POLITEKNIK
MALAYSIA
MUKAH

FIELD LINE SPRAYER

ELSIE JANE ANAK JOHN JANA	20DKM15F1133
MAGDALENA BINTI UDOU	20DKM15F1132
MUHAMAD SYAFIQ BIN YUSRAN	20DKM15F1121
NOBERTO NYASE ANAK NYANAU	20DKM15F1126
CHIA MEI CHEE	20DKM15F1130

PROJECT SUPERVISOR
MOHD AZIZEE BIN SUKOR

DEPARTMENT OF MECHANICAL ENGINEERING
POLITEKNIK MUKAH

SESSION: JUNE 2017

FIELD LINE SPRAYER

NAME	REG. NUMBER
1. ELSIE JANE ANAK JOHN JANA	20DKM15F1133
2. MAGDALENA BINTI UDOU	20DKM15F1132
3. MUHAMAD SYAFIQ BIN YUSRAN	20DKM15F1121
4. NOBERTO NYASE ANAK NYANAU	20DKM151126
5. CHIA MEI CHEE	20DKM15F1130

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

PROJECT REPORT VERIFICATION

This report entitled "**FIELD LINE SPRAYER**" has been submitted and reviewed as to meet the conditions and requirements of project writing.

Reviewed by:

Supervisor 1 : MOHD AZIZEE BIN SUKOR

Signature :

Date : 17TH MARCH 2017

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

1. Signature : 
   Name : ELSIE JANE ANAK JOHN JANA
   Registration Number : 20DKM151133
   Date : 17TH MARCH 2017

2. Signature : 
   Name : MAGDALENA BINTI UDOU
   Registration Number : 20DKM15F1132
   Date : 17TH MARCH 2017

3. Signature : 
   Name : MUHAMAD SYAFIQ BIN YUSRAN
   Registration Number : 20DKM15F1121
   Date : 17TH MARCH 2017

4. Signature : 
   Name : NOBERTO NYASE ANAK NYANAU
   Registration Number : 20DKM15F1126
   Date : 17TH MARCH 2017

5. Signature : 
   Name : CHIA MEI CHEE
   Registration Number : 20DKM15F1130
   Date : 17TH MARCH 2017

ABSTRAK

Mesin penggaris padang adalah mesin yang menghasilkan semua jenis garisan padang. Mata manusia mudah tertarik kepada bentuk geomatrik yang sempurna. Perkara ini menjelaskan kenapa peminat-peminat sukan sangat menghargai padang yang kemas. Selain itu, perkara ini juga memberi penjelasan tentang proses menghasilkan garisan padang kepada pelajar. Projek ini membuat satu kajian tentang bagaimana untuk menghasilkan dan bagaimana mesin berfungsi. Dalam melaksanakan projek ini, banyak kaedah yang digunakan sebagai plan untuk meningkatkan bentuk asli kepada bentuk yang baharu sebagai sampingan pelajaran dan sebagai penerangan yang lebih baik kepada pelajar. Proses untuk menghasilkan mesin penggaris padang ini adalah mengimpal, kerja mencanai dan kerja menyembur cat.

LIST OF TABLES

LIST OF FIGURES

CONTENTS

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Field line sprayer are used throughout the world to provide perfect field line. The principle advantage of field line sprayer is it produce bright lines from any angle. Therefore, whenever the straight lines are desired for the field (rugby and football field), field line sprayer is often the system choice. Field line sprayer require the use of a pump that is usually supported by the roller. There are many different pumps available for use either it is for aquaculture or industrial. For the line markings, it is a good choice to purchase pump sprayer.

1.2 PROBLEM STATEMENT

In the past, the roller system can only make the fixed line size and cannot be changed. This fixed line size gave difficulty to other user when they need to create field line. Other than that, the system required expensive cost for the spray. It is hard for the customer to willingly buy the spray with high cost. Next, the previous field line sprayer used the special paint for the line maker. The solution for this problem is we are going to design and fabricate the cheap and affordable machine compare to the previous system.

1.3 OBJECTIVES

The objectives of this project are

a) To fabricate and design a field line sprayer using spray system
b) To design a line sprayer that can change the size of the line without the help of roller.

1.4 SCOPE

The scope of this project is the field line sprayer only can be used specific for football and rugby field. Furthermore, the limitation for the line size is 2-inch minimum and 3-inch maximum.

CHAPTER 2:

LITERATURE REVIEW

2.1 INTRODUCTION

An idea to design is to aim on how to facilitate and solve problems on the old products or give a new image to the existing products. Design and ideas come from result where the problem faced by students during the learning and teaching. Once a problem is identified, a brief design is specified. Field line sprayer was created to produce bright, straight lines over even the roughest terrain. Besides, this project was created to produce a prototype of field line sprayer which is friendly to nature and student in Polytechnic Mukah. This project was created to overcome the problem for users to understand the method of line markings by practical and understand the usage of this method in real life. Pump system is the chosen concept for this project.

2.2 TYPE OF FOOTBALL FIELD

The vector stencils library "Soccer (Football) fields" contains 5 association football pitch templates. "A football pitch (also known as a football field or soccer field) is the playing surface for the game of football made of turf. Its dimensions and markings are defined by Law 1 of the Laws of the Game, "The Field of Play". All line markings on the pitch form part of the area which they define. For example, a ball on or above the touchline is still on the field of play; a ball on the line of the goal area is in the goal area; and a foul committed over the 16.5-metre (18-yard) line has occurred in the penalty area. Therefore a ball must completely cross the touchline to be out of play, and a ball must wholly cross the goal line (between the goal posts) before a goal is scored; if any part of the ball is still on or above the line, the ball is still in play.

2.3 ASSOCIATION FOOTBALL PITCH TEMPLATE

Association football pitch templates, vertical football field, vertical soccer field , sideline view football field, sideline view soccer field, horizontal football field , horizontal soccer field , end zone view soccer field .

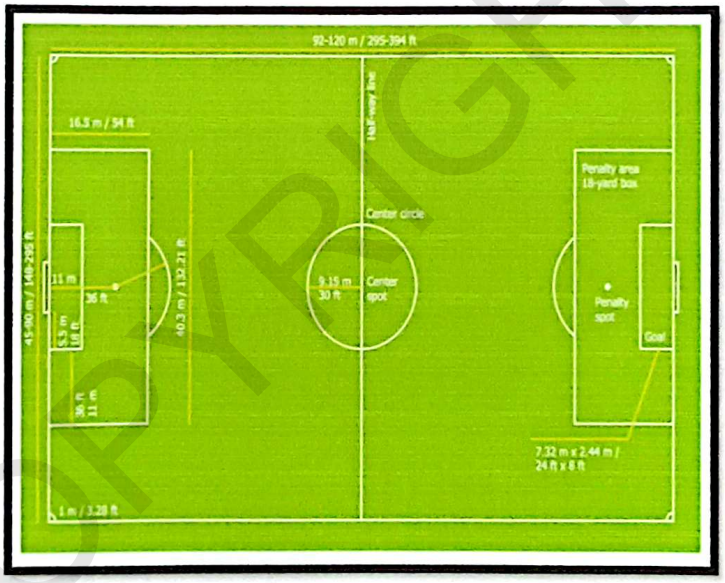


Figure 2.1: Football View Field

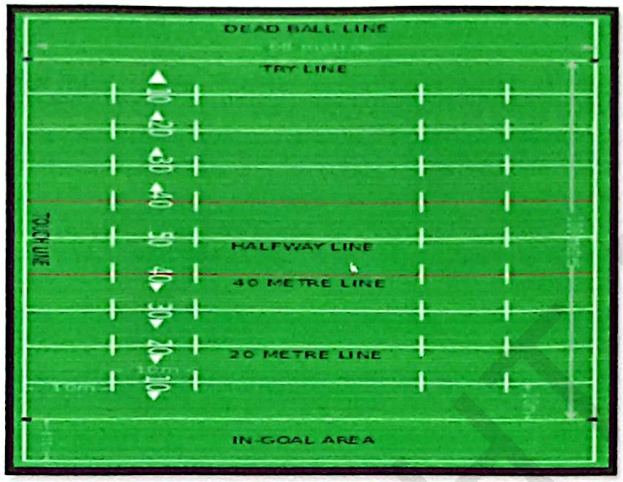


Figure 2.2 : Standard Dimensions and Markings of a Rugby League Field

The **rugby league playing field** (figure 2.2.1), also referred to as a **pitch** or **paddock**, is the playing surface for the sport of rugby league football and is surfaced exclusively with grass. The dimensions and markings of a full-sized playing area are defined in Section 1 of the *Laws of the Game*. These Laws are the agreed upon and maintained by the Rugby International Federation. The playing field is defined as "the area bounded by, but not including, the touch lines and dead ball lines" by Section 2. If the ball or any player in possession of it makes contact with the touch lines or dead ball lines or the ground beyond them it is deemed to be out of play. The rugby league field also has markings to denote where restarts, such as scrums, should be placed. Rugby league is played on a field 112–122 by 68 metres (122.5–133.4 × 74.3 yards). The longer boundary lines are *touch lines*, while the shorter boundary lines are *dead ball lines*. The touch lines and dead ball lines are out of play.

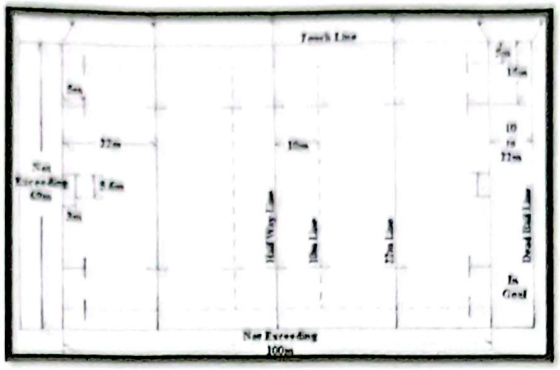


Figure 2.3: Rugby Union Field

Near each end of the field is a *goal line*, or try-line; they are 100 meters (109.4 yards) apart. A scoring area called the *in-goal area* extends 6–11 meters (6.6–12 yards) from each try-line to each dead ball line. Most play will occur within the *field of play*, this "is the area bounded by, but not including, the touch lines and goal lines".When the team in possession of the ball is attempting to score a try, the goal line is included in the in-goal area, grounding the ball correctly on either is a try. When the team in possession is attempting to return the ball to the field of play from their own in-goal area the goal line is part of the field of play. A team caught with the ball in their own in-goal must restart play with a drop kick of the ball from between their posts, this usually results in the other team gaining possession. Between the goal lines, broken lines run parallel to each touch line at 10 and 20 meters from touch. Free kicks are taken 10 meters in from the point where the ball entered touch after being kicked out to gain ground from a penalty. If a scrum is required to restart play and the event that caused it occurred "within 20 meters of a touch line or ten meters of a goal line the scrum shall be brought in twenty meters from the touch line and ten meters from the goal line". **(Figure 2.3)**

2.4 WHAT IS FIELD LINE AND FIELD PAINTING?

All line marking on the pitch form part of the area which they define. Field painting is part of the art and science of sports field management. It's a time – consuming task, but an important one. Painting creates the functional field markings that are essential to the play of the game, and accuracy provides the basis for those close call that decides the outcome of the action on the field. For example, a ball on or above the touchline is still on the field of play, and a foul committed over the 16.5-metre (18-yard) line has occurred in the penalty area. Therefore, a ball must completely cross the touchline to be out of play, and a ball must wholly cross the goal line (between the goal posts) before a goal is scored; if any part of the ball is still on or above the line, the ball is still in play. Marking out lines is a process that requires several elements to fall in place. Before the paint even goes down, there are several things to consider when it comes to evaluating a venue for line marking:

a) Indoor or outdoor venue
b) Is it an existing play field or a newly built venue?
c) Is the venue currently being used?
d) Will the lines require reapplication throughout the season?
e) Which line marking machine is suitable for the application (line width , size of area , etc.)

Understanding what exactly the lines are being used for will assist in getting the measurements of the field and the lines themselves applied correctly.

For example; High school football field

Table 2.1: Field Measurement

a) Hash Marks – Recommended 24" long and 4" wide
b) Yard Markers – Recommended 24" long and 4" wide
c) End Lines and Side Lines – Recommended 6"wide
d) Yard Line Numbers – Recommended 6" high x 4" wide

2.5 HISTORY OF LINE MARKING

Regular marking of sports pitch line has been existence since the late 19th century with the formation of the Football Association and the Rugby Football Union. Each sport's governing body began to develop their own rules and regulations, which led to each sport having their own particular pitch markings. Also, at around the same time, the All England Croquet Club decided to offer lawn tennis as an added attraction. Markings were used earlier in cricket following the foundation of the Marylebone Cricket Club (MCC) and the creation of a Code of Laws requiring the wickets to be pitched 22 yards apart. Most, if not all, of these sports were played on grass surfaces and required some form of line marking. Some of the earliest marking materials used were wood shavings and dust. Eventually this progressed to chalk and limestone materials that could be crushed into simple dry marking compounds and easily spread. Being while, the chalk and limestones materials reflected the lights, thus enhancing the visibility of the lines. A further development saw these materials being mixed with the water which acted as a carrier enabling more efficient use of the materials. At this time a simple transfer wheel marker was designed and developed to apply this liquid mix of chalk/limestones and water. Early marking materials did not have the ability to last long, being easily washed out during rain. To overcome this problem some ground staff resorted to adding weed killers or substituting white line marking materials with creosote. The

use of these materials generally killed off the grass, and between the 1960's and 1980's was an accepted practice. Law now bans the use of lime and creosote. During the 1960's and early 1970's a wide range of marking machines became available, better designed with enhanced engineering techniques giving an improved wheel performance. Pressurized jet systems were being developed allowing the marking out of two lines at once and giving an alternative method of application.

2.6 MARKING MATERIALS

Today we have a wide range of marking products available , applied through a variety of machines and applicators . Marking materials are designed to produce either permanent or non permanent lines :-

i. Non Permanent Materials

a) Powders . Chalk based products mainly for use on grass surfaces. The powder can be used on its own using a gravity fed dry marker or be mixed with water or emulsion products to produce a liquid and used in transfer wheel markers or some spray markers.
b) All Weather Surface Compounds . Special dry compounds for use on redgra, black ash and similar
c) Liquids . Water based paints and emulsions can be used on all grass and artificial surfaces (not redgra / black ash) . Can be supplied in a ready to use form or concentrated . Used in transfer wheel or spray markers .

ii. Permanent Materials

a) Paint . For use on playgrounds , car parks , sport halls and areas that need frequent washing . Applied by brush or a pump system sponge roller.
b) Aerosols . For use on grass or all hard surfaces . Can be applied by hand , with a handgun applicator , or a purpose built wheeler applicator .
c) Tapes . Plastic for use on grass or gravel / Redgra type surfaces . Fixed with nails or tracks .
d) Redcrock Pitch Line. A new concept involving the stitching of UV treated polypropylene material into the surface of the pitch using a specialist machine

. Produces a permanent line that , according to the manufacturer , is guaranteed for ten years .

2.7 MARKING MACHINE

The use of modern plastics and design technology has brought about a revolution in the development of pitch marking machines . They now come in a range of shapes , sizes and systems .The quality of line marking will be determined by a number of key factors :

a) Type of surface and surface conditions
b) The suitability of the machine / line marker used.
c) Selection and preparation of marking materials.
d) Experience and skills of the users.

Figure 2.4 : Dry Line Marker

For use on grass , redgra and clay. In some instances , particularly on muddy surfaces , it is still the best method of producing lines . Materials used for dry line markers come in various forms. These whitening powders are non toxic and are based on ground natural calcium carbonate . Hydrated Lime (Calcium hydroxide)

should never be used for line marking . It is toxic and can give rise to chemical burns and irritations . It can cause serious damage to the eyes and skin on contact in both its dry and wet forms .

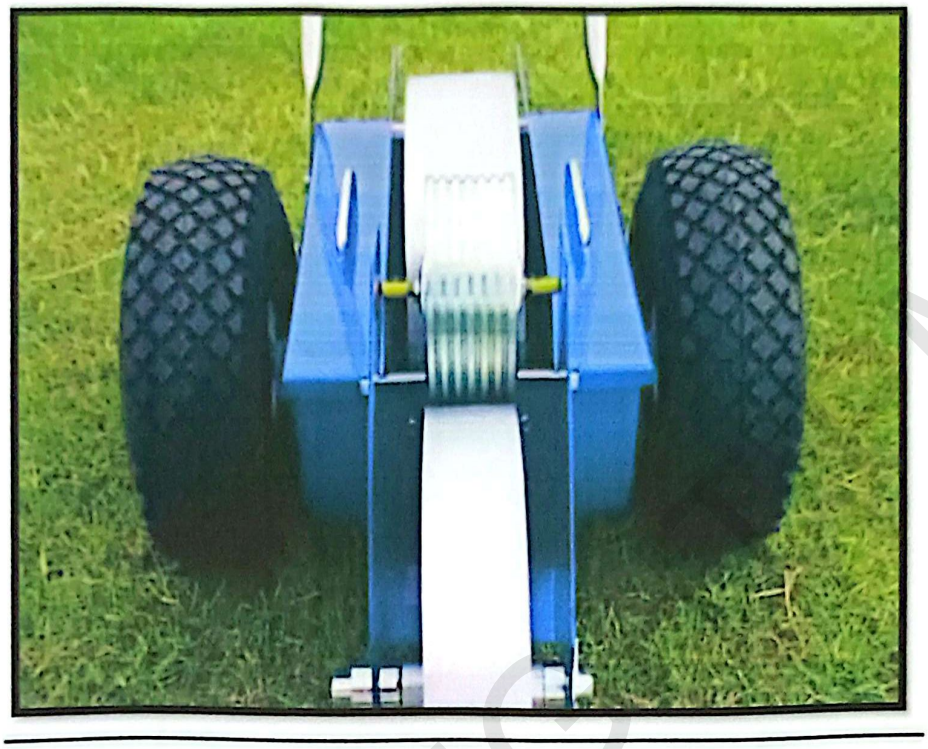


Figure 2.5 : Transfer Wheel Marker

This machine is used on grass surfaces . Width of line is dependant upon the width of the marking wheel , and can vary from 1 inch (25mm) to 4 inch (100 mm) . Best results are achieved when string lines are used as a guide . A reasonable amount of grass cover is required to produce a good line . These machines do not produce good lines when the ground condituons are wet and muddy . A problem can arise if loose grass clippings are picked up by the marker wheel , as they can clog up the machine .

Figure 2.6 :Belt Transfer Marker

For use on grass . Line width depends upon the width of the belt and can vary from 2 inch (50mm) to 4 inch (100mm) . This machine do work very well , giving a bright clear line , however the marker will not work effectively on muddy surfaces. As with the transfer wheel marker, if powder and water is used , it is important to mix them in a bucket before pouring into the tank to reduce the likelihood of clogging the mechanism with lumps. For use on all types of surface. The line width is variable , set by adjusting the metal guides at each sides of the nozzle. Some of the machines also have an automatic self clean functions . Spray line markers can have a variety of attachments for marking different surfaces , hand spraying and marking more than one line at once .

Figure 2.7 : Aerosol Markers

These line markers are very simple and effective . Aerosol spray markers come in a manner of designs – hand held applicators , two and four wheel markers .For use on artificials and tarmac . Can be used on grass but not an economical option . Wheeled applicators come in two and four wheeled options, with some that can be converted into either mode . Basically , the carriage holds an aerosol can in a inverted position with a hand spray release lever that allows you full control over the spraying . The width of the line is determined by the height of the can holder that is controlled by an adjustment screw on the handle of the marker . The spray quality can also be affected by wind turbulence ,the aerosol spray is very fine and can easily be influenced by poor weather conditions . Some markers are fitted with wind shields to prevent spray drift . The surface being sprayed must be clean and dry for maximum adhesion of paint . The advantages of using aerosol markers is the speed of use . There is no premixing of materials , the paint is instant . However, the cans

of paint do not last long . One 750ml can usually cover (25mm width line) about 70 meters, but this will be dependant on the surface being marked .

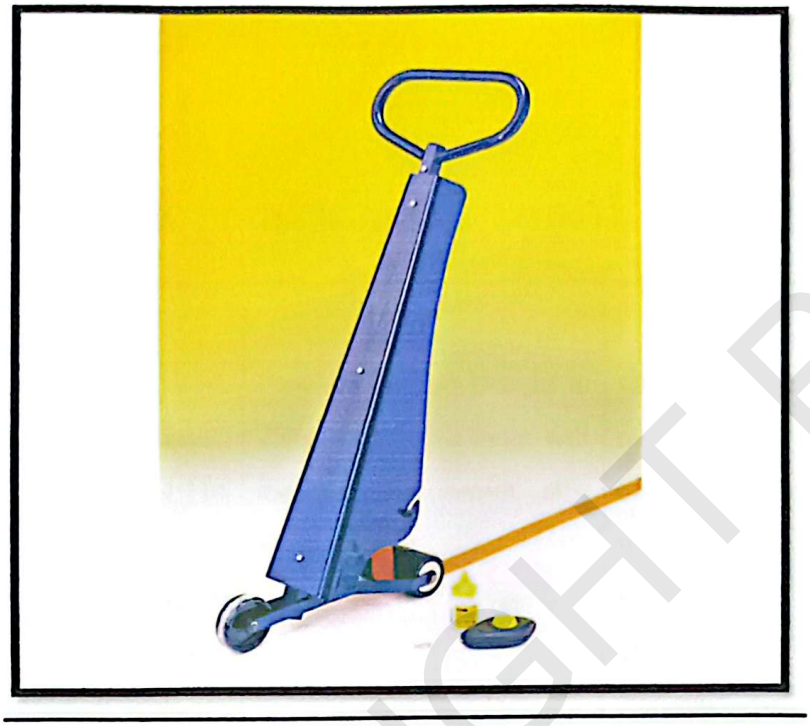


Figure 2.8 : Tapes

Tapes are used on redgra / clay tennis court sixed plastic tapes are secured to the playing surface by tacks or screws . With the development of better marking materials the use of tapes is now on the decline.

2.8 THE PROS AND CONS OF LINE MARKING

Table 2.2 : The Pros and Cons Of Line Marking

Method	Materials	Pros and Cons
Dry Line Markers – A variety of shapes and sizes , generally constructed of lightweight materials and come in two and threes wheeled versions. Materials holding capacity is usually 25kg.	Powders can be bought in 25kg bags . 1-2 bags will mark out a senior size football pitch .	One of the cheapest line marking .It is a very easy operation with no mixing required . However it is important to keep the materials dry ; using damp materials will affect the performance of machine . Very effective when having on wet and muddy surfaces as there is no need for surface contact .
Transfer Wheel Markers- Offer a range of marking widths , with different tank capacities .	Powders mixed with water and emulsion products can be used.	. Easy to use. The quality of line can deteriorate on muddy and very wet surfaces . Machines can get blocked up with debris picked up on the marking wheel . Ready made fluid saves time compared to mixing powder and water .

Spray Jet Markers – Now becoming the most popular line markers of natural turf on the market, they are fast , reliable and easy to operate . Some even have a tank washing process built into the unit for ease of maintenance .	Various emulsion products available on the market in a range of colours.	Fast and efficient . Large tanks . Easily adjustable line widths . Some models are self cleaning . This technology has enabled the development of ride on markers that can complete a pitch in 10 minutes . A range of attachments available for multi line marking and for spraying .
Aerosol Sprays – Quick and convenient marking system for permanent paint marking requirements , usually used on hard surfaces , school playgrounds and car parking areas .	A range of colours are available in 750 ml.	Quick and easy to use, however spray quality can be affected in windy conditions . Expensive if marking large areas .

2.9 PREPARATION AND LINE MARKING

On grass surfaces, line marking is normally the last task to be undertaken after brushing and cutting. This will remove any debris from the surface and prepare the grass for receiving the marking fluid. On synthetic and hard surfaces, brushing is required to remove any debris. The users need to be aware of the marking requirements of the particular sports. Poor line marking is generally attributed to poor preparation and poor attitude to the job or, in many cases, not having enough time allocated to this task.

2.10 BASIC CONCEPT OF PUMP

A pump in general is a machine which imparts energy to anything flowing through it. This can be any fluid, heat or even electrons. The devices pumping heat are called as heat pumps and electrical batteries can pump electrons. The spontaneous tendency of anything is to flow from high potential to low potential and this natural tendency is harnessed in many applications. But the pump does exactly the reverse; it forces something to move from low potential to high potential. For this purpose, pumps use energy and by their functioning transfer that energy to the substance flowing through them. Fluid pumps or Hydraulic pumps move fluids and displace them from one position to another and in course energizes them. In fluids this energy is manifested as its pressure and velocity. Similarly, heat pumps move heat from low temperature to high temperature against its natural tendency to flow from high temperature to low temperature. An electrical battery is also a type of pump; it pumps electrons in a circuit from low electrical potential to high electrical potential which is against the spontaneous tendency of electrons to move from high electrical potential to low electrical potential. Hence, an electrical battery can be called as an Electron Pump.

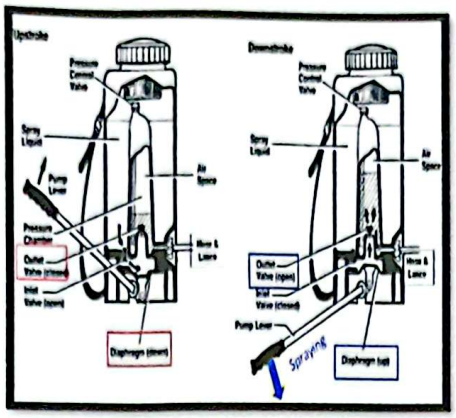


Figure 2.9 : Pump

2.11 FIELD LINE SPRAYER

Figure 2.10 : Field Line Sprayer

The field line sprayer in market is using graco high-pressure airless paint spray technology. It can coats both sides of grass blade in a single pass. Besides, it also durable light-weight design for years of uninterrupted use and at only 80 lbs (36kg) it's easy to load and unload. Exclusive-tall wheel cart rolls easily over ruts and cleat marks, resulting in less operator fatigue and straighter lines. It is fully adjustable spray guides make line width adjustments fast and easy without tools.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

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 explained in orderly. Methodology was a process that involve from starting to finish the project. The project started by identifying the problem that is faced by the user in using the field line sprayer to a better condition. By the end of the discussion, we have obtained and published the objectives, project and scopes.

3.2 PRIMER DATA

After getting some advices from our supervisor, the next step that we are going to do is discussion among the project members to gain access to information and build good relationship among us. This is very essential to create a harmonious working environment in the process of completion of the project.

P.R.I.M.E

3.3 PROBLEM

Problem is identified through observation of the existing field line sprayer. We also did some interview with random lecturer for further information about this project.

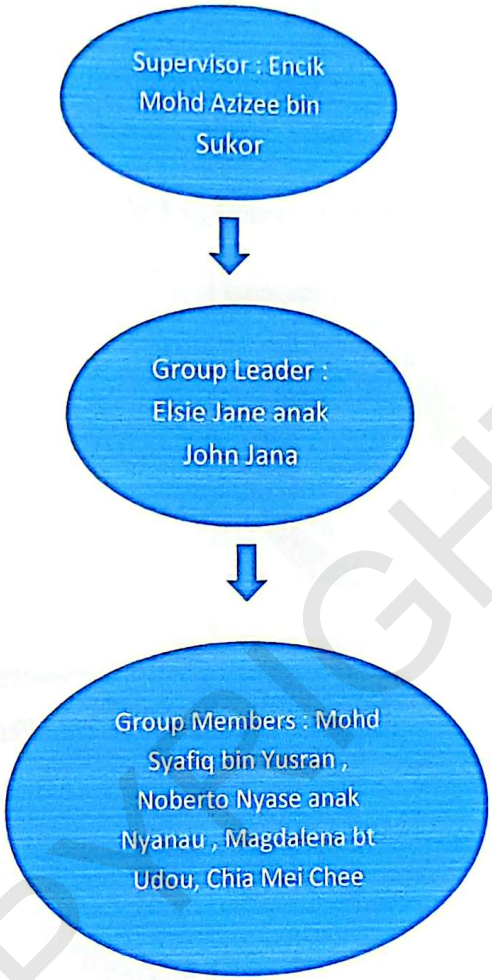
3.4 RESEARCH

We have done some research and study on the field line sprayer through internet and interview among the lecturer who are expertise and experienced in handling the machine. We have found that there were several problems in the existing field line sprayer as described above. To conclude, we want to improve the previous machine in order to give satisfaction to the user.

3.5 MODIFICATION

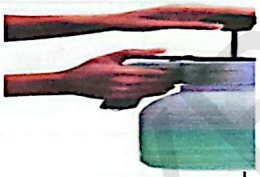
The new field line sprayer that we are going to design and fabricate is a modification from the existing machine.

3.6 GROUP FLOWCHART



3.7 CONCEPT GENERATION

Table 3.1 : Concept Generation

Mechanism	Concept 1	Concept 2	Concept 3
Wheel			
Pump Sprayer	 		
Oil Paint			

3.8 CONCEPT GENERATION AND EVALUATION

Table 3.2 : Pugh's Method

Evaluation Criteria	Importance	Concept 1	Concept 2	Concept 3
Safety	5	+	+	+
Easy to Operate	5	+	+	-
Less Risk of Injury	8	-	-	+
Esthetic	4	+	+	-
Lightweight	5	+	+	+
Price	8	-	-	+
Durability	9	-	-	+
Total (+)		4	4	5
Total (-)		3	3	2
Total		3	2	2

It is implemented by establishing an evaluation team, and setting up a matrix of evaluation criteria versus alternative embodiments. This is the scoring matrix usually associated with the QFD method and is a form of prioritization matrix. Usually, the options are scored relative to criteria using a symbolic approach (one symbol for better than, another for neutral, and another for worse than baseline). These get converted into scores and combined in the matrix to yield scores for each option.

3.9 ERGONOMIC APPLICATION

Definition of Ergonomics is the scientific discipline concerned with designing according to human needs, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance. Ergonomics is the applied science of equipment design, as for the workplace , intended to maximize productivity by reducing operator fatigue and discomfort .

Ergonomics field that being use are machine designs , hand tools and physical work.

a) Machine design - The design of the field line sprayer is created with the dimension of 2 inch minimum and 3 inch maximum

b) Hand Tools – Size of a finger and placement are different from person to person , avoid using tools whose handless have built-in finger grooves . When fingers do not naturally align with with \sure that tools handless are free from sharp edges and seems that might irritate and cut the hand . Choose tools with handles that are covered in a soft material , like foam or flexible plastic . Cushioned handles are not only comfortable for long hour of use , but they provide a much firmer grip and cut down slip age . Hard-handle tools can be quickly and inexpensively coverted by just adding a sleeve. If you need a forcefully pinch or grip an object for an extended amount of time, prevent muscle strain by switching from standard pliers to a clamp or grip . Only use tools allows you to work with your wrist in a straight position .The combined effect of good cognitive and physical ergonomics lead directly to consumer pleasure , fulfilment , and immediate acceptance of the product .Ergonomics reduces learning curves and limits the amount of customer education required for product sell-through . In total , good ergonomics directly contributes to the success of the product and can be measured quantitatively in terms of customer satisfaction , market share and profitability . Well-designed products sell. Poorly designed ones do not .

3.10 HEALTH AND SAFETY

As with many work based activities Health and Safety is paramount when carrying out line marking operations. Careful planning and recording of the work carried out should be undertaken. It is also a requirement to carry out risk assessments of the line marking task in relation to the nature of the hazard, degree of risk and the actions taken to minimize the risk. Use only safe and approved compounds that are currently available on the market. Do not use old compound. For safety precautions, we were using PPE (Personal Protection Equipment)

3.11 FABRICATION METHOD

a) Welding

Figure 3.1 : Welding

The type of welding that we applied is arc welding. Arc welding is a process that is used to join metal to metal by using electricity to create enough heat to melt metal, and the melted metals when cool result in a binding of metals. It is a type of welding that uses a power supply to create an electric arc between an electrode and the base material to melt the metals at the welding points. They can use either direct (DC) or alternating (AC) current, and consumable or non-consumable electrodes . The

welding region is usually protected by some type of shielding gas , vapor , or slag . Arc welding can be manual , semi-automatic or full automated.

b) Spraying Work

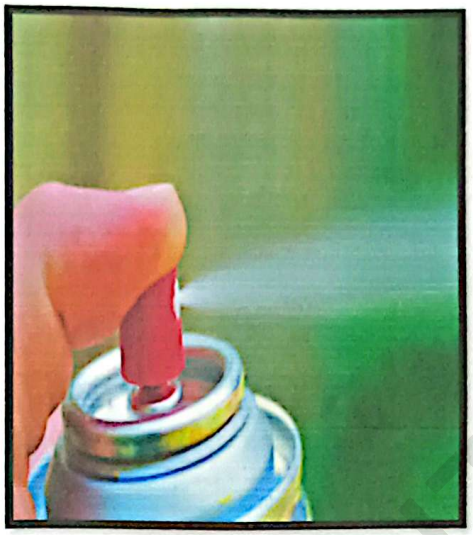


Figure 3.2 : Spraying Work

Spray painting is a painting technique where a device sprays a coating (paint,ink,varnish,etc) through the air onto the surface. For paint job, we use aerosol spray to spray the part of our project. The purpose is to avoid the body part become rusty besides of making the field line sprayer looks tidy and beautiful. Single color aerosol paint cans are portable and easy to store .

c) Drilling

Figure 3.3 : Drilling

Type of drill that were used is common drill . Drilling is a cutting process that uses a drill bit to cut a hole of circular cross-section in solid materials. The drill 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 . This forces the cutting edge against the workpiece , cutting off chips (swarf) from the hole as it is drilled .

d) Grinding

Figure 3.4 : Grinding

For grinding work, equipment commonly used is the grinder with different cutters. For example, cutters are used to cut steel and remove remnants of spatter and eye brush for a smooth surface finish. Before engaging in the process of painting field line sprayer adjustable parts and body frames, it should be brushes with sandpaper to produce a flat result paints and tide.

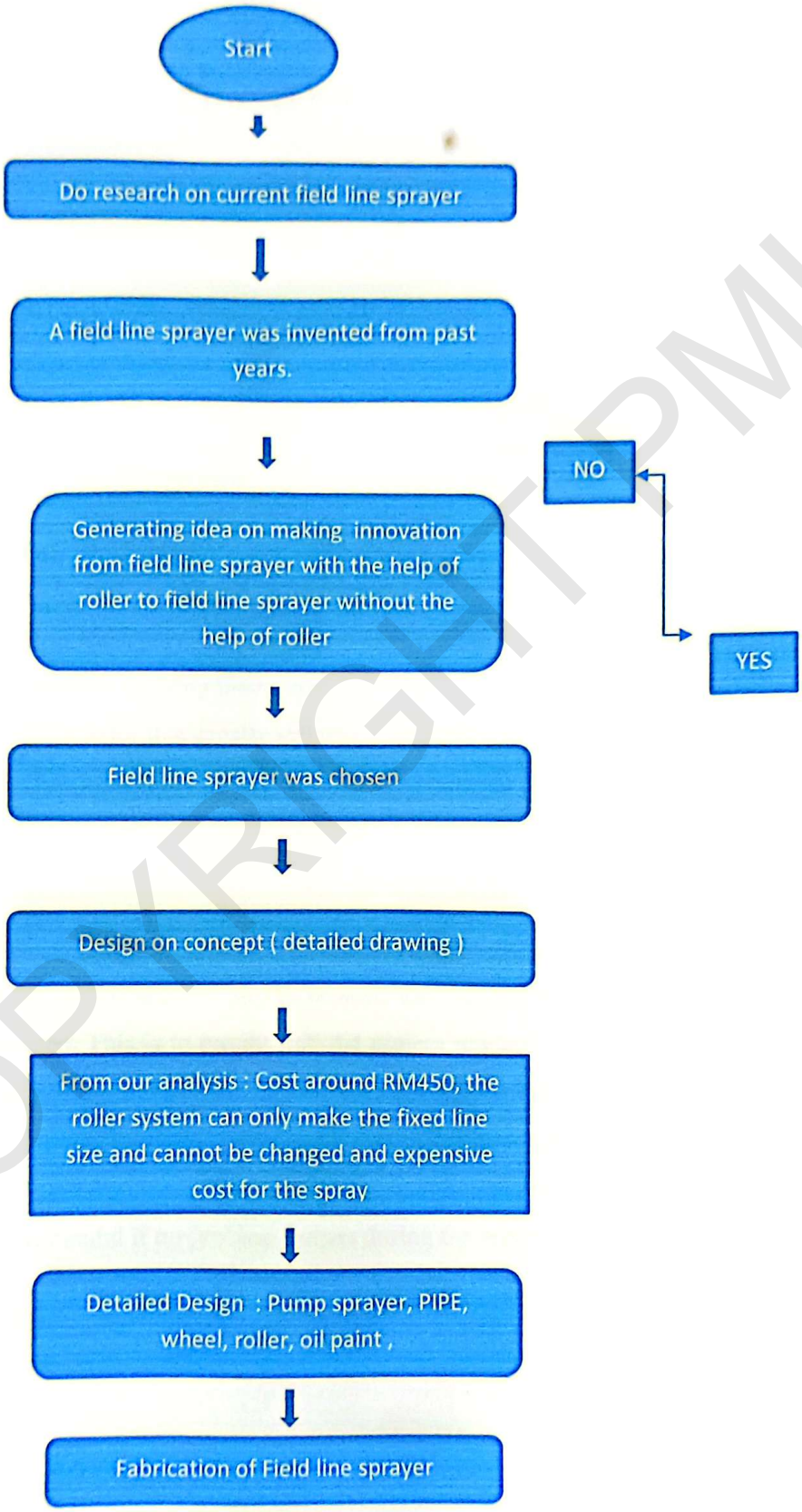
3.3 MATERIAL SELECTION

Different types of materials are used to fabricate the field line sprayer . This is because every part of the machine needs different type of component and material hat need to be taken seriously to avoid any weakness and unstable condition .

Table 3.3 : Material Selection

MATERIAL	DESCRIPTION
Wheel 	A wheel greatly reduces friction by facilitating motion by roll. Wheel is the best choice to replace the older roller because it is last longer. It also minimize the vehicle wear. in together with the use of axles.
Black Steel Pipe 	Black steel pipe is made of steel that has not been galvanized . Its name comes from the scaly , dark – colored from oxide coating on its surface. It is used in application that do not required galvanized steel .
Pump Sprayer 	A device for spraying liquid or solutions. It has a tank holds the solution, a pump handle that pressurizes the tank when its hand-pumped and a hose or wand attachment to be able to spray the solution where it is wanted. Also called as pump-up s

3.13 FLOW CHART OF DESIGN



CHAPTER 4

DATA ANALYSIS

4.1 INTRODUCTION

In this chapter, the result of data analysis is presented. The data were collected and then processed in respond to the problems posed in the chapter 1 of this dissertation. Two fundamentals drove the collection of the data and the subsequent data analysis. Those goals were to fabricate and design a field line sprayer using spray system and to design a line sprayer that can change the size of the line without the help of roller. Those objectives were accomplished. The findings in this chapter demonstrate the potential for merging theory and practice, To ensure the good quality of the line, there are two factor that greatly influence the field line sprayer which is a spray system and the line marking.

4.2 THE PURPOSE OF ANALYSIS

After the completion of the project, through assembling the parts, the test run is conducted. This is to ensure that the project produce is a success and hence achieve its objective. Improvement and further modification is made if any parts having failure of its function causing error while the operation process. The field line sprayer is tested for its ability to produce a good line marking. This project will be considering successful if no problem occurs during the test run analysis.

4.3 ANALYSIS

Spray System

Before the test run is conducted, the sprayer had been analysed earlier to confirm the oil paint can be smoothly coming out from the nozzle by using the ordinary and small sprayer. This is important to prevent the oil paint from any blockage.

Figure 4.1 : Spraying

Line Marking

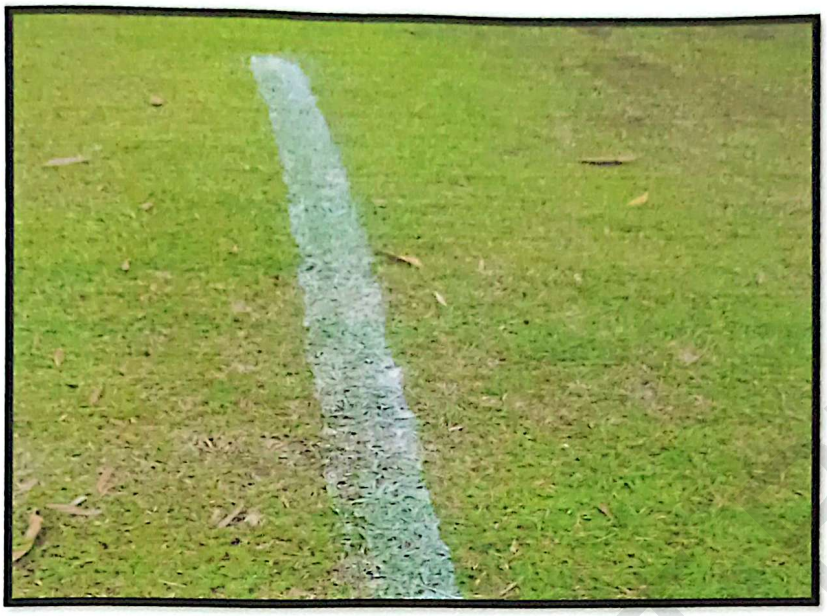


Figure 4.2 : Line Marking

Table 4.1 : Data Analysis

a) The time taken to make one straight line is less than 5 minutes
b) The concentration of the paint must be suitable and accurate . One litre of paint mixed with 4 litre of water
c) The time taken for the line to be dried is 30 minutes . (according to the weather)

CHAPTER 5

CONCLUSION AND SUGGESTION

In this chapter , the discussion, conclusion and recommendation of the results of fabricating Field Line Sprayer are shown . Field line sprayer is a machine that creates lines of the field in a perfect geometry shapes . The line marking produce bright , durable and quick drying . The good quality of line marking liquid will not wash off in the rain .

5.1 DISCUSSION

Problems

Before the test run is conducted, some problems happened as followed:

a) Welding Method

The black steel that has been assemble by welding could not attached perfectly This is because the welding method is not suitable which is weld only at the corner part of the steel.

b) Pump

The result from the spray method is not perfect. This is because the paint is quite concentrate so the pump cannot work well.

c) Wheels

The wheels cannot be function normally because it does not have enough force to pump the liquid in pressure control valve.

d) Sprocket

The sprocket that had been used broke into pieces. This is because the nut and screw are not tightened enough.

5.2 CONCLUSION

As a conclusion, this project entitled Field Line Sprayer is successful. This project had been completed according to the plan. The problems can be settled and overcome by the good teamwork. In addition, the learning technique that had been teaches in polytechnic and the experience that students had gain from the industrial training can bring the good result of the final year project. We had achieved the objectives that had been set out in the early project plan and management.

5.3 SUGGESTION

In the production of the final year project, a range of experience and important knowledge had been obtained. This subject is a very good exposure to the student which it can let the students express their experience, skills, and techniques and practice all the theories and tasks that they have learned during the class, implemented to produce this project.

Based on the discussion and conclusions of the project outcomes, there are some suggestions are given to the next students in order to improve the project. The improvement is important which is it include the improvement of the quality of project. Several suggestions had been made:

a) The schedule allocated for project student doing their project should be doubled, so more time given to finished the project, more, our usage of workshop should not clash with junior student.
b) The workshop should be opened at night according to the suitable time for students and lecturers.

REFERENCES

B, H. (2017, September 8). *https://en.wikipedia.org/wiki/Arc_welding*.

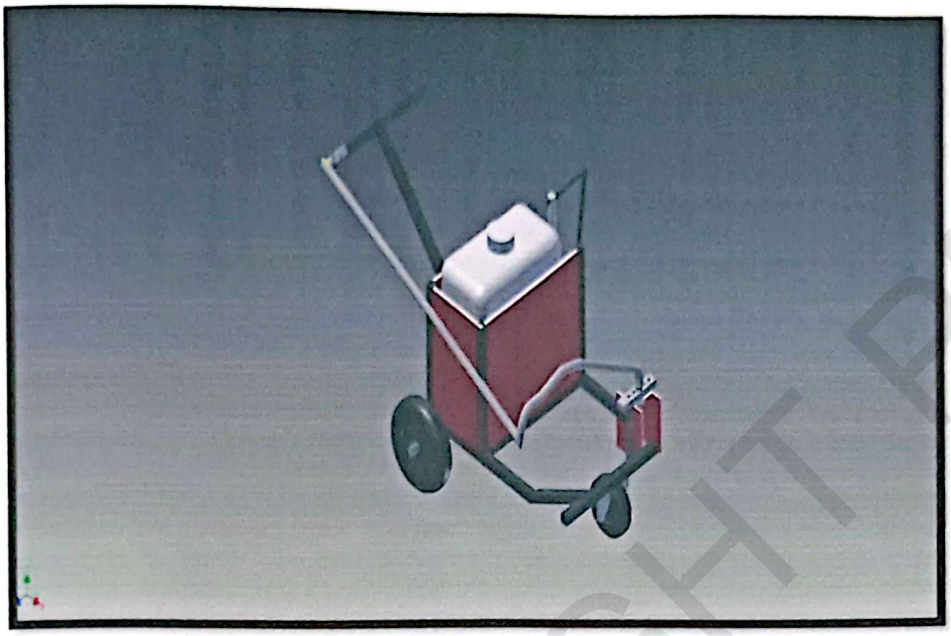
Dawson, P. (2007-2017). *http://www.rugbyhow.com/rugby-field.html*.

Gale, L. (2004, November 26). *https://www.pitchcare.com/news-media/the-art-of-linemarking.html*.

Prme, A. T. (2016, March 21). *https://www.amazon.com/Playing-Field-Line-Striping-Machines/b?ie=UTF8&node=13292501*.

Wikipedia. (2017, October 9). *https://en.wikipedia.org/wiki/Association_football*.

APPENDIX



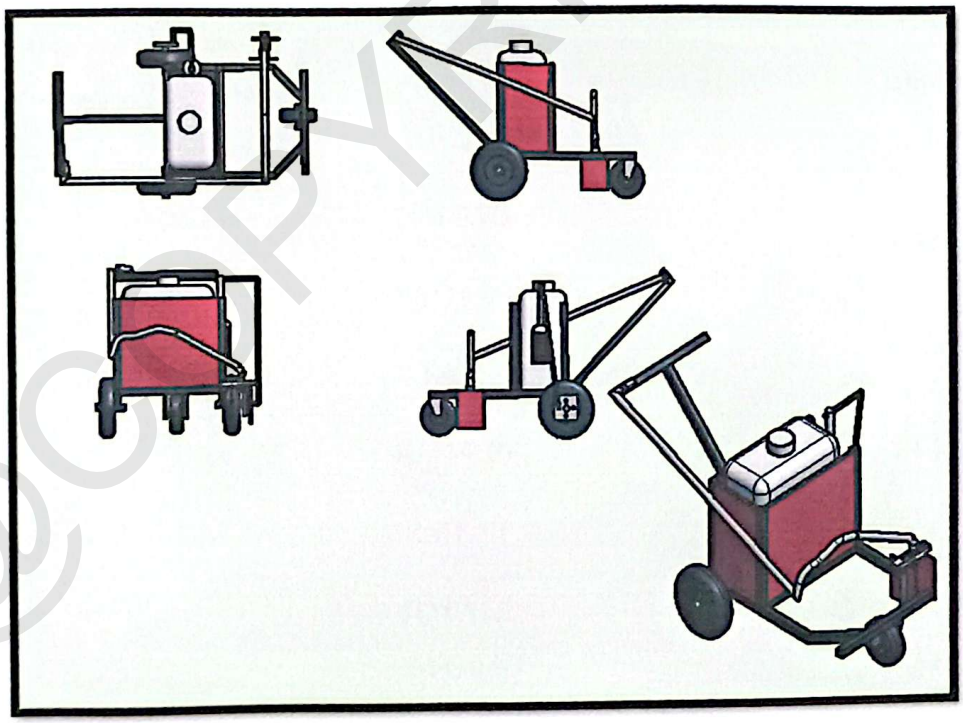


Table 5. 1 Cost Estimation

No	Items	Per Unit	Total Unit	Cost
1	Steel Square Tube	RM78.00	1	RM78.00
2	Crown Plastic Knapsack Sprayer	RM120.00	1	RM120.00
3	Wheels	RM29.00	2	RM58.00
4	PIPE (Steel)	RM67.00	1	RM67.00
5	Thinner	RM6.50	1	RM6.50
6	Spray	RM25	1	RM25.00
7.	Roller	RM25	1	RM25.00
8.	Aluminium Zinc	RM40.00	1 m	RM40.00
9.	Angle Bar	RM 3.70	1	RM3.70
10.	Sproket	RM11.00	2	RM22.00
11.	Sand Paper	RM2	2	
12.	Glue	RM14.20	1	RM4.00
13.	Rod	RM1.50	5	RM14.20
		TOTAL : RM470.90		RM7.50

SESI : DISEMBER 2016
JABATAN : JABATAN KEJURUTERAAN MEKANIKAL
KURSUS KOD : DUS343 PROJECT 1

TASKS/ACTIVITIES	STATUS	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16
1. Course Registration																	
2.Project 1 Briefing(M)																	
3.Project Classification(M)																	
4.Identify the design or case study																	
5.Select the design or case study to be carried out																	
6.Preparing Proposal(M)																	
7.Development of problem statement																	
8.Development of objectives																	
9.Pre-Presentation																	
10.Literature Review(M)																	
11.Define market strategy studies																	
12.Search information from book, jurnal & internet																	
13.Methodology Search (M)																	
14.Identify respondents																	
15.Identify market survey																	
16.Development of design method																	
17.Identify type of product testing/analysis																	
18.Writing Proposal (M)																	
19.Draft Final Project Design & Assembly																	
20.Cost estimation																	
21.Expected outcome from project design																	
22.Exstimation of capabilities/limitation of project																	
23.Development of prototype(where applicable)																	
24.Presentation Skill(M)																	
25.Preparing Presentation																	
26.Review Report																	

Nota
tarikh rancang
tarikh laksana

POLITEKNIK MALAYSIA MUKAH

MECHANICAL ENGINEERING DEPARTMENT

GANTT CHART/PROJECT ACTIVITIES

CODE COURSE : DJJ6143
COURSE : PROJECT 2

SEMESTER/JUNE 2017

		M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16	M17	M18	M19	M20
1	REGISTRATION WEEK																				
2	PROJECT BRIEFING																				
3	PROJECT PLANNING																				
a	PLAN THE DESIGN OR CASE STUDY																				
b	PROJECT SCHEDULE & GANTT CHART																				
c	MATERIAL ACQUIREMENT																				
d	SELECTING APPROPRIATE METHODOLOGY & WORK DISTRIBUTION																				
4	PROJECT FABRICATION																				
a	PROJECT FABRICATION TO 50% PROGRESS																				
b	50% PROJECT PROGRESS PRESENTATION																				
c	PROJECT ASSEMBLY																				
5	TEST RUN & DATA ANALYSIS																				
	DATA ACQUIREMENT																				
b	TROUBLESHOOTING																				
c	LIMITATION AND CAPABILITY ANALYSIS																				
6	SUMMARY																				
a	REVIEW OF PROJECT PROBLEMS STATEMENT																				
b	REVIEW OF PROJECT OBJECTIVES																				
c	REVIEW OF PROJECT LIMITATION/CAPABILITIES																				
7	FINAL PROJECT PRESENTATION 5/10/2017																				

SPECIAL BREAK 1

MID SEMESTER BREAK

SPECIAL BREAK 2

NOTE:

PLAN DATE

IMPLEMENT DATE

POLITEKNIK MUKAH SARAWAK