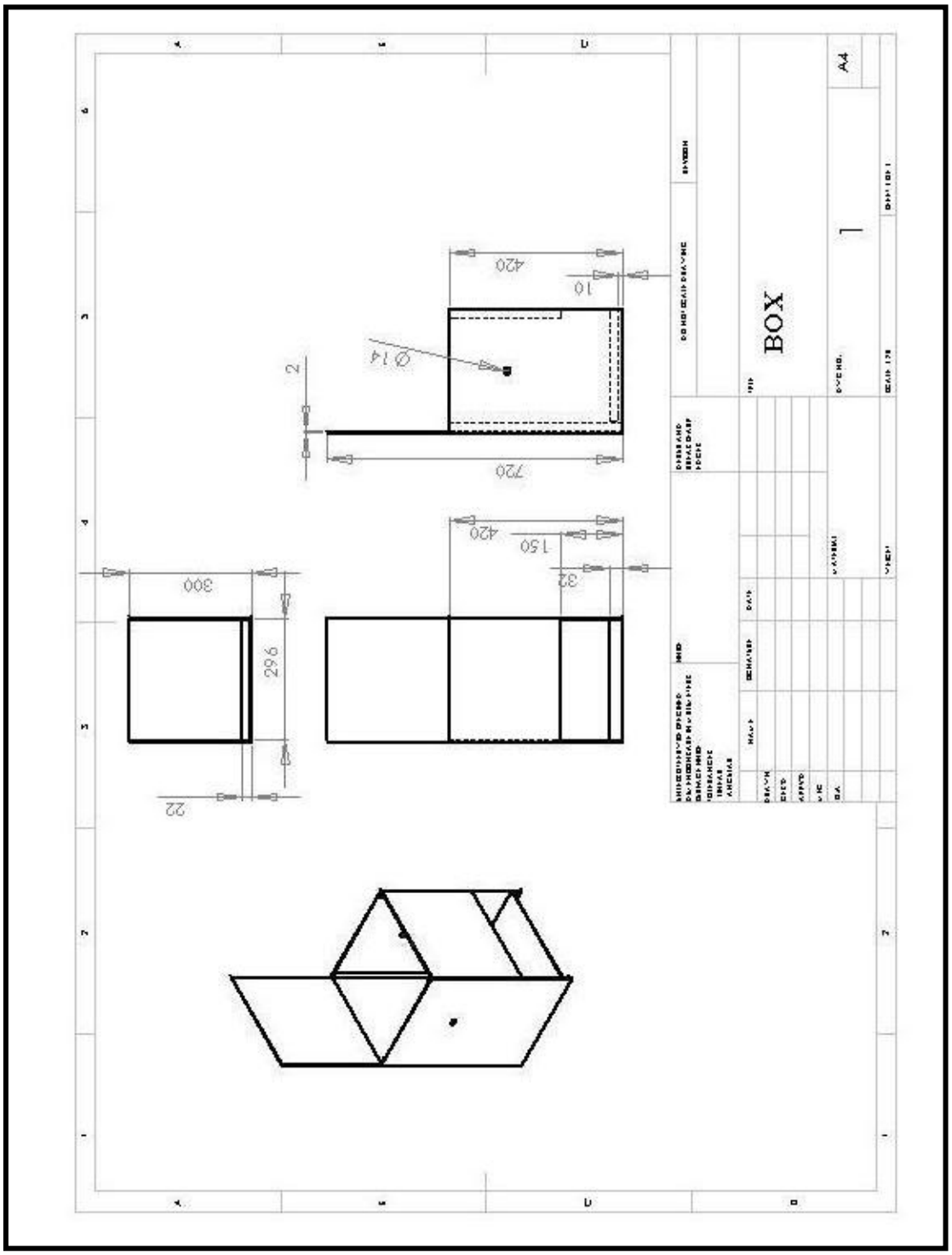
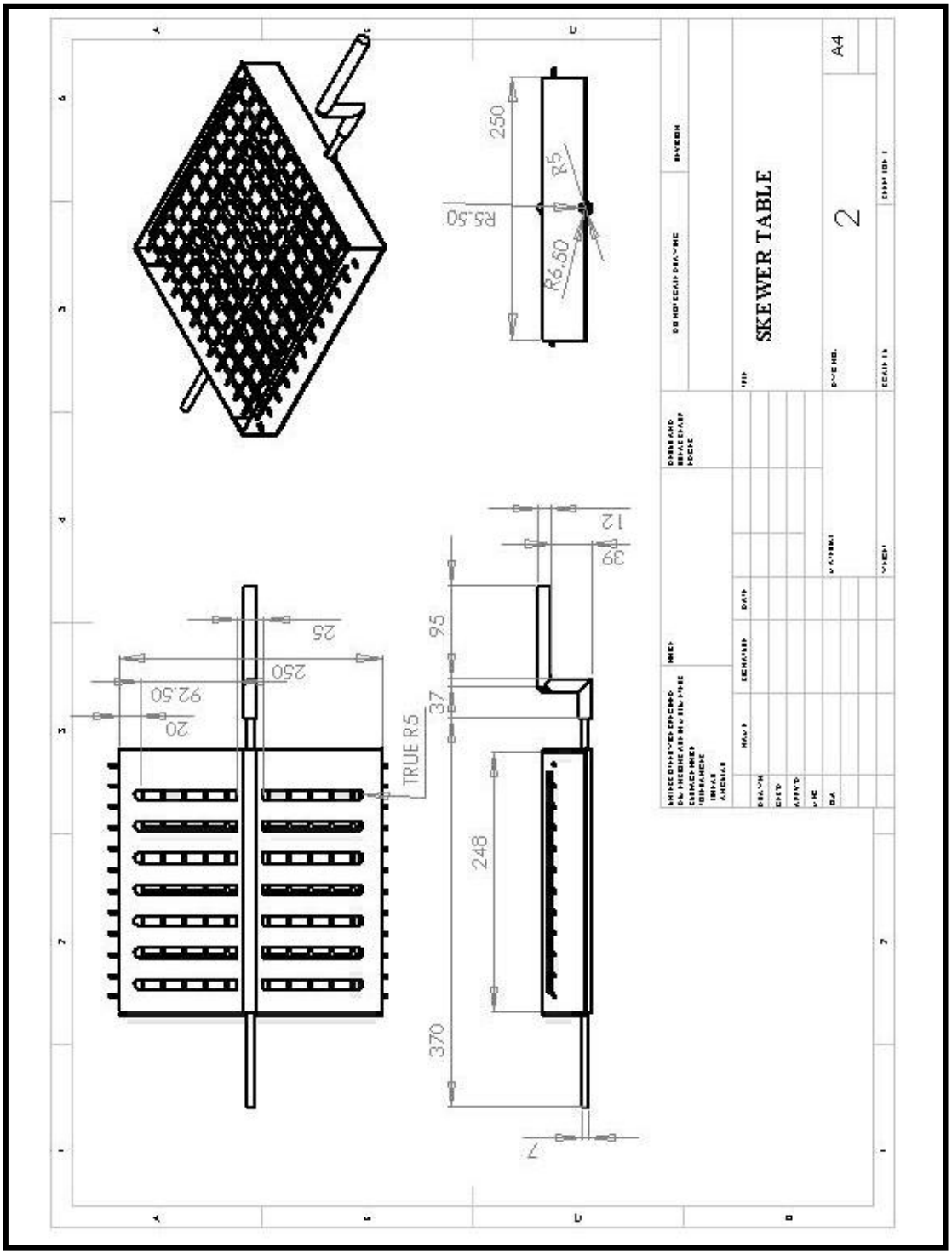
APPENDIX A

Solid Works 2D Drawing (Box)



APPENDIX B

Solid Works 2D Drawing (Skewer Table)



APPENDIX C

Solid Works 2D Drawing (Mini Satay Skewering Machine)