



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DESIGN AND FABRICATION OF 3 WHEELS STAND
UP ELECTRIC SCOOTER**

This report is submitted in accordance with the requirement of the Universiti Teknikal
Malaysia Melaka (UTeM) for the Bachelor of Mechanical Engineering Technology
(Maintenance) with Honours.

by

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FACULTY OF MECHANICAL AND MANUFACTURING ENGINEERING TECHNOLOGY

2019

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

Tajuk: DESIGN AND FABRICATION OF 3 WHEELS STAND UP ELECTRIC SCOOTER

Sesi Pengajian: 2019

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APPROVAL

This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Mechanical Engineering Technology (Maintenance) with Honours. The member of the supervisory is as follow:

Signature:

Supervisor : Encik Mohd Sulhan Bin Mokhtar

ABSTRAK

Ringkasan yang boleh di buat dari projek ini adalah ianya satu projek reka bentuk dan fabrikasi skuter elektrik tiga roda. Sebab utama mengapa projek ini dijalankan adalah untuk memberi kemudahan kepada orang ramai bergerak dengan mudah dan cepat ke sesuatu tempat. Skuter elektrik ini sesuai di gunakan bagi tujuan rekreasi atau untuk kegunaan perjalanan jarak dekat bagi mengelakkan peningkatan kesesakan lalu lintas. Selain itu juga, antara faktor lain adalah dari segi keadaan alam sekitar. Masalah alam sekitar yang semakin tercemar adalah salah satu faktor projek ini dihasilkan. Skuter elektrik ini sepenuhnya digerakkan menggunakan sistem elektrik. Oleh itu, sedikit sebanyak dapat mengurangkan masalah alam sekitar yang semakin bertambah dalam kebelakangan ini. Untuk menghasilkan projek ini, skuter elektrik ini terlebih dahulu dilukis menggunakan perisian seperti CATIA. Selepas itu, proses fabrikasi akan dijalankan berpandukan lukisan yang di lakar dalam CATIA. Di antara proses-proses fabrikasi yang dilakukan dalam projek ini adalah seperti proses pengukuran, proses kimpalan, proses pengerudian, proses pemotongan, proses pendawaian dan proses pemasangan.

ABSTRACT

The summary that can be made from this project is a three wheel drive scooter design and fabrication project. The main reason why this project is being implemented is to make it easy for people to move around easily and quickly. These electric scooters are suitable for recreational purposes or for short-haul travel purposes to prevent traffic congestion. Beside that, other factors are environmental factors. Environmental contamination is one of the factors contributing to this project. This electric scooter is fully powered using an electric system. Thus, to a lesser extent, they can reduce environmental problems in recent years. To create this project, this electric scooter was first drawn using software such as CATIA. Subsequently, the fabrication process will be carried out based on drawings illustrated in CATIA. Among the fabrication processes involved in this project are the process of measurement, welding process, drilling process, cutting process, wiring and installation process.

DEDICATION

To my beloved parents,

Mahadi Bin Abdullah

Thank you for all support, sacrifices, patient and willingness to share with me.

To my honoured supervisor,

Encik Mohd Sulhan Bin Mokhtar and all UTeM lectures.

To my dearest friends,

Muhammad Iqbal Bin Mohd Saad, Muhammad Aminuddeen Bin Abd Hamid, Muhammad Rozhan Bin Rosdin, Muhammad Fazihan Bin Ridzwan, Muhammad Aqiuddin Bin Ishak, Mohammad Haziq Bin Noordin, Ahmad Muzammil Zarif Bin Ahmad Zailan, Abdullah Bin Maliki and Mohd Nazirul Umair Bin Mohd Arif

Thank you for always giving me a guidance and persistent help to complete this project.

ACKNOWLEDGEMENTS

All praise belongs to ALLAH SWT. Without the health, strength and persistence it provided, I would not have been able to complete this project. I have taken the steps in this project and have spent time wisely completing this thesis. However, this would not have been possible without the support and assistance of many individuals. In particular, I would like to thank everyone who contributed to my project. They have encouraged me and given me many ideas in completing this project. First, I would like to express my deepest gratitude to my supervisor, MR Muhd Sulhan Bin Mokhtar for his unwavering support and guidance throughout the course of this project. He provided me with ongoing suggestions and oversight and provided information on the project thesis. Without continuous guidance and assistance, the thesis of this project would not have been possible. I would also like to thank my beloved parents, Mahadi Bin Abdullah and Wan Noriza Binti Wan Musa and all the families for their hard work and support and support during this project. In addition, I am very grateful to those who gave me the opportunity to ask information from the concept of the basic concept of the project. Also a big thank you to all my friends and friends, Iqbal Saad, Aminuddeen Hamid, Rozhan Rosdin, Jahir Haziq, Haziq Noordin, Fazihan Ridzwan, Nazirul Umair, Abdullah Maliki, Muzammil Zarif and Aqiuddin Ishak for helping me complete the project. Lastly, my appreciation also goes to the person who directly or indirectly helped me in developing this project. Thanks again to all my supporters.

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CHAPTER 1

INTRODUCTION

In this chapter, it contains a background of problem statements that encompass the goals to be achieved throughout the project and the scope of a clear study in determining the limitations of this study. This chapter also provides a reporting structure that generally describes the division of chapters and content related to a particular chapter. Overall, it covers the overall progress of the project, explaining how the entire project has been done.

1.1 Background of the study

The scooter is a two-wheeled transport and requires the rider's ability to move it and control the balance. There are various types of scooters available around the world, from scooters using two wheels sometimes unbalanced and often fall when used by beginners

This task is about the design and manufacture of electric scooter for the easy movement. The electric scooter is a highly positive transportation in all aspects for example in terms of environment. Basically, the electric scooter does not emit smoke that can cause air pollution compare to other motorcycle.

The main purpose of this project is to make it convenient for people to move easily and quickly from one place to another place. We know that there are many people are too busy and want to move quickly. So, it is one of the reason this electric scooter is created.

Electric scooter is one of the modified products of scooter by adding one wheel and electric system. The electric scooter is design for people to move easy and quickly. In

development of the electric scooter, the design of the chassis is one of the most important thing. The low structure of the scooter is one of the important aspect to facilitate people to ride and operated the scooter.

Electric scooter is a vehicle authorized by an electric motor to move. For electric motor power sources, some countries use different power, as it relies on the Law of the state. The creation of electric scooters is proof that the engineering field continues to grow, the creation of electric scooters increases the convenience of transport.

Although electric scooter use electric motors, it is still called as a scooter instead of a motorcycle. This is because the identity as a scooter remains largely partly in scooters. Therefore, it is not included in the transportation law which requires certification and operation as in good motor vehicles. It does not need to have a license to ride electric scooters.

The electric scooter is not a full motor vehicle, it is only a semi-motor scooter, which still has operators, gearing, brakes, and frame designs and so on. This electric scooter uses a battery which is a common power supply used on electric scooters. Electric scooters are not like motorcycles in many concepts, either design or power supply. In addition, electric motors also use lower power than motorcycles that can accelerate in just 14-20 km / h. There are several types of electric scooters commonly used by everyone in terms of weight and type of frame materials. Scooter weight also plays an important role in the speed of the scooter.

1.2 Problem statement

Problem statement is a brief description of the issues to be addressed and the problem solving methods to be addressed before resolving the problem.

The reason why this project is implemented is to provide people with the convenience of moving quickly and easily to a place without getting stuck in traffic jams or feeling tired of carrying on with daily work. The scooter design has been modified to make the ride easier and more comfortable for the riders. In addition, this scooter have an electric system which make people to move easily. Environmental problem is also one of the problem that has been happening. Therefore, by using the electric system, automatically this scooter can be classified as green transportation as for example green to the environment. In figure 1 depict the example of electric scooter.



Figure 1: Example of electric scooter

1.3 Project objective

Based on the introduction and problem statement above, the objective of this study are as follow:

- To design the electric scooter suitable for people to move easy and quick.
- To produce and fabricate design that has been drawn into a real product.

1.4 Scope

The scope of this project comes from the design of electric scooters for easy and fast moving people. There are four main section that must be reached to ensure electric scooter can work well. The overall scope of this project are below:

- This study focus on design and fabricate scooter by additional electric motor.
- This study covers the design and fabricate electric scooter with 3 wheel.
- The electric scooter has designed to be ride by one passenger only.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

Before start a project fabrication, there are numerous angles should be considered and assessed deliberately to guarantee that a project is running perfectly. The review included from reference books, perceptions, discourses, and assets from web. The project will be actualized based on the data gotten with a specific end goal to keep running as manual for completing the project. The review ought to be gathered each of the information or data gotten from an assortment of sources to get the best results of the project. This is to guarantee that the project will be delivered to accomplish the target and working legitimately.

2.1 Scooter

(Kingdom and Bloc 2019) express a scooter is a type of motorcycle with step by step frame and platform for rider legs. The scooter design elements are present on some of the earliest motorcycles, and scooters have been made since 1914 or earlier. Development of scooters continued in Europe and the United States between the World Wars.

2.1.1 History of Scooter

(Kingdom and Bloc 2019) state that the popularity of scooters began in era World War II with the introduction of the Vespa and Lambretta models in Italy. The scooter is intended to provide economic personal transport (engine from 50 to 250 cc or 3.1 to 15.3 cc). The original layout is still widely used in this application. Maxi-scooters, with engines larger than 250 to 850 cc (15 to 52 cu) have been developed for Western markets.

The scooter is popular for personal transportation because it is more affordable, easy to operate, and easier to park and store than cars. Licensing requirements for scooters are easier and cheaper than cars in most parts of the world, and insurance is usually cheaper.

2.1.2 Part of scooter

Part of scooter includes of handlebars, brake, frame and wheel. In figure 2 depict the samples part of scooter.



Figure 2: Basic part in Scooter

2.1.2.1 Frame of scooter

Steel frames are often designed using a variety of steel compounds including chromoly. Chromoly steel is a combination of chromium and molybdenum. (Sugimoto et al. 2008) states that at temperatures above MS temperature, steel has a elasticity of up to 900 Mpa, aggregate width 15-20% and a large reduction of 40-60%. The great flexibility is mostly seen from the uniform slit structure of a uniform, initial martensite and austenitic TRIP (sensitivity changes due to toughness), as well as some long-term commitments of internal concern arising from austenitic absence. Furthermore, for steel being an alternative to selecting materials to make this effort is because steel provides a very smooth ride.

The combination of aluminum has lower thickness and different quality compared to steel composites. However, they have excellent superior parts, giving them a favorable weight attraction on steel. The initial aluminum structure has seemed more powerless to fatigue, either

because incomplete compounds or defective welding methods are used. This looks different in relation to some of the steel and titanium composites, which have obvious weaknesses and less demand for welding or sewing together. However, some of these difficulties have been simplified with more talented work that are equipped with quality welding, better computing, and more prominent availability for today's aluminum composites. Quality attracts aluminum to proportions heavier than steel, and certain mechanical properties which guarantee it to be more favorable building materials. Investigations on some aluminum casting alloys indicate that with higher yield strength, moisture does not result in increased cracking spread. Aluminum and extra polished alloys for higher steel strength(Schneider et al. 2014).

(Bansal 2008) state that carbon fiber (as an alternative to CF, graphite fibers or graphite fibers) is fiber about 5-10 micrometres in diameter and is largely composed of carbon atoms. Carbon fiber has several advantages including high stiffness, high tensile strength, low weight, high chemical resistance, high temperature tolerance and low thermal expansion. These features have increased the popularity of carbon fiber in aerospace, civil engineering, military, and sports. However, it is quite expensive when compared to similar fibers, such as glass fibers or plastic fibers.

To produce carbon fiber, carbon atoms are bound together in crystals which are more or less parallel to this fiber length axis as the crystal alignment provides a strong ratio to high fiber volume (making it strong for its size). Some thousands of carbon fiber are combined together to form tows, where it can be used by itself or woven into fabric. Carbon fiber is usually combined with other materials to form composites. When it is absorbed by plastic resin and baked it forms a carbon fiber reinforced polymer (often referred to as carbon fiber) which has a very high ratio of weight, and is very rigid though quite fragile. Carbon fibers are also arranged with other materials, such as graphite to form reinforced carbon-carbon composites which have very high heat tolerance.

2.1.2.2 Brake

The implementation of the scooter brake is the most critical list for good scooters as it relates directly to a safe rider in a crisis situation. A scooter brake reduces scooter speed or saves or moves. The three main types are brake rims, disc brakes and drum brakes. There are various brakes used throughout history, and some are still used today. The slow-moving scooter mechanism consists of three basic segments, the start of the system for the rider to apply for brakes, for example, the brake lever, the component to send the signal, for example, the Bowden cable, hydraulic hose, rod, or chain; and the brake instrument itself, caliper or drum, to suppress at least two surfaces together with remembering the final goal to change, with the erosion, dynamic energy of the scooter and the rider being a warm heat to propagate. There are some brakes that are frequently used and linked to scooters. Such as disc brakes and drum brake.

A drum brake is a vehicle brake where friction is caused by a load that is pressing against the inner surface of the spinning drum (Pixel 2019).

(Pixel 2019) express a disc Brake is a tool for slowing or stopping the wheel of the road. Brake discs are usually made of cast iron or ceramic and it is connected to a wheel or axle. To stop the wheels, the friction material in the form of a brake pad (attached to a device called a caliper brake) is mechanically, hydraulically, pneumatic or electromagnetic forced on both sides of the disc. Friction causes discs and wheels to be slowed or stopped.

2.1.2.3 Handlebar

Scooter handlebars alludes to the steering system for the scooter, the likeness a guiding wheels. Other than steering, contingent upon their riding position, and give an advantageous mounting spot to brake levers, shift levers, cyclocomputers, bells, and so forth. Handlebars are joined to a scooter's stem which thusly appends to the fork. Many sorts of handlebar accessible

in the market nowadays. Each outline has a scope of contrast and capacity. Among the sorts of handlebar is standard handlebar, drop handlebar, bullhorn handlebar, flats handlebar and so on. Handlebars are most generally made of aluminium alloys, but on the other hand are regularly produced using steel, carbon fiber or titanium.

2.1.2.4 Brake lever

The meaning brake lever in the term of mechanical building is a lever on the handlebar that connects to the brake cable and thus operates the braking mechanism. (Ip 2019) express that a brake lever mounted to a drop type handle of scooter, involving a fundamental lever generously parallel to a bowed pole area and a helper lever parallel to a straight bar segment of the drop sort handle. The auxiliary lever is shift-table in turned position from the primary lever so that the strokes of both levers may bring about significantly meet strokes of a control wire thus that the straight rod section, might be adjusted. In figure 3 state the example of brake lever. In figure 3 state the example of brake lever.



Figure 3: Example of brake lever