POLITEKNIK MALAYSIA
MUKAH

OIL SEED ROLLER COLLECTOR

MAISARAH BINTI ISMADI	20DKM15F1135
MUHAMAD NIZAM BIN ZAKERIA	20DKM15F1123
ANDRIAN NJAU STEPHEN	20DKM14F1038
KELVIN CHENG TAI PAU	20DKM15F1110

PROJECT SUPERVISOR
EN MOHD FADLI BIN ARRIF

DEPARTMENT OF MECHANICAL ENGINEERING
POLITEKNIK MUKAH

SESSION: JUNE 2017

OIL SEED ROLLER COLLECTOR

NAME	REGISTRATION NUMBER
MAISARAH BINTI ISMADI	20DKM15F1135
MUHAMAD NIZAM B. ZAKERIA	20DKM15F1123
ANDRIAN NJAU STEPHEN	20DKM14F1038
KELVIN CHENG TAI PAU	20DKM15F1110

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

PROJECT REPORT VERIFICATION

This report is entitled **"OIL SEED ROLLER COLLECTOR"** has been submitted and reviewed as to meet the conditions and requirement of project writing.

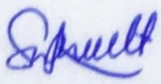
Reviewed by:

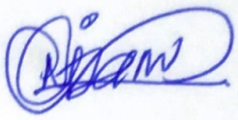
Supervisor Project : EN MOHD FADLI BIN ARRIF

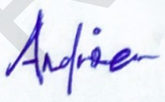
Signature :

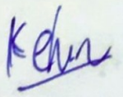
Date : 12/10/2017

"We declare that this report is our own except each piece that we have explained the source"

1. Signature : 
   Name : AL MAISARAH BINTI ISMADI
   Registration Number : 20DKM15F1135
   Date : 12/10/2017

2. Signature : 
   Name : MUHAMAD NIZAM B. ZAKERIA
   Registration Number : 20DKM15F1123
   Date : 12/10/2017

3 Signature : 
   Name : ANDRIAN NJAU STEPHEN
   Registration Number : 20DKM14F1038
   Date : 12/10/2017

4 Signature : 
   Name : KELVIN CHENG TAI PAU
   Registration Number : 20DKM15F1110
   Date : 12/10/2017

ACKNOWLEDGEMENTS

Firstly, we would like to give an appreciation to our project supervisor, Mr.Mohd Fadli bin Arrif,for his guidance's and advices. Without his guidance and advices, we surely lost our track and directions. Not only that, we also would like to say thank you to our family members because of their moral and financial support. We manage to stand firm in faith and stay courageous to make sure our final year research run follow the tracks as we planned. Last but not least, a thousand compliments to all project members, because of their great effort and team work given by them, we completely managed to complete our final year project and research successfully, Thank you.

ABSTRAK

Projek ini melibatkan tentang menghasilkan sebuah produk, iaitu "Oil Seed Roller Collector" yang merangkumi semua aspek dan konsep bagi memudahkan si pengguna. Objektif utama projek ini adalah untuk membina dan menaik taraf produk "Oil Seed Roller Collector". Semua parameter dan factor produk ini adalah berkait dengan kemudahan si pengguna untuk mengguna produk ini dan menganalis. Konsep rekaan yang dipilih adalah berdasarkan undian yang paling banyak semasa menganalisis untuk langkah terakhir memilih rekaan. Faktor-faktor yang diambil kira telah dipilih untuk menjalankan proses fabrikasi. Antara factor yang diambil kira adalah ringan, tidak berkarat, keras, murah dan sebagainya. Semasa proses fabrikasi berjalan, proses terakhir adalah menguji kaji sama ada produk berfungsi atau tidak. Jika produk tidak berfungsi dengan baik, pengubahsuaian akan dijalankan. Pengubahsuaian akan terus dijalankan sehingga produk berkesan.

ABSTRACT

This project consists on the assessment of making a product, the oil seed roller collector which will consider all aspects and concepts for satisfaction of the users. The main objectives of this project are to design and develop the oil seed roller collector. The project was start with development of design concepts that combine several ideas. All parameters and factor that related to customer satisfaction such as easy to maintenance or easy to uses was analysed. The design concept that gave highest vote during analysis stage was selected as a final design. All the factors that need to consider was taken during material selection for fabrication stage. The factor was considered for material selection such as lightweight, not rust, hardness, cheap, and others are taken for fabrication process. After fabrication process, the final product has been tested to ensure that the product is functional or not. If the product is not following specification, some modification will be made. The modification process will be repeating until the products achieve the desire specification.

TABLE OF CONTENT

LIST OF TABLE

LIST OF FIGURE

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

This project concerns on the assessment of making a product, the oil palm seeds collector which will consider all aspects and concepts for satisfaction of the users. The main objectives of this project are to design and develop the oil palm seeds collector which helps to ease an overarching burden. The project started with development of design concepts that combine several ideas. The factor was considered for material selection such as lightweight, not rust, hardness, cheap and others are taken for fabrication process. The modification process will be repeating until the products achieve the desire specification. This product is suitable for outdoor.

1.2 BACKGROUND OF STUDY / PROJECT

Malaysian is a country that largest production oil palm in the world. Malaysian has competitive advantage in palm oil industry because has owned experience more than century and lead market from productivity aspect and R&D. Conventional or traditional methods still been practiced in plantations to collect the loose oil palm fruit. This traditional method is not efficient, waste time, trouble employee, and cause pain waist to the worker.

Oil palm roller collector is created and experimented to solve this problem. Oil palm roller collector is a method and apparatus to collect loose fruit on the land. It also can be brought anywhere and easy to store when do not used. The design of this oil palm roller collector should be easy to repair. The fruit can be collected and removed at once. Employees only need hold this product in a state of stand u.

Several aspects need to be taken attention to ensure machine or tool collect loose oil palm seeds can be commercialized for local market and are catching on from parties those involved. Machine and tool collect loose fruit that efficient and effective can facilities to collect loose fruit that all this while is carried out manually. The methods collection by different also need thought especially to get machine or tool that is easy, safe and cheap and comfortable.

1.3 PROBLEM STATEMENT

i. Pick up system is not efficient anymore.

ii. Workers need to collect the oil palm seeds by sit, squat and bow that can cause the workers always in pain at their waist part.

1.4 OBJECTIVES

This oil seed roller collector is design to bring some objective as below:

i. To improve the system of collecting oil palm seed to be more efficient.

ii. To help save energy for collecting the oil palm seed.

1.5 SCOPE OF STUDY / PROJECT

For scope of study are mention as below:

i. The product is use in the fields of oil palm.

ii. Involving a few aspect of element in mechanical such as welding, grinding, drilling, cutting, and design for this project.

1.6 IMPORTANCE OF STUDY / PROJECT

The importance of this project, the initiation phase is critical to the success of the project as it establishes its core foundations. Effective project planning takes into consideration all aspects of planning including stakeholder engagement, benefits mapping, risk assessment, as well as the actual plan (schedule) itself. The two most cited factors for project failure are lack of stakeholder engagement and lack of clear roles and responsibilities.

1.7 DEFINITION OF TERMS / OPERATIONS

An operations definition, when applied to data collection, is a clear, concise detailed definition of a measure. The need for operation definition is fundamental when collecting all types of data. It is particularly important when decision is being made about whether something is correct or incorrect, or when a visual check is being made where there is room for confusion. Operation definition should therefore be made before the collection of data begins.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

According to history country which produces oil palm mostly was in world north. Malaysia is one of the countries that have the largest production oil palm in the world. Every seed coconut palm is very important to national income. Oil palm can be processed and make various commercial material needed by market.

Palm oil originated from oil palm fruit. Oil palm fruit contain husk, shell and kernel. Palm oil is located in husk area and kernel. Hereby many new machines were created to facilitate works whether in aspect unload or knitting. Most machine or tools were created to discharge and cut bunch and oil palm fronds but no machine to facilitate process collection loose fruit. Loose fruit means lost income. Entrepreneur oil palm planter would loss big profit besides pay cost of area maintenance if this fruit uncollected. To collect the loose oil palm fruit cause big problem. Previously, method used to collect the loose fruit with conventional or traditional methods. This meant collects using hand and employees have to sit squatting, bow or bend their body to collect fruit on the land and need to move from one tree to another tree. This methods cause backbone will feel pain. Oil palm owner will not let seed oil palm this without picked up because loose oil palm fruit also important role to increase the total collection and an individual's income.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

According to history country which produces oil palm mostly was in world north. Malaysia is one of the countries that have the largest production oil palm in the world. Every seed coconut palm is very important to national income. Oil palm can be processed and make various commercial material needed by market.

Palm oil originated from oil palm fruit. Oil palm fruit contain husk, shell and kernel. Palm oil is located in husk area and kernel. Hereby many new machines were created to facilitate works whether in aspect unload or knitting. Most machine or tools were created to discharge and cut bunch and oil palm fronds but no machine to facilitate process collection loose fruit. Loose fruit means lost income. Entrepreneur oil palm planter would loss big profit besides pay cost of area maintenance if this fruit uncollected. To collect the loose oil palm fruit cause big problem. Previously, method used to collect the loose fruit with conventional or traditional methods. This meant collects using hand and employees have to sit squatting, bow or bend their body to collect fruit on the land and need to move from one tree to another tree. This methods cause backbone will feel pain. Oil palm owner will not let seed oil palm this without picked up because loose oil palm fruit also important role to increase the total collection and an individual's income.

2.2 HISTORY OF OIL PALM

The oil palm is a tropical palm tree. There are two species of oil palm. The better known one originated in Guinea, Africa and was first illustrated by Nicholaas Jacquin in 1763, hence its name, Elaeis guineensis Jacq. *Laeis Guineensis* is a species of palm commonly called African oil palm or macaw-fat.

Oil palms were introduced to Java by the Dutch in 1848 and to Malaysia (then the British colony of Malaya) in 1910 by Scotsman William Sime and English banker Henry Darby. The first plantations were mostly established and operated by British plantation owners. Federal Land Development Authority (Felda) is the world's biggest oil palm with planted area close to 900,000 hectares in Malaysia and Indonesia. After Malaysia achieved independence in 1957, the government focused on value adding of rubber planting, boosting exports, and alleviating poverty through land schemes.

Figure 2.1: African oil palm (*Elaeis guineensis*)

2.3 PROBLEM TO COLLECT THE LOOSE FRUIT

Collection of loose fruit cause big problem to this crop entrepreneur. Loose fruit normally picked up by using hand and put together into bucket, plastic bag or gunny. Other than that there were also different options like using rake, planks and scoop. Employee has to bend body to collect fruit above land and move from tree to tree.

2.4 THE CURRENT PRODUCT

2.4.1 Using Nail Rake, Hand Basket and Net

Some location, the conventional methods still used to collect the coconut palm fruit. They are using nail rake, hand basket and net to collect the loose fruit on the land.

Figure 2.2: Using nail rake, hand basket and net

2.4.2 Using Scoop and Hoe

Some location, the conventional methods still used to collect the coconut palm fruit. They are using scoop and hoe to collect the loose fruit on the land.

Figure 2.3: Using scoop

2.4.3 Previous Product

Roller loose fruit picker has been proposed in 2009. It collects loose oil palm fruits by picking and retaining the loose fruits in a case without tedious and laborious efforts. The product consists of roller and handle. The product is small in size and collects limited amount of loose fruit. This was the first invention for collecting loose fruit.

Figure 2.4 Roller Loose Fruit

Specification :

- Diameter rod ; 1,2 mm
- Diameter cylinder; 18cm, wide 21 cm
- Handle; 3/4", length 120cm
- Weight; 1,3kg

2.5 PROPOSED DESIGN

We invented a new product (roller) with two handles which resembles grass cutting machine. We have upgraded the size with addition of using bearing and plat. The invention is an oval-shaped case made of a plurality of wires or rods. The roller is rolled with a little pressure against the ground causing the wires or rods of the case to split open and to trap the loose fruit inside. The cylindrical shape creates a cyclone atmosphere once the fruits are sucked, with minimal bruising to the fruits.

2.6 ADVANTAGES AND DISADVANTAGES

Advantages:

i. Does not lead to waist pain.
ii. Easy to use.

Disadvantages:

i. Rubbish presence.
ii. Injury of fruit.

2.7 CONCLUSION

Collection of loose fruit cause big problem to this crop entrepreneur. Observation from studies above showed that machine and tool collect oil palm fruit above able somewhat in order to meet part of basic principle to collect loose fruit. Several aspects need to be taken attention to ensure machine or tool collect loose oil palm fruit can be commercialized for local market and are catching on from parties those involved. Research is effective through machine development and tool need to be carried out in order to meet need in plantation sector and small farmer oil palm. Machine and tool collect loose fruit that efficient and effective can facilities to collect loose fruit that all this while is carried out manually. The methods collection by different also need thought especially to get machine or tool that is easy, safe and cheap and comfortable.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

Methodology is one of the important processes in product development. In fabricating process, it includes the measuring, cutting, drilling, joining and finishing processes. Designers should totally understand a chronology of project from beginning to the end. In fabricate the coconut palm collector, there are several steps must be followed. In this stage, all designers should understand the principle of material selection and method in order to characterize the material.

3.2 PROJECT PLANNING

3.2.1 Project Flow Chart

Based on the flow chart that shown in Figure 3.1, the project starts with the literature review and searching the information that related to the project. The process of gathering the information has been done by searching through the internet and some book that related to the project. In the literature review stage, some of the current product of the seed oil roller collectors, the specifications of

the seed oil roller collectors and the various functions of the current seed oil roller collectors are viewed. Once the information has been collected, the project continues with the process of conceptual design. In this stage, the information from the literature review and the knowledge are used to make the sketching and designing the new concepts. In this project, there are four new design concepts were generated.

The next step is concept evaluation. The concepts that satisfy in most criteria will be given highest rating. After the concept evaluation, the project continues with the process of finalization of the product. From the four designs, one concept was selected bases on highest rating. All the parts of the final design are draw into the desired shape and assembled. Once the design has been finalized, the process continues with the most suitable materials to fabricate the final design.

After product was selected, the fabrication process is take place and this process includes the measuring, cutting, drilling, and joining processed. The parts are assembled into the desired or actual project concept shape. According to the drawing, the dimensions are specified for the measurements of the project. All the dimensions are important and used to get the desired size for the project materials during the material preparation process. For all the materials which not come in the needed size are cut through cutting process to get the desired shape and size or dimension.

After fabrication process, the product has been tested to ensure that the product is functional or not. If the product is not following specification, some modification will be made. The modification process will be repeating until the products achieve the desire specification. Finally, the product will undergo the finishing process that includes the painting of the product.

3.2.2 PROJECT PLANNING (FLOW DIAGRAM)

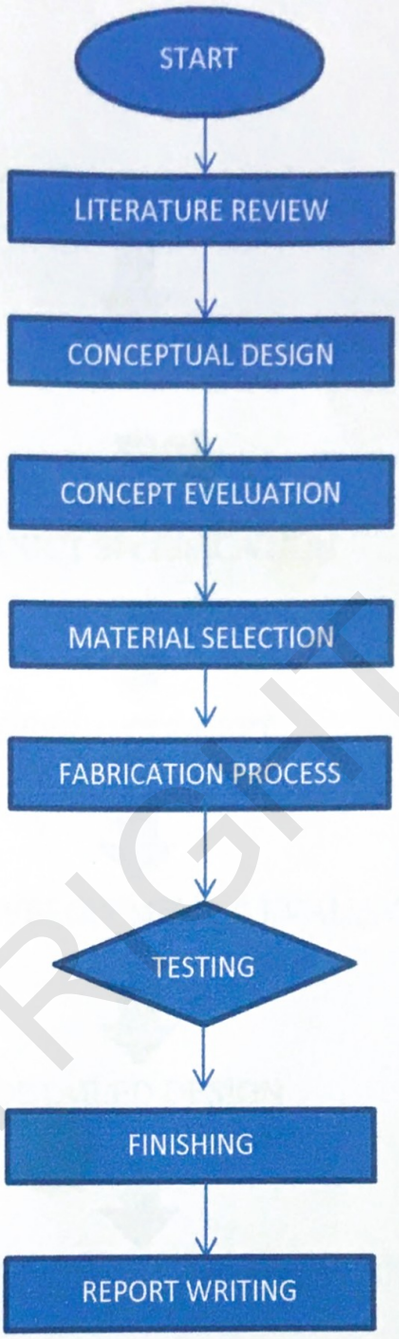


Figure 3.1 Flow Diagram

3.3 Project Design

3.3.1 Design Flow Process

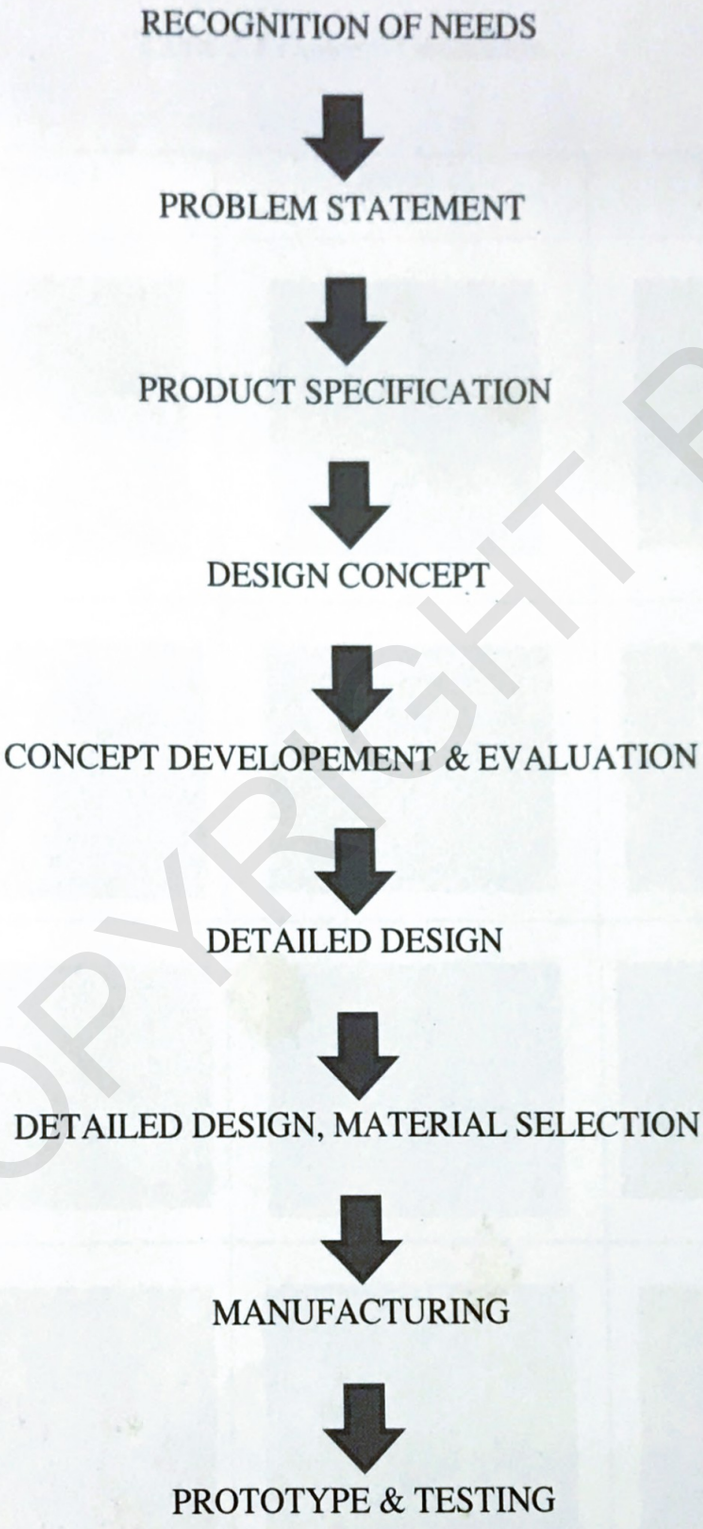
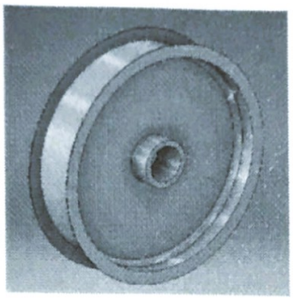
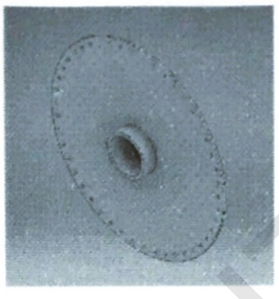
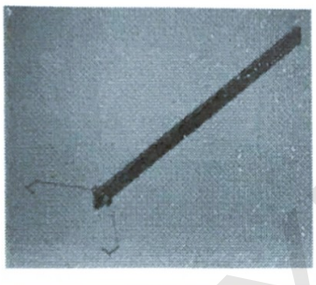
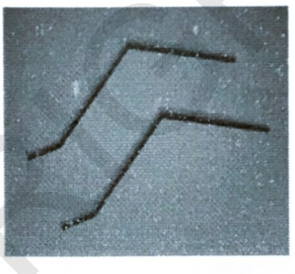
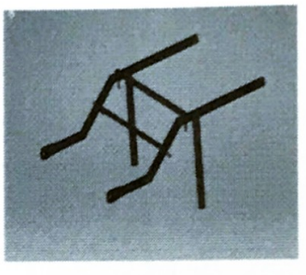
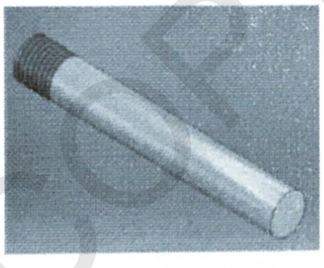
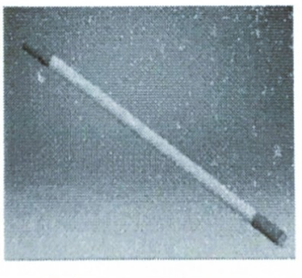
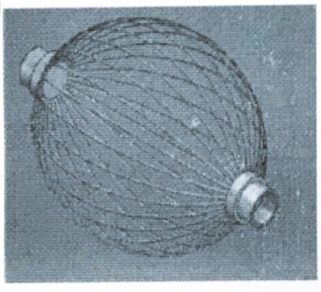
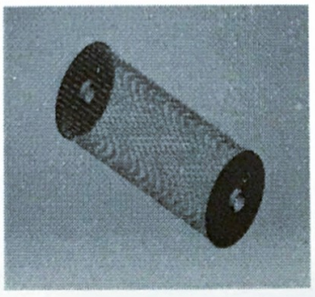
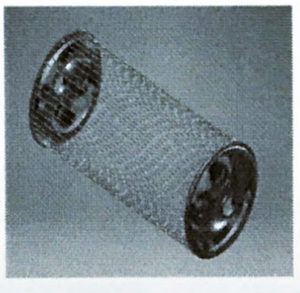


Figure 3.2 Flow Process

3.3.2 Concept Generation

Table 3.1 Concept Generation

Part Name	Option 1	Option 2	Option 3
wheel			
Handle			
Shaft roller			
Roller			

For this project, we choose to do option 3 because of the following reason:

i. Handle- using two handles to push the roller is more effective as our body is in a straight condition when pushing

ii. Roller – Our supervisor suggested this is the more effective way to suck the oil seed into the roller.

3.3.3 DESIGN CONSIDERATION

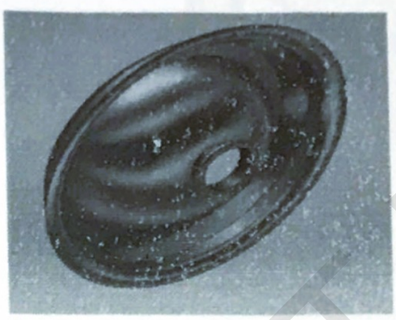
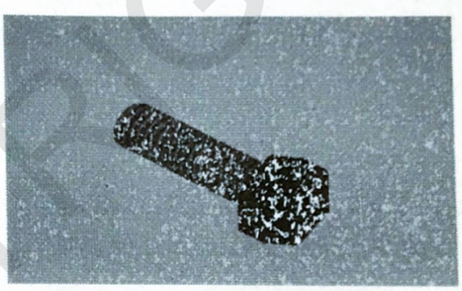
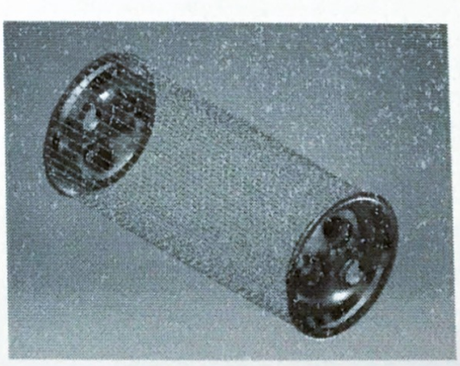
Table 3.2 Cost

Part name	Material	Quantity	Cost(RM)
Bearing	Steel	2	17
Bolt, nut	Steel	6,8	10.50
Plat	Steel	2	126
Rods	Steel	23	148
		TOTAL	301.50

3.4 MATERIAL SELECTION

3.4.1 FUNCTION

Table 3.3 Function of Material

Part Name	Option 1
WHEEL	 To move the oil seed roller collector
ROLLER HOLDER	 To hold the roller
RING ROLLER	 Used to collect the oil seed

3.5 Expected Project Design

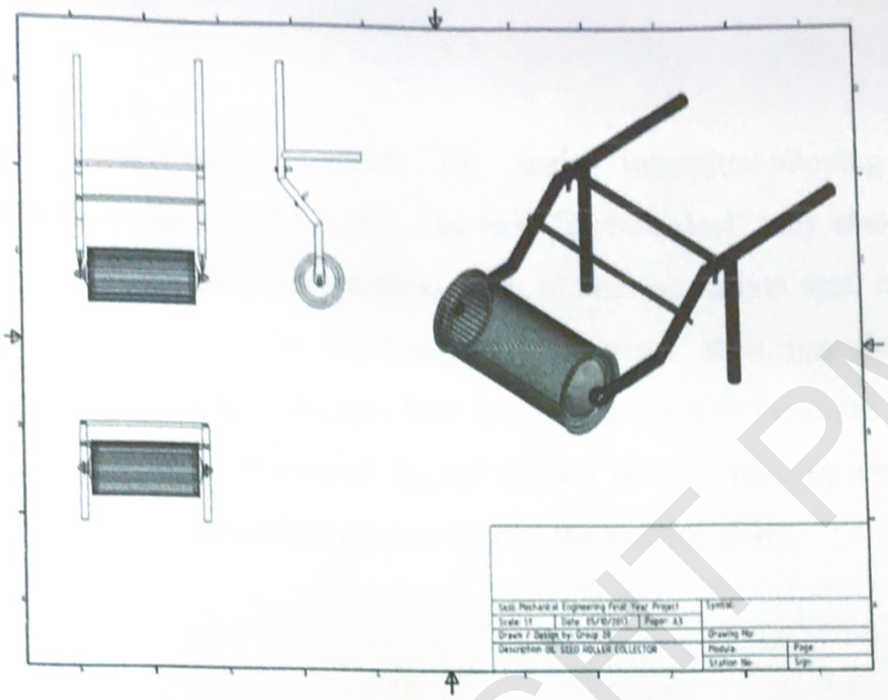


Figure 3.2 Expected Design

3.6 MATERIAL DESCRIPTION

3.6.1 CARBON STEEL

Carbon steel is steel in which the main interstitial alloying constituent is carbon in the range of 0.12–2.0%. The term "carbon steel" may also be used in reference to steel which is not stainless steel; in this use carbon steel may include alloy steels. As the carbon percentage content rises, steel has the ability to become harder and stronger through heat treating; however it becomes less ductile. Regardless of the heat treatment, higher carbon content reduces weldability. In carbon steels, the higher carbon content lowers the melting point.

3.6.2 Wheel/Plat

Figure 3.3 Wheel/plat

A wheel is a circular component that is intended to rotate on an axial bearing. The wheel is one of the main components. Wheels, in conjunction with axles, allow heavy objects to be moved easily facilitating movement or transportation while supporting a load.

3.6.3 Rods

These rods we are using for the roller are actually rods for welding. Each rod is the size of 1m. There were at least 30 rods used which the rods have been cut into half. The rods are the main material to create a roller in this project. We decided to use the rods because it is the perfect size for a medium roller.

3.6.4 Handles

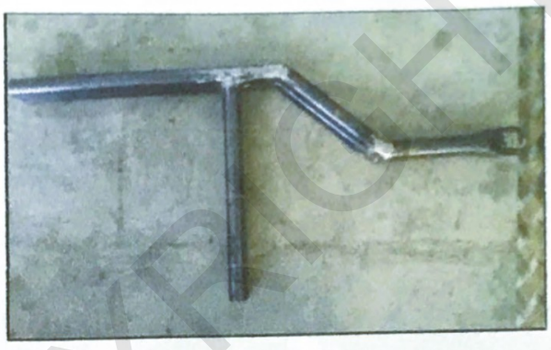


Figure 3.4 Handle

A handle is a part of, or attachment to, an object that can be moved, or used by hand. The design of each type of handle involves substantial ergonomic issue, even when these are dealt with intuitively or by following tradition. Handles for tools are an important of their function, enabling the user to exploit the tools to maximum effect.

3.7 FABRICATION METHOD

3.7.1 Grinding Process

We grind rod to cut it into half for the roller. Type of grind that we use is hand grinder. Grinding is a starting process to smoothly cut the rod into a balance length. The length of the rod is measured for a medium size roller. After that, we grind the handle so that it will safe to be hold. Type of grind that we use is hand grinder that we had our own. Grinding is a finishing process used to improve surface finish, abrade hard materials, and tighten the tolerance on flat and cylindrical surface by removing a small amount of material.

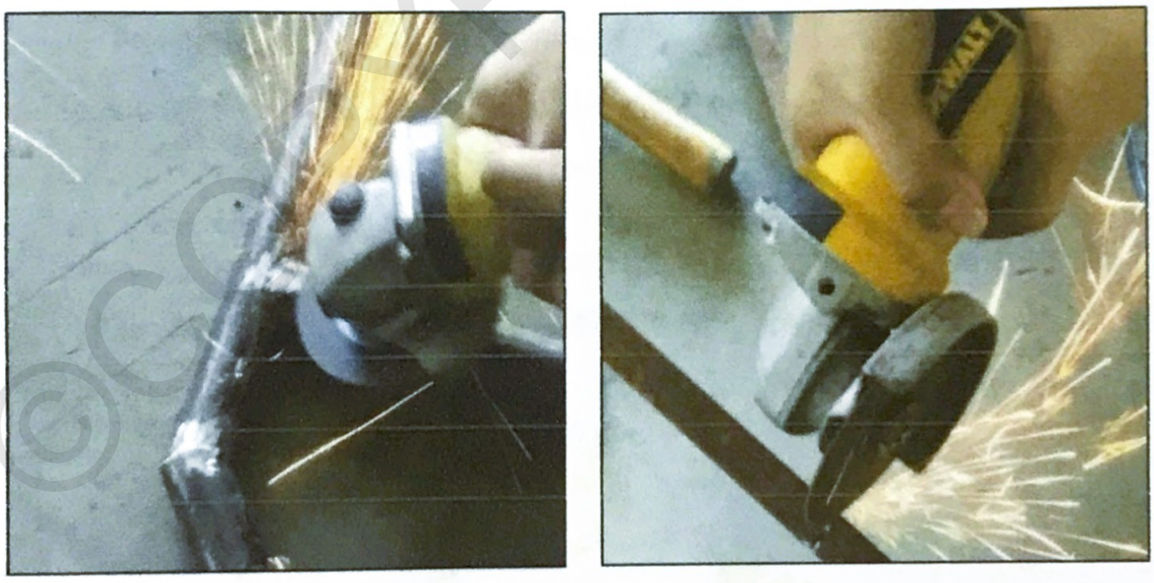


Figure 3.5 Grinding

3.7.2 Drilling Process

Figure 3.6 Drilling

Drilling is a cutting process that uses a drill bit to cut a hole of circular cross-section in solid materials. The drilling bit is usually a rotary cutting tool, often multipoint. The bit is pressed against the workpiece and rotated at rates from hundreds to thousands of revolutions per minute.

For our project, we used the method drilling to the plat. This is easier to attach the rod as marks. The rods will be inserting inserted into each hole then we will weld it together to make it attached.

3.7.3 Welding Process

Figure 3.7 Welding

The most common type of welding that we use is arc welding. We used current from 80Amp-120Amp. Welding process is the process of attaching the handle. It is to ensure the durability of our project.

Welding process is an important role in our project. The rods of the roller attached are using TIG welding. It took a lot of time and struggles but we managed to attach the rods to the holes.

3.8 CONCLUSION

Efficiency of suggestion of design depends on the work plan that had been managed. To achieve success in the design suggestion, work plan activity must be discusses with project supervisor to make sure it goes smoothly and according to time. All procedure will be explains in orderly. The total cost of all of the components must fall within the department determined budget. There is the possibility of contributions to the project from outside investors if the budget is exceeded, as well as costs that can be avoided by salvaging parts. We managed to follow the budget estimated even we have exceeded a bit as we have plan.

CHAPTER 4

PROJECT DESIGN

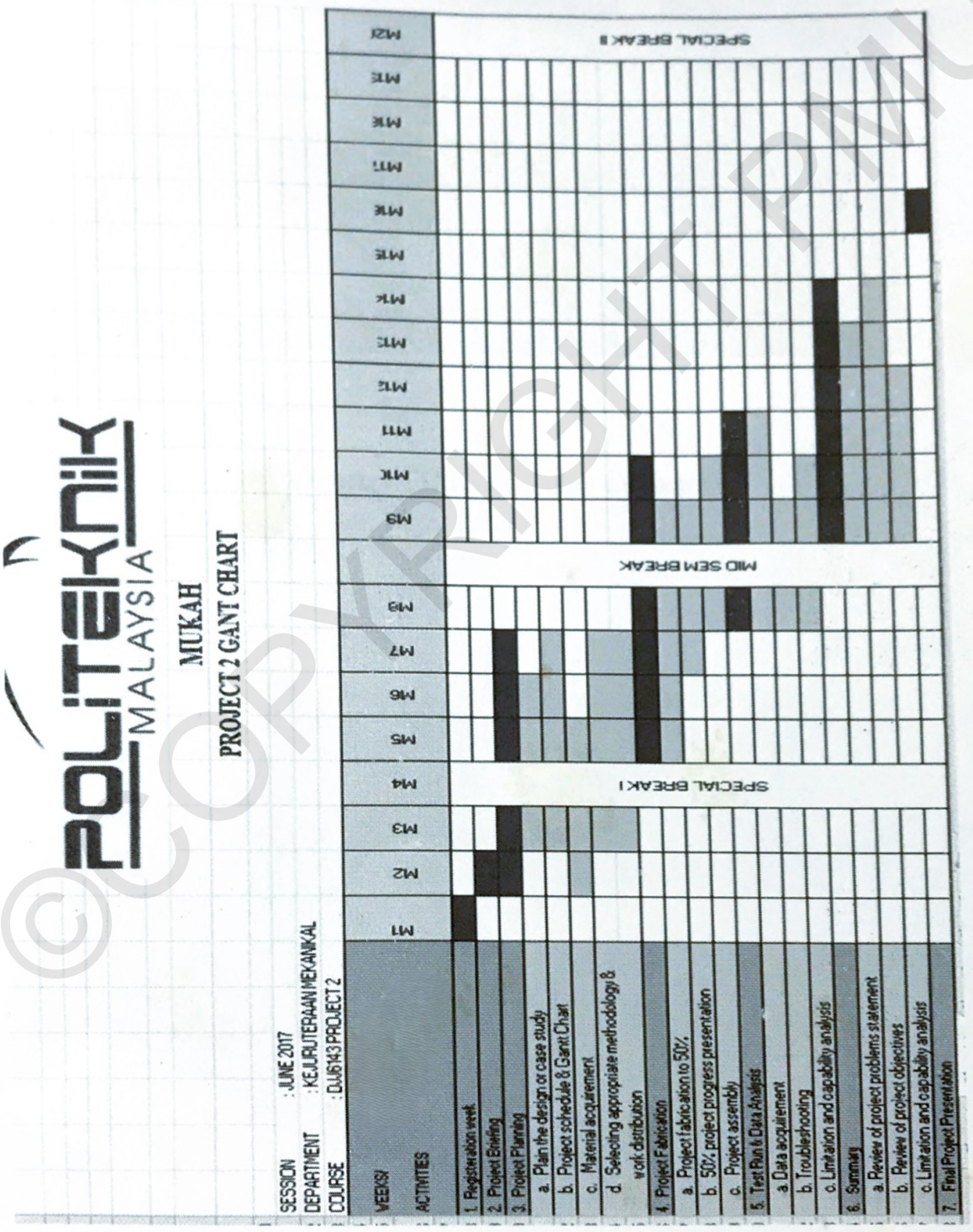
4.1 INTRODUCTION

In this chapter, we will be presenting the design of our product. The invention is a plurality rod which is the roller to trap the loose fruit inside. The cylindrical shape creates a cyclone atmosphere once the fruits are sucked, with minimal bruising to the fruits. We came with two handles as it functions similar to grass cutting machine. The function is for easier to push the machine at any level. There are some improvements that been made in the project design, resulting from the problems that occur in the design of which has been adopted in the production of this project.

4.2 PROJECT DESIGN

4.2.1 Gantt chart Project 2

Table 4.1 Gantt Chart



4.2.2 Design Plan

Figure 4.1 Oil Seed Roller Collector

4.3 PROJECT DEVELOPMENT

Exercise works the manufacture and design of this module requires advance planning. This is to simplify work processes that include methods and procedures that will be used to complete the project in order to achieve the objectives set. In order to make the design come reality, fabrication process needs to be done first. The processes that involve are:

Figure 4.2 Measuring and marking holes for drilling the plat

Figure 4.3 Making sure the size of the rod fits the hole

Figure 4.4 Welding the rods to create the roller

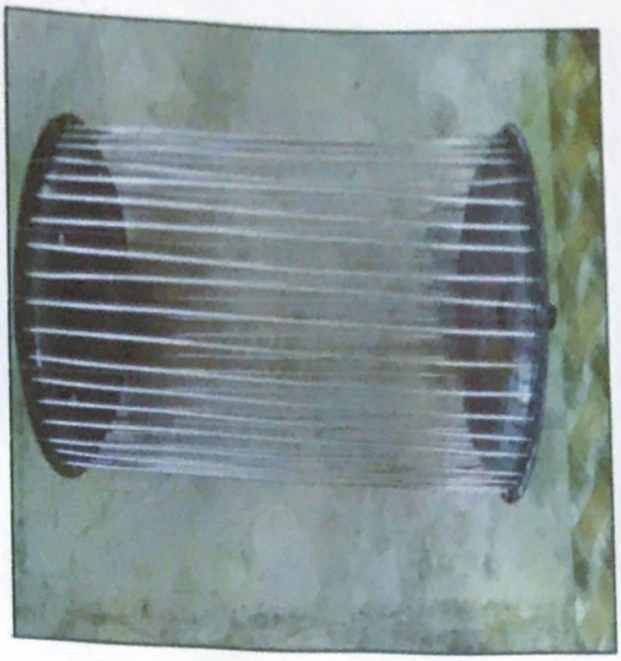


Figure 4.5 The frame of the roller

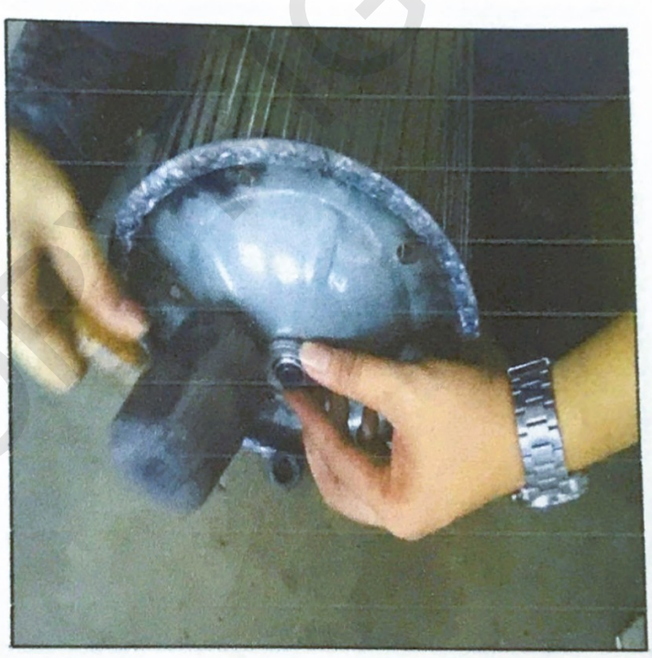


Figure 4.6 Attach the bearings and nuts

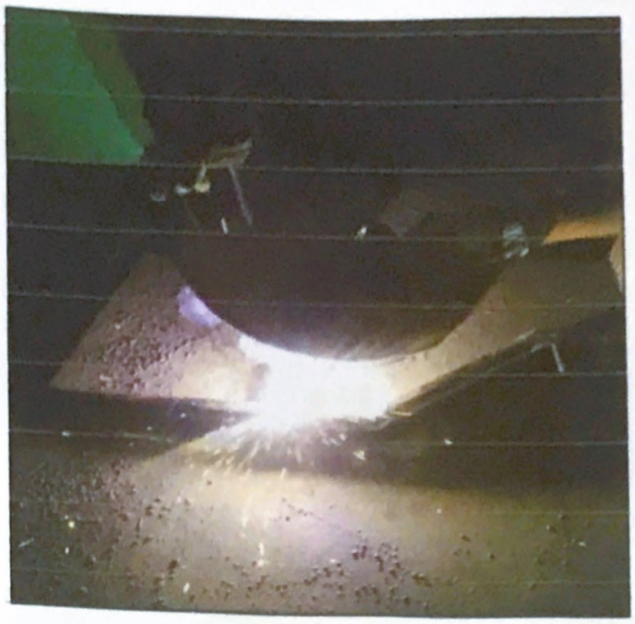


Figure 4.7 Weld the handle

Figure 4.8 After the handle had been weld, we grind to make the surface even smooth.

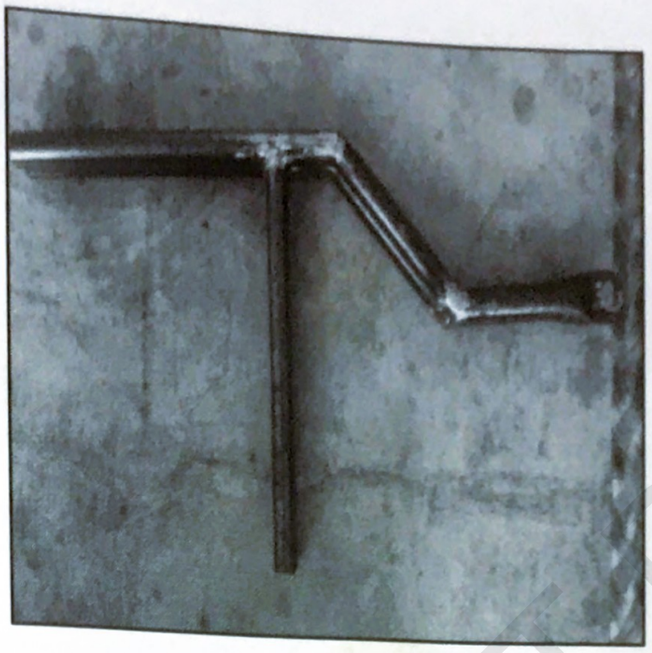


Figure 4.9 The frame of the handle

4.4 CONCLUSION

Therefore, there are some improvements that been made in the project design, design new projects resulting from the problems that occur in the design of which has been adopted in the production of this project. We focused to model the project design in the computer aided design and make calculation for some components.

CHAPTER 5

SYSTEM IMPLEMENTATION

5.1 Introduction

The project built should bring benefits not only to students but for the future as well. Our project is well done and attached. Test run must be held in order to make sure our product works. The test result can be determined either the project has achieved objectives. Project is considered successful if no or less problems occur during the test drive is done.

5.2 Tidiness and Durability

Tidiness aspect is to ensure the tidiness on our product is well taken precisely. Therefore it is important to concern about durability of material chosen. In terms of the selection of materials are also of great concern because it will affect the durability factor in the production of our projects. To make sure the tidiness of our project, we sprat the roller by using spray painting so that it would be tidier and directly the corrosion can be prevent. The purpose of tidiness is to make it more attractive.

5.3 The Purpose of Analysis

Improvement and further modification is made if any parts having failure of its function causing error while the operation process. If there is any problem encounter during the first test run, the second test run should be made to overcome the problem. Comparing is done after second test run initiated to contrast the before and after modification had been made. The purposes of analysis are:

- ✓ To ensure the oil seed roller collector runs well.
- ✓ To ensure the collect the collection of oil seed at the farm plantation can be made.
- ✓ The ring roller on the oil seed roller collector is focused to collect all the oil seed at farm plantation.

5.4 Analysis

Analysis is the process of breaking a complex topic or substance into smaller parts to gain a better understanding of it. Analysis includes the requirements, structures, mechanism, system and dimension.

5.4.1 Analysis of Oil Seed Roller Collector

Table 5.1 Project test run result

Test	No. Of Oil Seed Collected	Overall oil seed used for test	Pass/ Failure
1	5	10	Pass

5.4.2 Identifying Problem

There are some problems occur during the completion of our project. The problems are as stated below:

1. The oil seed are limited to find.
2. No permission for us to test run at oil palm plantation.
3. The gap of the roller cannot suck too much oil seed.

5.5 Operating

1. Check whether the roller is in clean condition without any particles such as leaves or stones.

2. Adjust position while holding the handle.

3. Push the handle to move the roller.

4. As the roller moves, it will suck the oil seed into it.

5. To remove the oil seed, open the gap of the roller a bit and gently shake the roller since the rod are flexible.

6. The machine is quite easy to use since it is manual. The handle can be pull and attached back from and to the roller if a person wants to take out the roller.

5.6 CONCLUSION

Based on our project objective, we achieved to design a roller collector as planned. We have also achieved to collect palm oil fruit. Lastly, our project is easy to be handled since it operating manually. We managed to collect the fruits even it does not collect a lot.

CHAPTER 6

CONCLUSION

6.1 INTRODUCTION

In process doing the final project, we learned from this project that designing and fabricating is not easy job. Many factors have to be considered also to calculation to be repeated many times. This needs a team effort and more experience since we are student for that out project is limited.

Students are exposed into actual working environment or situation which enhance students' knowledge and skill to instil the qualities of integrity, responsibility and self-confidence. Students also exposed to safety practices and regulations in industries as well as develop spirit of teamwork among students and fellow supervisors or lecturers. This program also access students' ability and competency in their preparation to join the workforce upon completion of their study in Mukah Polytechnic Sarawak

6.4 RECOMMENDATION AND SUGGESTION

During the time to complete this project, there are too many knowledge and experience that have we gained. We have tried our best to complete this project without any problems, but there is still a problem that cannot be avoidable by us. For future recommendation, we suggest that:

- To design a shorter and rounder roller
  - ✓ This is because a shorter length of roller would be able to suck in the fruits more.

- Change the handle from two into one
  - ✓ This is because it would be suitable for any height.

6.5 CONCLUSION

As a conclusion, overall processes involved in this project are starting from design concept, fabrication and assembling procedures. We learned very useful knowledge in designing machines especially the computer aided design, welding skills, drilling skill, and others mechanical skill. We have gained new knowledge and experiences through this project carried out. To complete this project, we face various problems bit all can be resolved with cooperation given by member of a group. Finally we able to finish this project within the schedule that we have plan at the beginning.

REFERENCES

Deraman, M. S. (2009). Roller-Type Oil Palm Loose FruitPicker. MPOB Information Series, MPOB TT NO. 419.

Economic Transformation Program. 2013. In Palm Oil and Rubber. Retrieved January 18, 2015, from http://etp.pemandu.gov.my/annualreport2014/

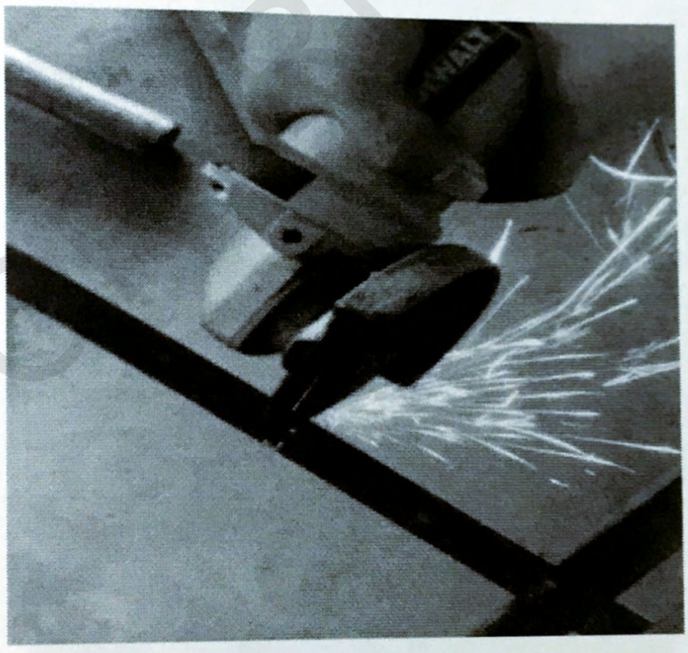
Palm Oil Facts and Figures. 2013. In Sime Darby Plantation. Retrived August 8, 2014, from http://www.simedarbyplantation.com/upload/Palm-Oil-Facts-and-Figures.pdf

Shuib, A. R. 2012. "Oil Palm Loose Fruit Collector (MKIII)". MPOB Information Series, MPOB TT NO. 505.

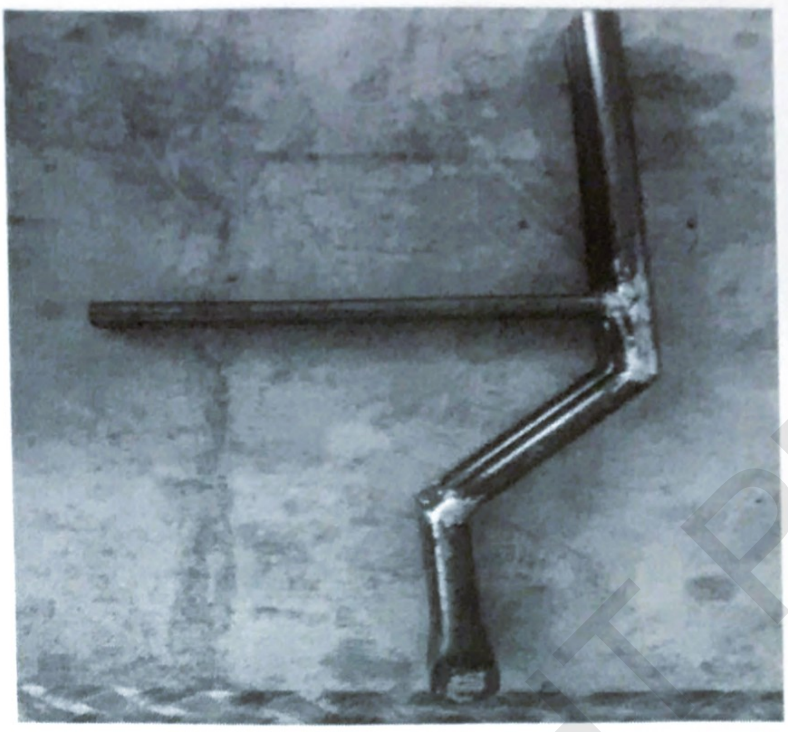
Yusof, A. Z. M. 1995. "Loose Fruit Collector". PORIM Information Series, PORIM TT NO. 19.

APPENDIX

The complete design of oil seed roller collector



The process of grinding or cutting



The frame of the handle

The side of the roller

The process of welding the handle

The roller collector

POLITEKNIK MALAYSIA

MUKAH

PROJECT 2 GANT CHART

GROUP 28
SESSION : JUNE 2017
DEPARTMENT : KEJURUTERAAN MEKANIKAL
COURSE : DJJ6143 PROJECT 2