

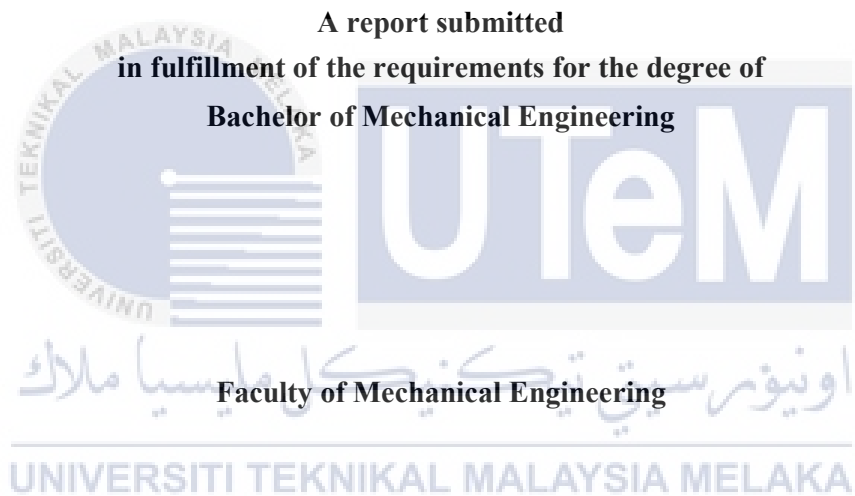
DESIGN AND ANALYSIS OF INNOVATIVE MOTORCYCLE PHONE CHARGER



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**DESIGN AND ANALYSIS OF INNOVATIVE MOTORCYCLE HOLDER PHONE
CHARGER**

NUR ATIKAH BINTI MAHAT

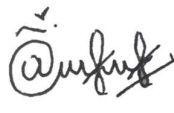


UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021

DECLARATION

I declare that this project report entitled “Design and Analysis of Innovative Motorcycle Phone Charger” is the result of my own work except as cited in the references.

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Date : 27 / 08 / 2021



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APPROVAL

I hereby declare that I have read this project report and in my opinion this report is sufficient in terms of scope and quality for the award of the degree of Bachelor of Mechanical Engineering.



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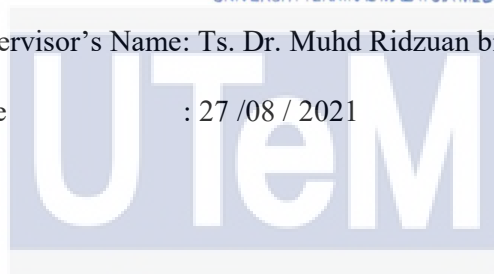
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DEDICATION

I am thankful that the results of the project can fulfill my dream successfully. Then, I dedicate this to Ibu and Abah who have always supported me to achieve this success.



ABSTRACT

Many motorcyclists such as those working in food delivery services and postal services are now heavily using mobile phone during driving, to navigate their route towards desired destination. To safely use the device, motorcycle phone holder is used to mount it on the motorcycle. However, existing motorcycle phone holder can further be improved in several aspects such as easy to use, simple design, strong grip and best safety factor design. Hence, the objective for this project is to develop the new design of a motorcycle phone chargers with the alternative power sources and to analyse the new design with improvement on safety features. The major research activities involved are conducting the survey to motorcyclist for determine the customer needed, develop new design by using customer requirements and analysis the new design to improve safety features. Later, new conceptual designs of motorcycle phone charger were developed, and the best concept design was selected using Pugh selection method. Detail design of the product had been produced. Final design had been sketching on SOLIDWORK thus, the improvement on final design had been improved by using Theory of Inventive Problem Solving (TRIZ) Method. Other than that, the improvement on final design had been analyses using Finite Element Analysis (FEA) to analyse factor of safety (FOS). In conclusion, the innovative motorcycle phone charger had been developed in the form of safety features. The new motorcycle phone holder had been analyse in this research to greatly help existing motorcyclist to use their mobile phone during driving more conveniently.

ABSTRAK

Kebanyakan penunggang motosikal seperti bekerja dalam perkhidmatan penghantaran makanan dan perkhidmatan pos yang menghadapi kesukaran menggunakan telefon bimbit ketika menunggang bagi mengemudi laluan mereka ke destinasi yang diinginkan. Bagi menggunakan peranti dalam keadaan selamat, pemegang telefon motosikal digunakan untuk melekapkan pada motosikal. Walaubagaimanapun, kewujudan pemegang telefon motosikal dapat dinaiktarafkan dalam beberapa aspek seperti mudah digunakan, reka bentuk mudah, cengkaman kuat dan faktor keselamatan reka bentuk yang terbaik. Oleh itu, objektif projek ini adalah untuk membangunkan reka bentuk baru pengecas telefon motosikal dan menganalisis reka bentuk baru dengan penambahbaikan ciri-ciri keselamatan. Kegiatan penyelidikan utama yang terlibat iaitu menjalankan kaji selidik kepada penunggang motosikal untuk menentukan keperluan pelanggan, membangunkan reka bentuk baru dengan menggunakan keperluan pelanggan dan menganalisis reka bentuk baru untuk meningkatkan ciri-ciri keselamatan. Kemudian, konsep baru bagi reka bentuk pengecas telefon motosikal dimajukan, dan konsep reka bentuk yang terbaik dipilih menggunakan kaedah pemilihan 'Pugh'. Reka bentuk terperinci produk telah dihasilkan. Reka bentuk akhir telah dilakarkan pada 'SOLIDWORK' dengan itu, penambahbaikan reka bentuk akhir telah diperbaiki dengan menggunakan Teori Kaedah Penyelesaian Masalah Inventive 'TRIZ'. Selain itu, penambahbaikan reka bentuk akhir telah dianalisis menggunakan Analisis Unsur Terhingga 'FEA' untuk menganalisis faktor keselamatan 'FOS'. Kesimpulannya, pengecas telefon motosikal inovatif telah dibangunkan dalam bentuk ciri-ciri keselamatan. Pemegang

telefon motosikal baru yang ditubuhkan dalam penyelidikan ini dijangkakan dapat membantu penunggang motosikal untuk menggunakan telefon bimbit mereka semasa menunggang dengan lebih selesa.



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With all my might I praise Allah, our creator, for giving me this opportunity. I was allowed to complete my project successfully despite many allegations. I would like to thank him, for giving me the desire to complete this project successfully with my ability better and brilliantly.

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Special thanks also to the faculty, Fakulti Kejuruteraan Mekanikal, Universiti Teknikal Malaysia Melaka for the facilities especially the lecturers who provided a lot of facilities to use on my final year project.

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CHAPTER 1

INTRODUCTION

1.1 Background of study

Nowadays, technology has become more efficient and advanced every day, for example, mobile phone are always advanced in more different functions that make it necessary for everyone. Most of the new technologies uses electrical energy as main sources. The main sources are need to convert to electrical energy by using limited sources of energy. Mobile phone is the important technology that are used for everyone. It is make their work easy and faster to communicate, navigate and etc. In mobile phones, electrical sources is stored in the battery to make it easier the user to use it for a long time.

However, this is undeniable with the sophistication of technology which now presents many weaknesses in terms of the technology itself especially mobile phones. The mobile phones had the duration of the time used. If the longer the time used, the faster the battery lost its energy. The weakness of battery mobile phones will give the problems towards the users especially for the motorcycle riders. The motorcycle is the most vehicle that used to travel far easily without stuck in traffic jams. Certain of motorcycles are not provide with the specific charger for motorcycle riders. Hence, the motorcycle riders had limited to store their electrical energy to charge mobile phone during travelling.

Most of motorcycle riders are using the power bank as main source to charge the mobile phone. The power bank is known as portable charger consists power storage. It is a device that has been a required to charger moderate source in the lack of power supply and compatible with most electronic gadgets. The portable storage bank produces rechargeable cells that are able to consume a sufficient amount of charge that is enough to charge the

device at least twice (Subhashini et al., 2018). This also helps the riders to use mobile phone without worry about running out of battery.

Unfortunately, the power bank had difficult to charge a device while travelling from one place to another place due to the effectiveness of power supply and distinct when the power bank out of electrical storage. Furthermore, it may occurs when they forget to carry a power bank or cable of mobile phone. It may cause a problem to a rider for using the mobile phone. Thus, the alternative source are needed to help the riders for avoid the unexpected problems. This alternative source may helpful with the improvement the power sources in the motorcycle phone charger not only for power source but the design of phone charger more efficient.

1.2 Problem Statement

There is a big percentage of motorcycle riders among the Malaysian community. Most riders preferred using motorcycles on overcoming road problems, especially during congestion. In the current situation, everyone had their mobile phone as a basic technology for communication, navigation, and others. The use of technology providers helps motorcyclists in terms of finding the location of a place, especially during working. During working hours, most motorcycle riders were using the mobile phone to communicate with the customer and finding the location. It is difficult for motorcycle riders to use the mobile phone while controlling the motorcycle. In addition, motorcycles does not provide charging station for mobile phone which motorcyclists have to face difficulty so as cars. Most of the time, motorcycle riders has using the power bank as the power source to charge the mobile phone. Suddenly, motorcycle riders have an inconvenient problem because the power bank has unexpected problems such as human negligence.

Furthermore, the power bank also had the limit of using which is it can be charged at least twice similar to the mobile phone. However, the battery life of a mobile phone depends

on how long the mobile phone is used. The longer the use of mobile phones the faster the battery runs out quickly. In order to solve these types of issues, the alternative power sources had been reviewed to ensure the power supply can be used for mobile phone. Thus, the design of motorcycle phone charger suitable for power source when it applied on the future project. Hence, the design for motorcycle phone charger had been design with specific safety features to suit the requirement of the users.

1.3 Objective of Study

The main objectives of this researched are:

- i. To develop new design of motorcycle phone charger with alternative power sources
- ii. To analyse the new design of motorcycle phone charger with improvement on safety features

1.4 Research Scope

The research scope of the researched are:

- i. To distribute the survey to potential user for customer requirement
- ii. To focus on develop the new design of motorcycle phone charger including safety features based on customer requirements.
- iii. To perform analysis on the design motorcycle phone charger with safety features.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter will be explained further about the information on the motorcycle phone charger with variety of energy source. The information on motorcycle phone charger is provided from online sources which the product have been sold on online shopping. The sample of products on online shopping to guide this project for analysis of the design and specific features. Other than that, it will help this project to analyse the product based on customer requirements. Hence, the power source may had been reviewed to ensure that the design of motorcycle phone charger appropriate with power supply.

2.2 Variety of Energy Source

2.2.1 Solar Energy

Solar energy used as the renewable energy to indicate the power supply for motorcycle phone charger. This is because the energy source from sunlight that consists of light and heat. Therefore, the power source of motorcycle phone charger can be generate the electricity for mobile phone.

During producing the flows of energy, there was the type of electronic and hardware applied to it. According to Cells and Irvine (2017) shows that the photovoltaic cell was one of the components for transferring radiant solar energy into electrical energy. Then, the greatest and most intelligent factories are focused on crystalline or multi-crystalline silicon. These modules are also the most effective for single-junction cells. Most productive cells are made of multi-junction Gallium Arsenide (GaAs) on Germanium (Ge) substrates which

are the most powerful and costly. Most of the production of solar multi-junction cells is for the space market, but increasing was showed the possibility for use with concentrates for energy harvesting.

Although, Juang and Radharamanan (2019) point out that photovoltaic cell power output test which is a monocrystalline solar panel with aspects of 22 inches by 24 inches that can produce 50 watts of power when exposed to 1000 W/m^2 , the typical irradiation value used to estimate accurate, direct sunlight. Moreover, the experimental had been conducted by Hidayanti (2020) shows the performance of portable battery charger of monocrystalline solar panel states the average of current and voltage are generated for data 1, current 21.8 mA and voltage 5.07 V, data 2, current 11.9 mA and voltage 5.0 V and data 3, current 26.4 mA and voltage 5.09 V. Battery charging time from blank to fully complete for data 1 is 74 hours, data 2 is 135 hours and data 3 is 61 hours. Furthermore, the experiment had been proved by Mudi (2020) This charger has an output voltage of 5V and an average current of 800mA to charge a mobile phone, the whole system charges the phone for 4-5hours and also has a capability of 4800mAh.

Other than that, the Maximum Power Point Tracking (MPPT) technique to minimize the power extraction under all conditions. According to the Távora and Designer Andrea Sarmiento Maia (2012), computing confirmation proves that EH01 has a tracking efficiency of up to 95% for simple solar power. However, the Maximum Power Point Tracking (MPPT) can improve the effectiveness of the photovoltaic system by 15% (Koutroulis et al., 2001).

In conclusion, solar energy was a renewable energy source which able to increase the efficiency of power. Thus, the improvement of power supply had been proven the several methods whether experimental or theoretical.

2.2.2 Wind Energy

Wind energy was the methods of producing the energy source to indicate the power supply for mobile phone during riding. This is because the different direction method using the wind energy for getting the current and voltages. Therefore, the various direction of wind that had been applied to develop for portable phone chargers.

Most of researched had been using the propeller fan and blades on their research to conduct the experiment for shows how the wind can be producing to generate the electrical. According to Saikumar et al. (2014), states that the number of blades determines the propeller's rotational speed which varies according to the angle of the pitch and the angle between the blades. If the number of blades is higher, the output speed is higher, giving more output voltage and inversely. This researched also supported by Razuan and Hussin (n.d.), states that the cooler fan was being used as a system that converts electrical energy from wind energy. The propeller's rotational speed is then determined by the number of the blades and the angle between the blades. Therefore, the higher the number of blades, the higher the output speed and the voltage generated, and inversely. Furthermore, Ali et al.(2016) also states that the effectiveness of a portable wind turbine depends on the configuration of the rotor. The blade numbers can influence the output of power from the turbine. For a compact hand-held phone adapter, the optimal number of blades depends on the intent of the blades.

From the testing, Rahman and Patil (2015) proved that the fan is measured at a wind/vehicle speed of 30 kmph to 80 kmph. The fan is observed to start working at a speed of 30kmph and to start producing adequate power at a speed of 40kmph (i.e. 3.7volts at 300mA). However, at 80 kmph the charger operates effectively since the generator's maximum power is 6 volts. However, the researcher Subhashini et al. (2018) proved that the maximum speed of the geared DC generator is 1297 rpm, and based on the experiment conducted, it was reported that the maximum voltage will generate 17V at 1297 rpm, which

is adequate to support the entire power machine as 5.3V was necessary for operation. Besides that, the researched had results which the portable mobile charger by using a Multi-Directional Wind Turbine (PMDVT) is very useful in obtaining external energy source that uses for mobile phone. The quantity of voltage that PMDVT can produce was up to 7.67V with a motorcycle speed of 100 km/h. When the motorcycle's speed increases, the voltage will rise. This can be demonstrated by the fact that only about 50 percent of the actual working voltage can achieve the full voltage output of the DC motor. Unless the motor generates more voltage at standard rpm, which is up to 5V continuously, it would be optimal to use the same compact handheld phone charger at moderate airflow speed. It may also be more effective for the consumer, and the blade may not be harmed Ali et al. (2016). This researched had been conductor similar with Razuan and Hussin (n.d.) states that the motorcycle has a top speed of 100 km/h, but the maximum speed used in this analysis is just 80 km/h. The output voltage required to start charging was 3.33V at 30km/h of motorcycle speed during the horizontal position and the minimum 3.0V will be transformed to 5V by the boost converter to charge the battery. The voltage produced is 3.72V, unlike the vertical location of the fan at a speed of 40 km/h where that is above the appropriate output voltage to start charging the battery.

In conclusion, wind energy is renewable energy used as a source of energy. The energy source can be used on the motorcycle if the speed of the motorcycle is at maximum speed. The energy source needed to charge a cell phone requires adequate wind energy. This allows the launch of energy resources to be obtained well.

2.2.3 Wheel Rotation Power Source

The use of dynamo is one of the methods to obtain a source of electricity supply. This method requires a slide between dynamos to generate electricity. The friction is either a bicycle tire or a motorcycle tire. The tires are restricted by the pillion rider because the bicycle-only rides on it while the motorcycle needs its speed limit.

By using a motorcycle wheel rotation, the design was utilized to make a device can be charged. The electric power supply provides by a dynamo which is the movement of wheel rotation will generate the electricity to the dynamo hence, the current amplifier was applied to limit the output voltage of the dynamo. With a DC-DC converter, it can be changed the 12VDC voltage coming from the regulator circuit to 5VDC. The DC voltage was connected to the regulator DC circuit which was applied to stabilize the output voltage. From the generator, the voltage was unstable because voltage follow based on the speed of rotation of the motorcycle wheel. When the rotation of the dynamo was higher, the voltage was higher (Jalil et al. 2019).

With electricity generation from the dynamo is able to increase energy sources effectively regardless of the problem of finding energy sources especially when traveling from one place to another. However, dynamo can only be obtained through rotating objects such as bicycles or motorcycles.