

FABRICATION OF DISPLAY UNIT FOR ELECTRICAL AND ELECTRONIC
WIRE HARNESS OF SINGLE CYLINDER FOUR STROKE ENGINE FOR
TEACHING PURPOSE

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DIPLOMA OF ENGINEERING
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HARNESS OF SINGLE CYLINDER FOUR STROKE ENGINE FOR TEACHING PURPOSE

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A report submitted for partial fulfillment of the requirement for the Diploma of Mechanical
Engineering award.

Faculty of Mechanical Engineering
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JUDUL

**FABRICATION OF DISPLAY UNIT FOR
ELECTRICAL AND ELECTRONIC WIRE HARNESS
OF SINGLE CYLINDER FOUR STROKE ENGINE FOR
TEACHING PURPOSE**

SESI PENGAJIAN: **2011/2012**

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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 Final Year Project.

Signature :

Name of Supervisor : MOHD FADZIL BIN ABDUL RAHIM

Position :

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STUDENT'S DECLARATION

I hereby declare that this report titled “Fabrication Of Display Unit For Electrical And Electronic Wire Harness Of Single Cylinder Four Strokes Engine For Teaching Purpose” and the result from my research are based on the references that have been used in order to complete it. I hereby declare that the work in this chapter is my own except for quotations and summaries which have been duly acknowledged. The report has not been accepted for any diploma and is not concurrently submitted for award of other diploma.

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DEDICATION

To my parents especially and friends, also for whom with their effort to support me in order for me to pursue study in higher education, and also in order to complete this project and project report to fulfil the requirement for Diploma of Mechanical Engineering award.

To my supervisor too, Mr. Mohd Fadzil Bin Abdul Rahim and all the Mechanical Stuff with their helpful suggestions, guidance and assistance in order for me complete this Final Year Project for diploma course.

ABSTRACT

This project is about to design the display unit for the electric and electronic wire harness of the motorcycle for the teaching. Its purpose is to ease the user to study about the wire harness in the motorcycle without need to tear down the whole bike. This project component is base on single cylinder four stroke engine of Yamaha FZ 150i which is using the injection technology. This project is design base on the sketching from the computer software and manual sketching to place the electronic component of the motorcycle which will ease the user to understand the arrangement of the wire harness in the motorcycle. Understanding the problem of user to identify each component, it has been label and each of them had been described as simple as possible. Each material of the project is using the tough and rigid to built the chassis and resist to any force. It also can be modified for the further development in the future. As the result it has down the cost and satisfied the user about the project purpose.

ABSTRAK

Projek ini adalah bertujuan untuk menghasilkan satu unit paparan wayar dalam motosikal untuk memudahkan pengguna mengenali dan mempelajari system wayar secara ringkas tanpa perlu meleraikan motosikal. Unit paparan yang dihasilkan adalah berpandukan pada system motosikal Yamaha FZ 150i yang menggunakan teknologi pancutan minyak yang lebih efisien dari lain-lain motosikal yang kebanyakannya masih menggunakan system karburator. Projek ini dihasilkan dengan berpandukan pada lakaran gambar berkomputer untuk meletakkan komponen-komponen utama motosikal pada kedudukan yg mudah difahami pengguna tentang fungsi dan tujuan dihasilkan. Memahami aspek masalah yang dihadapi oleh pengguna motosikal tentang system wayar, unit paparan yang dihasilkan lebih mesra pengguna dimana setiap komponen disusun mengikut posisi di dalam motosikal. Penghasilan unit paparan ini menggunakan bahan yang tahan lasak dimana dapat bertahan lama untuk tujuan pembangunan dan penambahbaikan. Keputusan ini nyata sekali menurunkan kos dan meningkatkan kebolehharian produk dan keyakinan pelanggan.

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CHAPTER 1

INTRODUCTION

1.1 Project Background

This project is aiming to fabricate the display unit for teaching purpose. The final product can be use to learn the wiring in motorcycle without need to tear down the whole motorcycle in order to get an overview the whole system. This project also help student to identify any component of electrical and electronic of the motorcycle.

1.2 Problem Statement

The problem of this project is to determine how to simplify the main wire and display it as simple as possible with correct arrangement of the wiring to avoid short-circuit. this aso include to tear down the whole bike to get the main wire of the motorcycle. Then, fabricate the display unit for electric and electronic wire harness of single cylinder four stroke engine.

1.3 Objectives

- i. To tear down the whole part of the motorcycle.
- ii. To design and fabricate the display unit.

1.4 Project Scope

- i. Design the display unit platform and the layout of the electrical wire harness.
- ii. Fabricate the display unit of wire harness that can be used for teaching in the class.
- iii. Label each wire that is connected to ease the user to identify the electrical and electronic component.
- iv. To carry out the finishing work of the display unit.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter will discuss about the component that important in building the motorcycle wire harness. This include all the component that run on electronic part which are fuel injection system, lightning system, ignition system, engine management system (ECU), sensor and actuator.

The wiring system is important because it is the major part of the motorcycle that run on every detail on the motorcycle. If the wiring system is damage, the motorcycle is consider broken even the mechanical part still running smooth. Usually, repairing the wiring system in the motorcycle need an expert about the system and manufacture guide book. This why in the motorcycle guidebook where include about the safety and precaution about the wiring system that user need to be alert.

According to certain website about the motorcycle wiring system, "specific wiring issues regarding a particular vehicle make and model, get a factory manual if you can or at least get a Haynes or Clymer (or similar) manual for your specific make and model. These have wiring diagrams on the back pages. If you are attempting to make parts from one vehicle work in another vehicle, get both manuals, strictly for figuring out what wire serves what function and so you know what to connect to where and what to eliminate"..

2.2 ELECTRIC AND ELECTRONIC OF THE MOTORCYCLE

This is basic component that the motorcycle need in order to run the engine and all the electronic part.

2.2.1 Fuel Injection System

According to the website reference, fuel injection is a system for admitting fuel into an internal combustion engine. It has become the primary fuel delivery system used in automotive petrol engines, having almost completely replaced carburetors in the late 1980s.

A fuel injection system (figure 2.2.1) is designed and calibrated specifically for the type(s) of fuel it will handle. Most fuel injection systems are for gasoline or diesel applications. With the advent of electronic fuel injection (EFI), the diesel and gasoline hardware has become similar. EFI's programmable firmware has permitted common hardware to be used with different fuels.

Carburetors were the predominant method used to meter fuel on gasoline engines before the widespread use of fuel injection. A variety of injection systems have existed since the earliest usage of the internal combustion engine.

The primary difference between carburetors and fuel injection is that fuel injection atomizes the fuel by forcibly pumping it through a small nozzle under high pressure, while a carburetor relies on suction created by intake air rushing through a venturi to draw the fuel into the airstream.

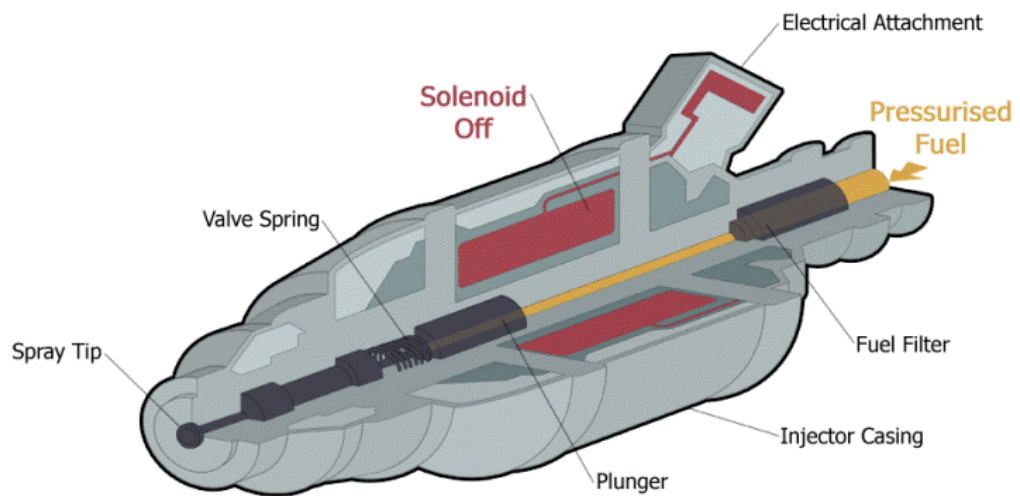


Figure 2.1: Fuel Injection Design

2.2.2 Lighting System

Vehicle lighting systems are very important, particularly where road safety is concerned. A key point to remember with vehicle lights is that they must allow the driver to:

1. See in the dark.
2. Be seen in the dark (or conditions of poor visibility).
3. Sidelights, tall lights, brake lights and others are relatively straightforward.

Headlights present the most problems, namely that, on dipped beam they must provide adequate light for the driver but without dazzling other road users. Many techniques have been tried over the years and great advances have been made, but the conflict between seeing and dazzling is very difficult to overcome.

In Figure 2.2, the sketching about the lighting system in the motorcycle. It showed all wires are connected to the battery as the main source of power.

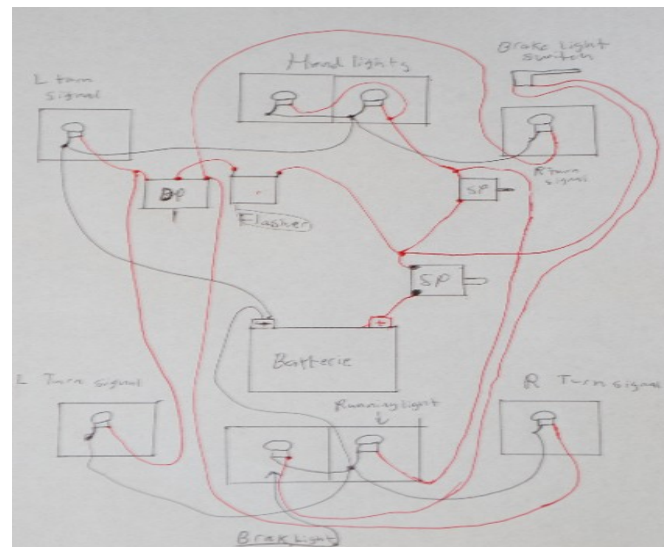


Figure 2.2: Ligting diagram

2.2.3 Ignition System

The fundamental purpose of the ignition system show in figure 2.2.3 is to supply a spark inside the cylinder, near the end of the compression stroke, to ignite the compressed charge of air-fuel vapour. The ignition system has to transform the normal battery voltage of 12 V to approximately 8-20 kV and, in addition, has to

deliver this high voltage to the right cylinder, at the right time. One winding of a coil is switched on and of causing a high voltage to be induced in a second winding.

A coil-ignition system is composed of various components and sub-assemblies, the actual design and construction of which depend mainly on the engine with which the system is to be used.

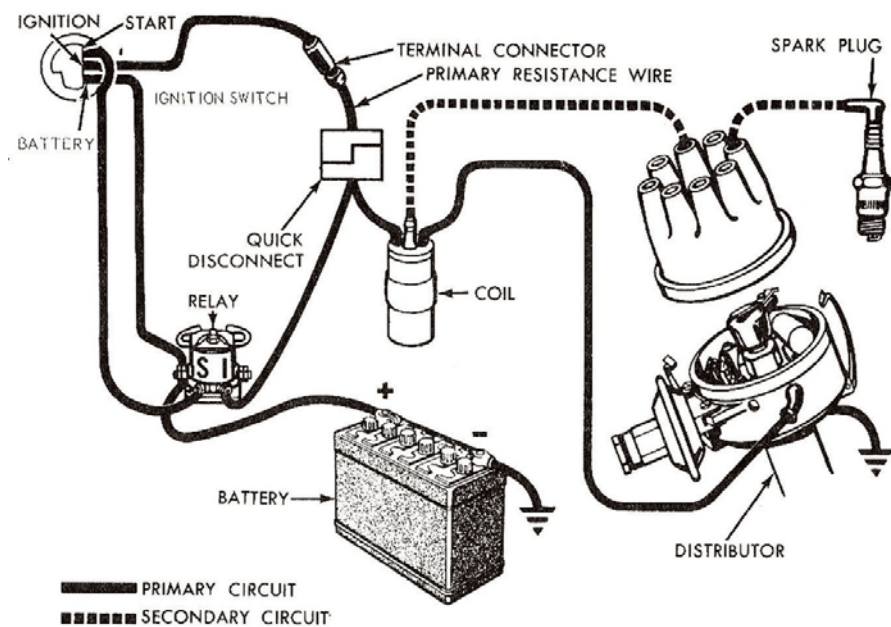


Figure 2.3 : Ignition System

2.2.4 Engine Management System

A hierarchical structure for the tasks of the Electronic Control Units devoted to automotive engine control is proposed. It has been divided into three parts:

- the driver interpreter
- the engine controller
- the actuators controller

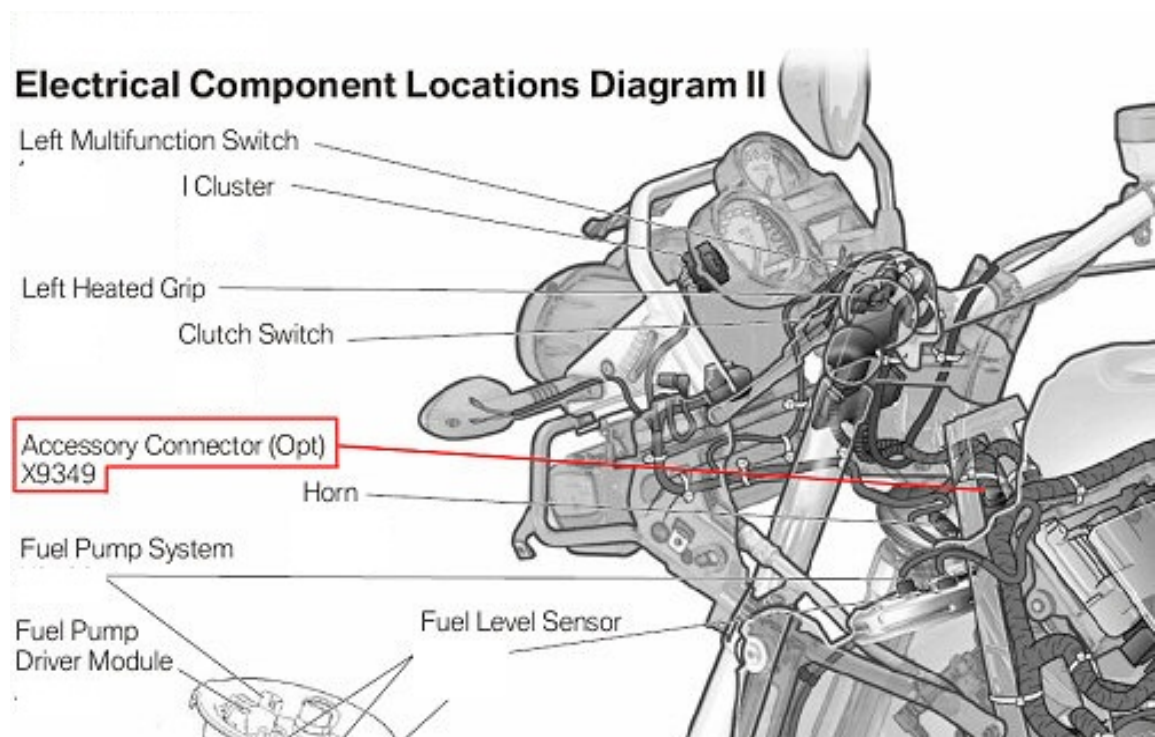


Figure 2.4 : Engine Management System

2.2.5 Sensor And Actuator

A *sensor* is any device, such as a thermometer, that detects a physical condition in the world. In this case the sensor will detect the vital part of the motorcycle such as the speed, temperature, ignition and oil management. For example, Figure 2.2.5 show the speed sensor for the motorcycle. This sensor will detect how fast the motorcycle is running. This is crucial because this basic part of the motorcycle will determine the safety of the motorcycle can be running.

Actuators are devices, such as valves and switches that perform actions such as turning things on or off or making adjustments in an operational system. It can integrate sensors and actuators to create a closed-loop operational system.



Figure 2.5: Speed Sensor

2.3 Summary

This chapter has present a few electronic and electric system of a motorcycle engine. The system include the fuel injection system, the lighting system, ignition system, the engine management system, and finally the sensor and actuator system.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter will describe about the overall methodology in this project from beginning until end of the project. All the processes will be described in this chapter by following the chart. During this part, every information and data will be gathered together and concluded according to the objectives and scope of the project.

3.2 Project Flow Chart

From figure 3.1, the project start with the literature review and research about the title. These were shown the flow of the fabrication of the display unit for electric and electronic wire harness of single cylinder of four stroke engines for the teaching purpose. These tasks have been done through study on the internet, books, discussion with the supervisor and the other resources.

After gather all the relevant information, the project had begun on week five. In this step, the bike has been tore down to get the main wire. It has to be labeled to avoid the confusion because all the wire needs to be connected correctly on the display unit.

After that, discussion had been made about the display unit fabricating is begin. In this process, the L-shaped mild steel is been chosen to built the chassis of the display unit. This process involved cutting and welding the steel to get the shape. This chassis need to be stable and strong in order to place all components.

After finish fabricating the display unit, all components is been tighten to the board and arrange it correctly. The testing of the component will be determined if the wire are connected correctly or not. If the wire is connecting correctly, the electronic and electronic will run smoothly like the normal motorcycle. After that, proceeding to the finishing stage which are painting and smooth all the sharp edge of the display unit. If the wire did not function as needed, the arrangement and connection stage need to be repeat again.

After all the process mentioned above is done, all the material for the writing is gathered. The report writing process will be guided by the UMP final year project report writing, this process also included the presentation slide making for the final presentation of the project.

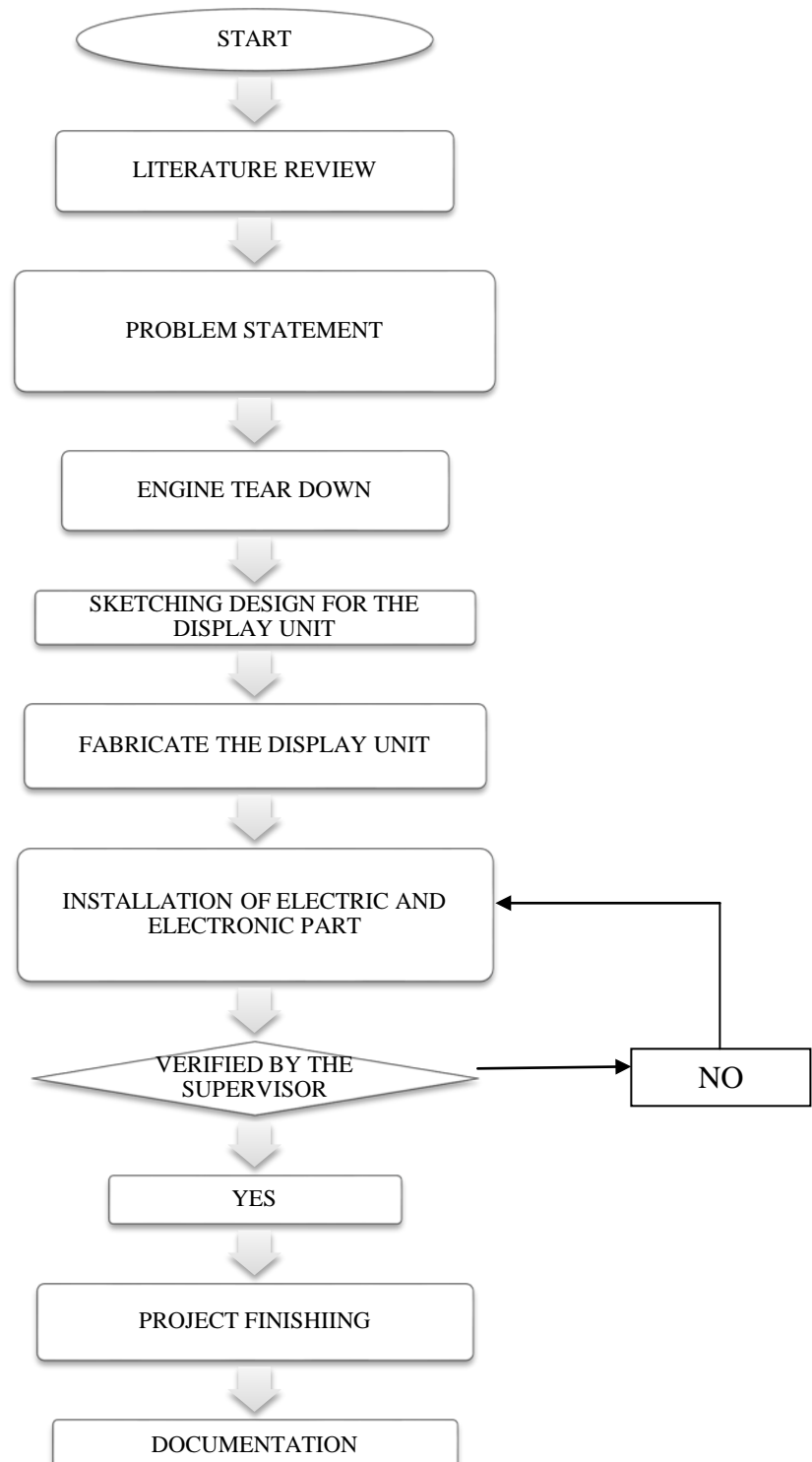


Figure 3.1: Flow Chart

3.3 SKETCHING DESIGN FOR THE DISPLAY UNIT

After choose the selected design for the project, the early sketch is transfer to the engineering drawing and also for the solid modelling by using the computer to show the actual design for the display unit.

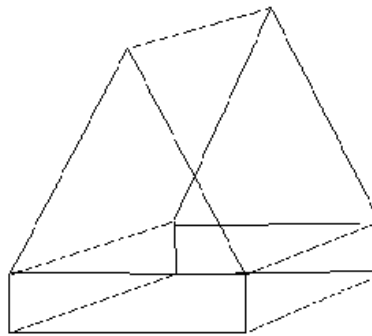


Figure 3.2

After select the design and the early sketch, the next step are set the dimension and run the dimensioning process. The dimensions were set before run the project drawing according to the relevant dimensions by refer to the currents display unit and the other parts to make sure all of them were fit.

Part by part are been draw according to the dimensions that have been set, and after finish the drawing, all the parts were assembled to give and show the actual design for the project.

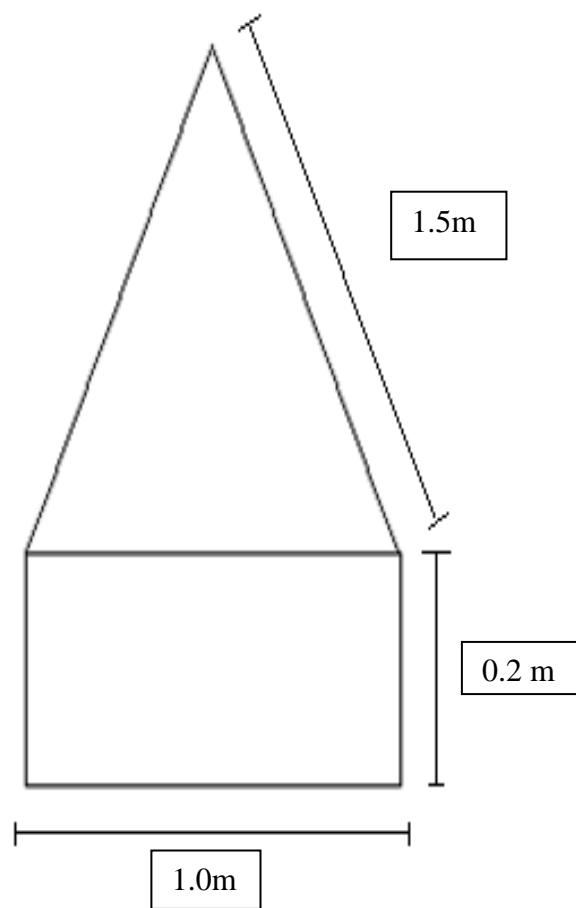


Figure 3.3: top view

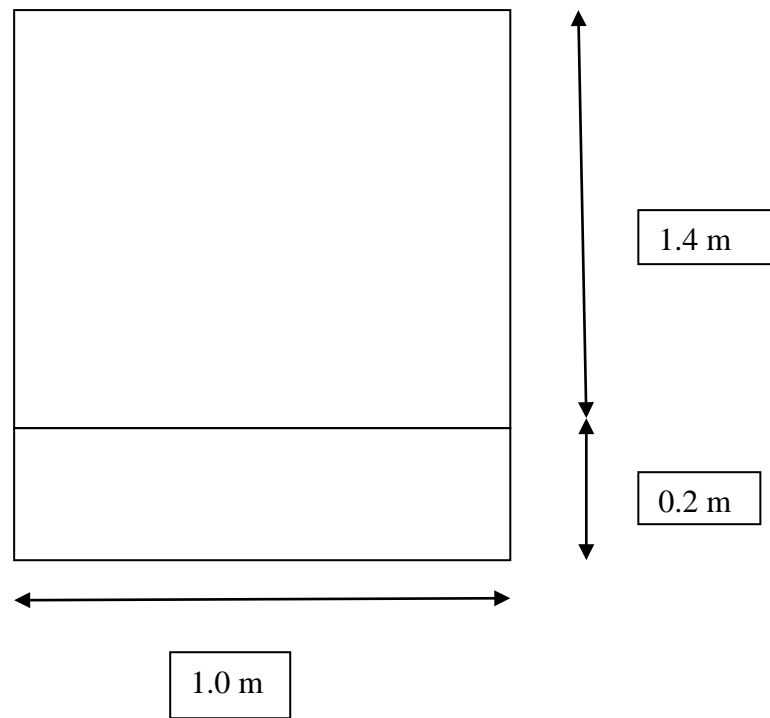


Figure 3.4: front view

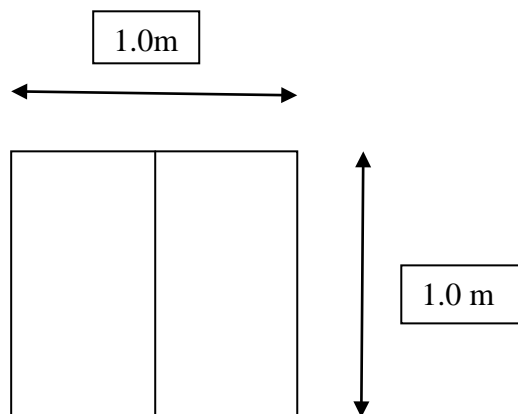


Figure 3.5: top view

3.4 FABRICATION PROCESS

This process use the materials that selected, make the product base on the selected design and then followed by the selected dimension. In this process, many methods are used in order to make the design become reality. Fabrication process uses a different method. All the methods that can be used are sketching, measuring, cutting, grinding, bending, drilling, finishing and many more method. The fabrication process starts with the dimensioning by using marking and measuring process until finishing. The processes involve are as below.

3.4.1 Marking and Measuring

The marking and measuring process was done first base on the dimensioning. The common tools and devices used are steel ruler, center punch, measuring tape, 90° elbow, vernier calliper and pencil to mark and measure the raw materials. Measures are taken more or 3 times for accuracy reasons.



Figure 3.6: Marking and Measuring

3.4.2 Metal Cutting And Removal

All the material had been cutting using the cutter. It had been measured about one meter each to build the chassis.



Figure 3.7: Cutting

3.4.3 Grinding

The materials are grinded carefully into shape desired with using portable grinding machine and disc cutter to remove unwanted parts and to give smooth surface finish on the edges to make sure that joining process can be done precisely. The mild steel are clamped on the table and the grinding process is done first by grinding off unwanted parts.



Figure 3.8: Grinding

3.4.4 Welding

The steel had been weld to build the chassis and had been tested its toughness to put the heavy component on the board. It had been tested and welded several time to make sure it can withstand any force.

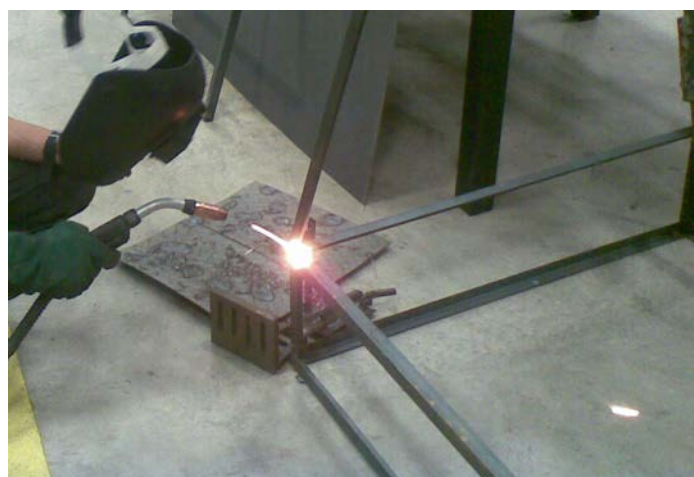


Figure 3.9: Welding

3.4.5 Finishing

After joining process and testing the product, the final stage of finishing which is filing and painting process. In filing process, make the smoothing the product to ensure a clean and non-sharp edge which can be hazardous using sand paper and smooth file to get the smooth surfaces and to remove dirt and rust.



Figure 3.10: Finishing

CHAPTER 4

RESULT AND DISCUSSION

4.1 INTRODUCTION

This chapter discusses on the result and discussion of the project. It includes design parts, bill of materials (B.O.M) and also test result based on functionality of the component. This chapter also provide whether there is weakness occur so that further improvement can be made onto the product. Also the result can compare whether meet the specification required or expected by referring to the data provided.

4.2 Bill of materials

Bill of materials below explains on the materials ordered or used in this project. The materials used are listed in Table 4.1 according to it no. material, quantity, and dimension for this project.

ITEM	QUANTITY	DIMENSION
CABEL TIGHT	13	-
BOLT	6	-
MILD STEEL	3	14m
PVC BOARD	1	1.2Mx1.4m

Table 4.1 : bill of material

4.3 Design Descriptions

This design of the display unit is base on the pyramid shape and been chose because of the toughness and rigid factor. The chassis of the display unit is using the mild steel which is considered tough and rigid. The PVC board had been chosen because it is wide and easy to place the component on it. It also easy to be drill compared to other material such aluminium sheet and tougher than plywood which is easily broken or damage if we drill it too much and not resistant to the water.

4.3.1 Expected Result

The design had been tough and rigid. Each joint had been weld repeatable to make sure the structure is tough and solid. Behind the PVC board had been place the chassis from the mils steel to make sure the PVC board did not bend when it had been tighten with the component.

4.4 DISCUSSION

While developing this project, there are some error and problem had occur that need some improvement to been done in the future. The total cost to produce this product can be reduce if decrease using bolts and nuts. Many errors have occurred during making this project. These errors occur from the beginning until the finishing of the project. The errors occur were detected by further observations and analysis.

4.4.1 Material Preparation

Materials required for this project are ordered through bill of materials (Refer to Table 4.2: Bill of materials). Some of the materials can also be bought by students themselves from hardware shops. Some materials required are already available in the university laboratory main store.

4.4.2 Designing and sketching

For designing, ideas are develop entirely from the student. References aren't available due to all measurements and drawing designs are generated from the students. However there are the matters of stability within the design. Students has to focus on stability a functions since it is a platform which has to hold a heavy object and also able to rotate it in a certain position. This criteria has been the guideline as well developing the design not only to fit the main function but also practical to users.

4.4.3 Budget preparations

The budget for this project should be entirely handled by the university. The students have to inform the University regarding the matter whereas the budget itself is not affordable and practical for a student of such level to provide.

4.4.4 Fabrications problem

a) Materials

The problems regarding the materials are the available materials some aren't sufficient within the University materials store. Some materials require strict procedure to be extracted out of the store which cause valuable time spend on handling the paperwork and asking for permission. Some materials required long period of time to arrive. This does not only cause a major error in fabrication process, but also halted the schedule behind time period required. This has caused the project to be finished behind required or desired time.

b) Fabrication

During fabrication, there is a matter of precise measurements which can affect the project. The measuring has to be taken more than once. There are also the cutting processes in which some materials require scroll saw and band saw to be used to cut plastic into circle shape. This process requires intense accuracy in which can produce defects once a minor error occur.

4.4.5 Advantages

This display unit model has several advantages. First advantage of this model is it is tough and firm for the display unit because of its chassis made of the mild steel. This is important because the chassis need to support the PVC board and the

component on it. It also can hold any force due to several layer of welding to its joint and tested several times. This will avoid the model from collapsing.

Next advantage of this model is, it has simple diagram on it. The component had been arranged according to “head to tail concept”. This kind of arrangement help user to understand the arrangement of the component base on the actual motorcycle.

This display unit is using the actual component of the motorcycle. All the electronic component are taken from the motorcycle and been paste on the PVC board. All the wire are connected behind the PVC board is not been edit or modified.

4.4.6 Disadvantages

Several disadvantages from this project has been detected. First it is heavy and did not easily to move by one person. This can be solved by putting the roller at the base.

Next disadvantage of this project is, it do not have the detail about the component that been attach to it. This information can help user to understand better about the motorcycle component.

Furthermore, the finishing of the project did not look well because several technical problem while building the display unit. The measurement for each joint need to be more accurate and each angle had to been calculated well before joining it.

Some component such as the headlight and taillight cannot be put because of the design of it. It display only put the bulb of headlight and taillight.

4.4.7 Final Product

After finishing the fabrication process, the result of this project had been display. It has been properly examined and carefully stored to avoid the damage and corrosion. The project is successful done and achieve its target.



Figure 4.1: Final Product

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Introduction

For this final chapter, it will discuss and represents about the project conclusion along with the recommendation for the whole of this project. The main topic for this chapter looks upon what the final conclusion is based on previous data along with recommendations that can be of use for this project. All the problems that have been faced during running the project from start until finish. All the right action that needs to do before, present and after the project is stated in this chapter. The recommendations are considered as improvements to this project for future references.

5.2 Conclusion

As the conclusion, the project to design and development of display unit has achieved its target and objective successfully. Although behind schedule, this project was able to be done within the 14 weeks period. By referring to the Gantt chart provided, the project had confronted several unavoidable setbacks but manage to be done accordingly. This project is hope do to be a good use especially to the students for studying and also benefits in their studies.

Overall view on the project that had been carried out was good. The project provided deep insight in knowledge through research by internet and consultation with the lecturers and instructor engineers. The data and information provided helped in making the project more effective in all aspects. The research along with the

constant consultation with the supervisors and instructor engineers added with presentation of the project gives a good verbal communication and help strengthen the vocabulary.

Even more, this project has given a chance to train time management, writing skills and independent on searching and providing results to problems. Experiences along with deep knowledge are gained from this project through fabrication work involving usage of various machines available in the laboratory. It also includes improvements in welding skill. To conclude it, this final year project has provided self discipline to the student and punctuality along with good management skills.

The project scope is covered very well for the design and development of the display unit. It should be tested with one experiment has been made to determine if the product works well or not. The experiment is also done in determining of any weaknesses of the design. All the data have been recorded for improvement purpose. After all of the process, the report is established. With the creating of the display unit along with the electric and electronic component, this project is hope that it can bring much convenience and satisfaction to users.

5.3 Recommendation

These are a number of recommendations provided for future references on this project. They are provided for the faculty in improving the product.

5.3.1 Student Skill

The skills in fabrication process such as drilling, cutting and others related with using the mechanical machinery must be improved and well train before running the project.

5.3.2 Project Planning

The project planning should be done properly to ensure the project fabrication can be done and followed all the planning in the Gantt chart. The time also must be managing wisely, so, all the progress on the project can be done in time and all the process can be completed.

5.3.3 Materials

The material that been used should be more light and resistant to the corrosion. Planning and suggestion from the supervisor or the technician about the material should been discussed before built the model.

5.3.4 Facilities

While proceeding with this project, students had encountered a few technical problems with project. Mechanical laboratory did not have the machine to cut the material into circle shape such as plastics that can't capable with high temperature. But in other case, students can use the conventional tool such as scroll saw. Students also had problem to drill the hole with small diameter. Some numbers of machine and equipment aren't sufficient to the use of students in which causes problems during fabrication. These have cause students to share equipment which can lengthen the fabrication period. The faculty can provided more machines especially welding

machine in which can fasten the work and help students to improve more in time management.

5.3.5 Design

The design could be improve to get better looking display model. It also should be more portable and easy to be transport. The label in the component should be more accurate and information. Any information regardless about the electric and electronic component should be display properly to avoid confused among the user.

5.4 Further Improvement

Every weakness are detected and repaired to ensure maximum comfort towards users. This project may be modified so that it can add more functions with more interesting shapes.

APPENDIX A

Project Schedule

Project Activities	Week													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Identify the Problem														
Identify the scope, objective & project														
Literature review														
Conceptual design/selection														
Material selection														
Concept evaluation & finalized design														
Material preparation & fabrication process														
Testing & modification														
Report writing														
Presentation														

Gantt chart

