UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF SMALL ENERGY GENERATION FROM VEHICLE MOVEMENT

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

By

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfilment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Power) with Honours. The member of the supervisory is as follow:

…….

(Mr Mohd Yunos Bin Ali)

ABSTRAK

Pembangunan teknologi dengan menggunakan tenaga angin sebagai tenaga yang boleh diperbaharui untuk menghasilkan elektrik. Projek ini akan memberi tumpuan kepada tenaga kecil terhasil dari mana-mana pergerakan kenderaan. Idea utama adalah untuk menghasilkan alat yang boleh menyimpan tenaga elektrik daripada tenaga sisa. Semasa kenderaan bergerak ia menghasilkan tenaga yang terbuang tanpa disedari. Turbin angin menangkap corak aliran angin untuk membuat turbin bergerak. Turbin angin menukarkan tenaga kinetik kepada tenaga mekanikal menggunakan bilah. Bilah boleh dipasang terus pada aci motor. Dengan memutar aci penjana motor, ia menukarkan tenaga mekanikal kepada tenaga elektrik. Kemudian, elektrik telah disimpan di dalam bateri menggunakan pengawal pengecasan. Projek ini terdiri daripada motor dan komponen elektronik untuk menyimpan tenaga dan stabilkan voltan keluaran. Voltan dan prestasi kelajuan angin telah direkodkan semasa kenderaan bergerak untuk menganalisis prestasi. Pengetahuan dalam penyelesaian masalah salah satu daripada pengetahuan yang penting untuk memastikan litar berjalan dengan lancar.

ABSTRACT

Development the technology by using wind energy as a renewable energy to produce electricity. This project will be focusing on small energy generation from any vehicle movement. The main idea is to produce device that can store energy use from waste energy. This wasted energy obtains during the movement of vehicle. Wind turbine capture the wind flow pattern to make the turbine moving. The wind turbine converting the kinetic energy into mechanical energy using blades. Blades can be installed directly onto the motor shaft. By rotating generator motor shaft, it converts mechanical energy into electricity. Then, electricity was stored in battery using charging controller. Project consist of motor and electronic component to store the energy and stabilized the output voltage. The voltage and performance of wind speed were recorded during vehicle moving to analyse the performance. Knowledge in troubleshooting one of the important knowledge to make sure the circuit run smoothly.

DEDICATION

To my beloved parents

Ariffin Bin Jaya

Robiyah Binti Safar

Siblings

Nur Athirah Binti Ariffin

Muhammad Aliff Bin Ariffin

Supervisor

En. Mohd Yunos Bin Ali

For the support, love, teach and encouragement. Thank you very much.

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In the name of Allah, the Most Beneficent and Most Merciful, Who has created the mankind with knowledge, wisdom and power.

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I cannot end without thanking to my beloved family for your kind of understanding and moral support that never ending to me during carry out this final year project. May God bless each and every one of you.

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LIST ABBREVIATIONS, SYMBOLS AND NOMENCLATURES

HAWT	-Horizontal-Axis Wind Turbine
VAWT	-Vertical-Axis Wind Turbine
WARP	-Wind Amplifier Rotor Platform
UPS	-Uninterruptible Power Supply
USB	-Universal Serial Bus
DC	-Direct Current
V	-Volt
A	-Ampere
kW	-Kilowatt

CHAPTER 1
INTRODUCTION

1.0 Introduction

This chapter explain clearly on the background of the project and problem statement. Based on that, the objective and scope have been identified. This all main point will give the overview of the whole purpose of the project.

1.1 Background of the Project

Nowadays the electric power generation becomes important to researchers in order to achieve clean energy in the future. The demands on electrical power has increase rapidly due to the growth of population and technology all over the world which makes the electricity no longer only basic necessity of life but also one of the key element for a country's industrial wealth. This non-conventional energy sources such as solar, wind and biomass have play a big role to contribute in the development of generating electricity. This non-conventional energy can be considered as the energy of the future because it is pollution-free and eco-friendly. Although these sources of energy are abundant in nature, it usually not be used frequently in industry and become a wasted energy. If this wasted energy is fully utilized it can become a huge benefit to industry as it is a renewal energy that uses a minimum effort and more cost-effective.

Development of small energy generation from vehicle movement is about research for development of non-conventional energy considering the benefits of this electricity generation. The main idea is to produce device that can supply or charging electric to hand phone and small appliances or store energy use from wind energy. The

moving vehicle produce wasted source of wind energy. In order to prevent this, the project is created to utilize this relative wind energy. The wind energy that produces from the vehicle movement can produce electricity using blade at wind turbine for converting the kinetic energy into mechanical energy. Blades can be installed directly onto the motor shaft to convert the mechanical into electricity for storage in a battery system. Based on the wind flow pattern, the flow of wind will be capture by the wind turbine and produce the electricity need for the battery system. The amount of electricity obtain is fully depend on the wind speed, so the average speed movement from the wind turbine need to be measure during the vehicle movement.

Wind energy one of an inexhaustible source that are cleaner than coal, natural gas, and oil sources that can ambitious if fully harnessing this power energy without develop difference view among different technologies. So it will create incentives for energy sources as it produces no toxic pollution or global warming emissions. With the exception of not controlled by cartels, the cost of power is low for domestic and commercial users. As one of the cleanest and sustainable way to generate electricity, it will be a loss if this energy does not fully utilize. The wind energy produces from this vehicle movement will be use as a main power supply to generate electricity for this project. The aim of the project is to develop small energy generation that fully use of this wind energy for the future user.

The importance of this project to the future researchers is it can provide baseline information on the demands of electrical power that can be a key element for a country's industrial wealth. This research will help people to learn how to value electricity and produce it from renewable sources. The development of small energy generation from vehicle movement can encourage industry to use renewable source for a cleaner technology.

1.2 Problem Statement

In this 21st Century, electricity plays a vital role for all the kind of aspect of modern living and convenience. Electricity become the most important things that go

on in the world and become one of the sorts of things that people cannot live without Depending on this electricity not only just happen in home, but also in industry such as communication and transportation. Communication technologies probably are the most aspect that needs this electricity. With electrically powered, people now can communicate with each other all around the world no matter how far the distance or isolated it is as long if it has a source of power to use on the mobile phone or other electronic communication device.

Electricity to some degree also is need by transportation industry to give improvement over existing vehicle. Traveling using vehicle for long journey always give a problem to recharged battery phone. These problems happen because of insufficient adaptor as the vehicle such as car only have one or two USB adaptor. It will be not enough if the car has two or more passengers. If the car charger is not working or have broken, what alternative source that can get to charge the phone battery. What to do if an emergency happens during travel if does the phone do not have sufficient battery. What if the driver gets lost during the journey and need the phone to connect the internet or call someone to ask for their help. The worst possible scenario might really happen just because of this. Moreover, car chargers also have a pollution issue and affect the overall power and fuel capacities of a car. There is solution to avoid this by having small device that can charge low power electronic. When vehicle moves, it can produce wind energy that can use to generate electricity.

As one of the natural and cleanest energy in this world, wind energy is the most commonly available source and it will be a wasted if do not fully utilizes it. The small device can be used as emergency source for charging system. This technology will help traveler to faced charging problem of electronic gadget during travelling by armed with charging device use from source of renewable energy. If all modes of transportation do apply this, the worst situation can be avoiding and improve the technology of existing vehicle.

1.3 Objectives of the Project

I. To develop a model of small energy generation from vehicle movement.
II. To produce electricity by using innovative energy generation from vehicle wasted energy
III. To produce output with 5V.

1.4.1 Scopes

This project will be focusing on small energy generate from any vehicle movement with the source of waste wind energy. This wind energy produces by vehicle movement. From the vehicle movement, the energy waste in wind power can be generating by using wind turbine. Wind turbine convert wind kinetic energy into mechanical energy using blades. Blades can be installed directly onto the motor shaft to convert the mechanical into electricity for storage in a battery using charge controller circuit.

1.5 Summary

This chapter is to describe the introduction of the project and gives the explanation project's objectives. The problem statement is identified and the details of scope of work have been defined to know the purpose of this project.

CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

This chapter relates to the reading material of the literature review that will discuss about the overview of the project, history of the wind energy generation and the different types of wind turbines. Besides that, this chapter also explains about other method use and previous work related to the project. From that it will be able to discuss the components used in this project operation. The information obtained from this literature will be used to assist the implementation of the next process.

2.1 History of Wind Energy Generation

Wind energy today is one of the main sources used to generate electricity. Wind is a form of solar energy and it will always blow as long as the sun shines. That why wind is called a renewable energy source. Before the industrial revolution, the energy is needs to improve human daily life. For transportation, the power of the wind is need for sails to go to every corner of the world. The wind also is used to drive the simple machines that ground the grain and pumped water. The simple machines based on the ability to harness the power of wind have been upgraded to use widely around the world. One of the wind machines that use before the industrial revolution is a classic windmill.

The industrial revolution of the classic windmills through times and transition have develop a wind turbine. Wind Turbines is a system that uses kinetic power of the wind to generate electricity. The history of emergence of wind turbines system starts from application of driving a sailboat and sailing ships in numerous cultures of civilization. Wind power has been used since early history by mariner for sailing boats

on rivers and lakes and then ships at sea (Fig. 1). (M. ragheb, 2014, p.1). As early as 5000 B.C, the civilization along the Nile River has created boats that improvise with propelled. Since early recorded history, people have harnessed the energy of the wind for regular basis in daily life.

Figure 2.0 : Early 5,000 years old ancient Egyptian sailboat

The use of natural energy is growing over time, evolving from movement of ships to operating irrigation pumps to finally generating for general use. The usage of this wind energy eventually spread around the world. People have inventing new ways to extract energy from this renewable source. By the 11thcentury, people in the Middle East have developed a windmills system that extensively used for food production. This idea and technology have been brought back to Europe by returning crusaders and merchant from wars. It helped to increase European knowledge about this renewable source. Europeans have learned how to make better ships and become worldwide explorers to search for new technology. The technology of the Middle East also attracted the Dutch to refine the windmill. The Dutch people invented the technology and adapted it for draining lakes in their country. Holland use windmills since 1350 AD to drain marshes and shallow lakes and turning them into productive agricultural land. (M. ragheb, 2014, p.2). In the late of 19^{th} century, this windmill technology is taken by settler into the New World to use to generate electricity. This windmill is use to pump water in the farms and generates electricity in homes and industry.

In the year of 1887 the first known wind turbine is created by Prof James Blyth of Anderson's College, Glasgow. The college now is known as Strathclyde University. The wind turbine is installed in the garden of holiday cottage at Marykirk in Kincardineshire to produce electricity. The turbine was used to charge accumulators for lighting the cottage. The cottage make a history as it is the first house in the world to have electricity supplied by wind power. Since that, the wind turbines have been through the process of revolution. Many improvement and improvisation have been made for this technology. The modern applications such as hybrid energy, water pumping and battery charging are make from this non-conventional energy source. The current wind generators technology has revealed that this source energy has very low external and social cost that is clean and safe for consumer. Nowadays wind machines are primarily used in electrical power generation. So that the terminology: "wind generators" becomes a more appropriate designation. (M. ragheb, 2014, p.2).

The modern utilization of wind power have establish into the landscape of modern world. From windmill to wind turbine, the technology has a decent safety record and steady growth. There is a booming demand of wind power today because undoubtedly one of the cleanest energy from a renewable source. It fuel costs is free in comparison with the use of foil oil and coal for energy sources of non-renewable. The scientists are searching for new and more efficient methods of generating energy as the demand of wind energy growth is gaining momentum in many ways across the world. As fossil fuels continue to diminish and climate change poses an ever-increasing threat, this wind energy can be a solution to create a no pollution source of energy.

2.2.0 Type of wind machine work

There are exist in two direction of the rotating shaft (axis), horizontal-axis and vertical axis which this two type usually used until now. The wind machines occur in varies of size. Output power generates depends on the size of turbines. A single home or business may have a capacity of less than 100 kilowatts can only use small turbines to generated power. Large turbines used to power some large commercial which may

have capacity of 5 million watts, or 5 megawatts. Large turbines are usually in one company into wind farm that lend power to the electrical grid.

2.2.1 Horizontal-Axis Wind Turbine

The horizontal-axis type is the most wind machines being used today. Horizontal-axis wind machines have exactly same blade like airplane propellers. Wind machine stand as high as a 20-story building and has three blades that span 200 feet across for a typical horizontal. In the world we have blades longer than a football field which is a largest wind machine. To capture extra wind, wind machine need to stand tall and wide.

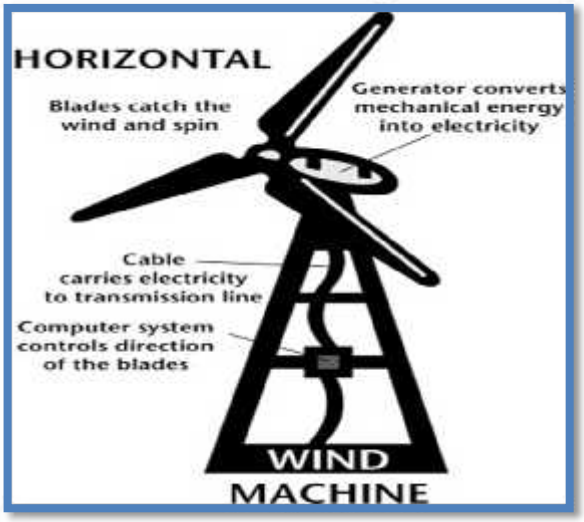

Figure 2.1 : Horizontal-axis Wind Turbine

2.2.2 Vertical-Axis Wind Turbine

The criteria for vertical-axis machine are it have blades that go from top to bottom and looks like a giant two-bladed egg beater are the most common type. The vertical wind machines it type are typically stands 100 feet tall and 50 feet wide. Until today only a very small percent of the wind machines used this type of machines. To upgrade the wind system machine used today, the Wind Amplifier Rotor Platform (WARP) have been designed

to be more efficient and use less land but it differences kind of wind system. The WRAP looks like a stack of wheel rims because do not use larger blades.

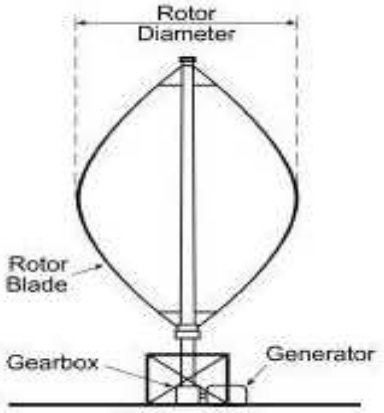

Figure 2.2 : Vertical-axis Wind Turbine

2.3.0 Previous Works

There are several studies on electric generation using a wind turbine concept to produce energy without emit any greenhouse gases or toxic waste in the process of producing electricity. As one of the fastest-growing energy sources in the world, wind energy would be a sustainable energy source that can be relied on for the long-term. The previous research can help to improving technology and saving cost in terms of fuel consumption for mobile battery charger application.

2.3.1 Design mobile battery charging based on wind energy

According to Saikumar.P, Thmaraikanannan.D, Yuvaraj.G, and Yuvaraj.C (2014) the most commonly available and used energy resources are solar and wind. The objective presented here is charging of low power electronic gadgets using the wind energy available during travelling. (Saikumar.P, Thmaraikanannan.D, Yuvaraj.G, &Yuvaraj.C, 2014). It discusses an energy converter that uses wind energy technology to power