UNIVERSITI TEKNIKAL MALAYSIA MELAKA

CONCEPTUAL DESIGN AND FABRICATION A NOVEL ENERGY HARVESTER FOR MALACCA RIVER

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

by

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DECLARATION

I hereby, declared this report entitled “PSM Title” is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor Degree in Mechanical Engineering Technology (Maintenance Technology) with Honours. The member of the supervisory is as follow:

……

En. Muhammad Nur bin Othman

(Project Supervisor)

ABSTRAK

Sumber air adalah salah satu tenaga boleh diperbaharui yang boleh diubah menjadi sumber tenaga elektrik. Sememangnya, penyumbang utama kepada penjanaan dan sumber tenaga generasi ini akan habis. Kajian mengenai projek ini adalah lebih untuk menyelesaikan masalah ini. Seperti yang kita ketahui sumber air seperti tenaga hidro dari sumber sungai boleh diubah menjadi tenaga elektrik. Kuasa hidro boleh diterokai dengan lebih meluas dan menjadikannya sumber utama untuk menjana elektrik. Ini menjadikannya kelebihan jika terdapat alat untuk menjana elektrik menggunakan kuasa hidro yang dibangunkan. Reka bentuk baru untuk mengkomersialkan penuai tenaga elektrik ini dibangunkan. Dalam projek ini, teknik reka bentuk baru untuk menggunakan tenaga boleh diperbaharui ini telah dibuat untuk menjana tenaga menggunakan kuasa hidro dari sungai. Dalam projek baru ini, teknik dengan memanfaatkan tenaga boleh diperbaharui dilakukan untuk menggunakan kuasa hidro. Lakaran dan reka bentuk telah dibuat dengan lebih teliti menggunakan perisian SKETCHUP. Bahan untuk menghasilkan penuai tenaga ini telah dipilih berdasarkan kajian bahan untuk memastikan ia dapat dipercayai. Hasil kajian itu digunakan untuk meneruskan proses fabrikasi. Pada akhir projek ini, penjana kuasa elektrik diuji dengan menggunakan voltmeter untuk menguji elektrik yang dihasilkan dari projek ini. Melalui kajian ini, satu prototaip penuai tenaga dari sumber tenaga boleh diperbaharui berjaya dibangunkan dan berfungsi sepenuhnya dan boleh ditukar kepada elektrik.

ABSTRACT

Water resources are one of the renewable energy that can be transformed into a source of electricity. Naturally, the main contributor to this generation of electricity generation and resources will be exhausted. The study of this project is more to solve this problem. As we know the source of water such as hydropower from the river source can be transformed into electricity. Hydropower can be explored more widely and make it a major source for generating electricity. This makes it an advantage if there are tools to generate electricity using hydropower developed. New design to commercialize this electric energy harvester is developed. In this project, a new design technique for utilizing this renewable energy has been made to generate energy using hydropower from the river. In this new project, the technique by taking advantage of renewable energy is done to use hydropower. Sketches and designs have been made more thoroughly using SKETCHUP software. The material to produce this energy harvester has been selected based on material studies to make sure it is reliable. The results of the study were used to continue the fabrication process. At the end of this project, electric power generators are tested using a voltmeter to testing the electricity generated from this project. Through this study, a prototype of energy harvester from renewable energy sources is successfully developed and fully functional produced and can be converted into electricity.

DEDICATION

I would like to dedicate my project to my beloved parents, my supervisor Mr. Muhammad Nur Bin Othman, and co-supervisor of Mr. Azrin Bin Ahmad and all my friends to support me from the beginning to the completion of this project.

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Bismillahirrahmanimahim, I would like to thank the deepest gratitude to Allah for giving me the blessing to complete this work. First and foremost, I appreciate the supervisor of my project, Mr. Muhammad Nur Bin Othman, and co-supervisor. Azrin Bin Ahmad who always guided and encouraged me during this study. Thank you very much for giving professional advice and suggestion to bring this project to its final form. I am also very grateful to my supervisor for criticism, advice, and motivation without his support and interest, this final year project will not be the same as that presented here.

I would like to extend my sincere thanks to my friends especially Roslan Bin Pasak and Abdullah Fahmi Bin Ibrahim for their support, knowledge, and ideas. Both of them started my initial conception of this project. My sincere thanks also to my beloved family especially my parents, Ab Latif Bin Mohamad and Hamiah Binti Dongkol. With prayer and morals supposing both, I have the pressure to solve any problems

Finally, I would like to thank for everyone who directly or indirectly helped my year-end project.

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INTRODUCTION

1.1 Background of Study

Energy is an important source of everyday life in every country. The energy used in their daily life to do any work on the machine. For example at home, energy is used to turn on washing machines, refrigerators, televisions and so on. While in the manufacturing sector, the energy needed to carry out daily activities of the machWave power pickup is a method used to produce electricity. Additionally, energy harvesters using river flows or hydro power are also a means of generating electricity.

Renewable energy is the best alternative to handling parts or supporting non-renewable energy such as fossil fuels. This is because energy from fossil fuels takes hundreds of years to be used to produce fossil energy sources. In addition, hydro energy is one of the clean and environmentally friendly renewable energy. Energy from these sources does not produce air pollution. Therefore, it can ensure endurance for human health due to pollution such as acid rain, fog, greenhouse effect and so forth not through this renewable energy source.

The purpose of the project is to conduct preliminary investigation to find potential energy that can be produced through water resources in Malaysia. In addition, it should be seen from some aspects and factors. One aspect is to maintain a

clean environment rather than being contaminated by the result of non-renewable energy.

As the best alternative, renewable energy is the best option to replace this non-renewable energy source. As we know, there are many renewable energy sources such as solar energy, wind power, hydropower, geothermal and biomass power. Renewable energy usually provides energy services in four major areas of electricity generation, air / air cooling, transportation and energy (abroad). The technology used to produce renewable energy is relatively new, although renewable energy has existed as long as the earth itself.

1.2 Problem Statement

Energy resources that are not renewable fossil fuels is one of the most important resources in Malaysia. Fuel and its use will run out faster than you can produce. In Asian countries, Malaysia is one of the developed countries in need of energy resources is growing every year. But the sources of fuel energy will eventually become extinct in the future. To avoid the shortage of energy resources, finding ways to avoid electricity storage.

Besides that, the phenomenon of effect of greenhouse gases and air pollution are also familiar in Malaysia. A large amount of carbon dioxide produced causes global warming the Earth is experiencing. Air pollution and acid rain is a result of the impact of fossil fuels. This issue will harm the health of humans and ecosystems also affect us. This problem should be taken seriously and a system of eco-friendly power generator is needed to reduce this pollution.

Malaysia's population is increasing every day. These factors will lead to limited land area apart the construction work. With this increase, the power plant systems that are needed to accommodate electric needed. Power plant systems typically require a large area to be built. It is also inappropriate because the built area

of water can cause water pollution. A solution is needed to generate electricity for the future.

1.3 Objective

Each project has an objective to achieve. In general, the project's objective is to contribute to the development of converter systems renewable energy to electrical power. To ensure that this project meets the goals and requirements, the goal of the project is as follows:

i. Design and develop new energy harvesters based on renewable energy source (river).
ii. To testing the energy generated from renewable sources.

1.4 Scope

To ensure that the project is running smoothly and achieved as planned, some scope has been set as follows:

a) To design a generator using renewable energy from hydropower (river).
b) To produce a low cost energy harvester.
c) To study various design of energy harvester.
d) For fabricating and developing a novel technique to convert renewable energy to electricity power.

CHAPTER 2

LITERATURE REVIEW

2.1 Type of Energy

2.1.1 Non – renewable Energy

Coal, petroleum, and natural gas is an example of non-renewable energy. Main elements of the fossil fuel is carbon. The duration of the forms of fossil carbon is hundreds of years. The same way all these fossil fuels are formed.

Plants and animals have the energy stored in them when he died. In moist soil there are plants, algae and plankton that absorb sunlight to create energy through photosynthesis. Organisms of plants and animals that have died will be washed away and will eventually disintegrate in beneath the seabed. Fossil fuels such as coal, natural gas and petroleum is produced when plants and animals that have died recently received high heat and underground pressure caused by stone and specimen piled on their top. Eventually become fossil fuel.

Non-renewable energy is also causing environmental pollution such as air pollution and acid rain. This is because the combustion of fossil fuels produces

carbon gas and chemicals. It is harmful to human health. Non-renewable energy also will eventually become extinct (John et al., 2011).

2.1.2 Renewable energy

Renewable energy can be classified into several types. Solar energy, wind energy, hydropower, geothermal and biomass power is an example of renewable energy. Renewable energy is energy that is collected from renewable sources, which naturally added on human time scales, such as sunlight, wind, rain, tides, waves, and geothermal heat. Renewable energy often provides energy services in four key areas of electricity generation, air and water heating / cooling, transport and energy outside country. Technology used to generate renewable energy is relatively new although renewable energy has been around as long as the earth itself.

Renewable energy technologies is the fuel energy into a form that is most commonly used as electrical energy and heat, chemical, or mechanical power. Renewable energy is energy that is safe, clean and environmentally friendly. It also does not cause pollution. Pollution such as the greenhouse effect, air pollution from fossil fuel fumes and acid rain will also affect human health. Production of renewable energy is very important to be highlighted as a very high power demand nowadays.

2.2 Type of Renewable Energy

2.2.1 Solar power

Renewable energy sources are increasingly commercially at present to cover the shortage of energy resources. One of these is solar energy. Sunlight

illuminates the whole world is a natural resource that really is not contaminated. The quantity of solar energy on the earth is more than requirement of human annually. It can be used to convert from sunlight to solar energy sources are renewable and thus can deal with human problems in lack of energy resources. Solar energy can be converted to electrical energy using a variety of technologies. Technology commonly used such as photovoltaic (PV) panels, concentrating solar thermal power (CSP) and concentrated photovoltaic (CVT). It is a sub-section of technologies that are becoming popular nowadays. Natural energy sources are most potential produced is by using photovoltaic (PV) (Lin, 2015).

In addition, through solar energy cells it is used to transfer fotoelectric effects of the electric power. This energy is usually used to supply power to large stations such as space stations, artificial satellites, and also down supply to rural areas. Additionally, the source of solar energy is also used to supply solar power plants and combined into power generation (Lin, 2015).

According (Mohammad Bagher, 2015), through the solar energy the earth receives a Very Extraordinary supplies. Where the sun's fusion reactor that has more than 4 billion years to burn. Within a minute, the energy of the sun is enough to supply the energy needs for one year during the World Energy. This is the source of energy that will not run out even free, but to take advantage of solar energy is a relatively new idea. In addition, in the last three days, the amount of solar radiation on the earth is equal to the energy stored in all fossil energy sources.

Effective methods to produce solar photovoltaic energy has Multiple Benefits. Among its advantages is one of the most promising sources of renewable energy in the world. besides, it is also is not contaminated, Part Engaged Can Also reaching Up to bottom, and Low Cost to have a life of 20-30 years. No installation is required massive and shows that it is very unique.

In addition, Inland too can produce the solar energy resource. Electricity can be produced with as little or as much Build system as a solar energy system that is needed. After generator Power of the solar energy, it will be distributed to a few areas such as home, school, and business. Energy solar capacity plus so much more along with the development of the Community. Countries in the developing world, the source of solar energy is the longest needed On This Day. It is also the longest segment of the rapidly growing photovoltaic market to. Government finds modular, centralized character ideal to fill the electricity needs of thousands of remote villages in their country (Mohammad Bagher, 2015).

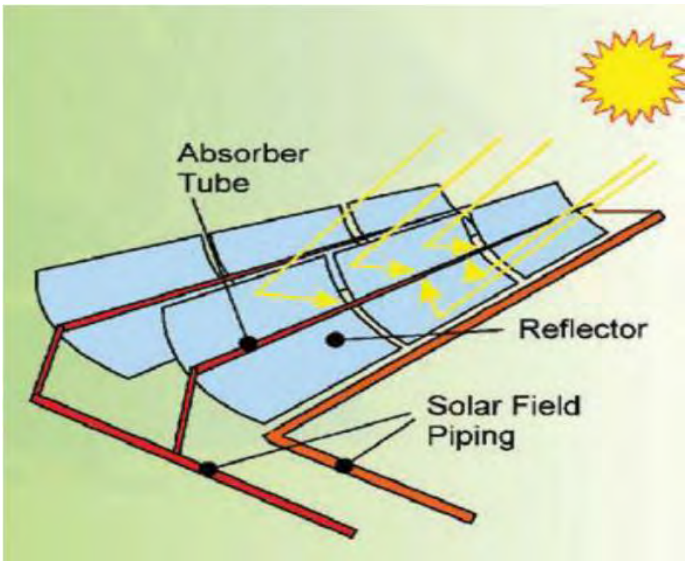

Figure 2.1 : Simple Working of Solar Energy (Mishra & Tripathy, 2012)

2.2.2 Wind power

One of the renewable energy is energy that is not extinct, the wind power. This energy is very environmentally friendly and clean energy because it does not produce air pollution, acid rain and the like to the environment. To generate through this, wind turbines is used. Wind energy resources in many countries has been widely used as a source. This is because the power of the wind can be

commercialized with other renewable sources. It also can improve the economy in generating electricity.

Air pollution will lead to acid rain nor will occur through wind energy compared with energy from fossil fuels. This problem affects human health. Why renewable energy produced in line because it does not produce carbon and pollution-free, does not require fuel, do not create greenhouse gas and also wind energy does not produce toxic or radioactive waste (Jaber, 2013).

2.2.3 Hydropower

Hydropower is a renewable energy source based on the natural water cycle. It is energy that comes from the energy of moving water comes from the Greek words namely hydro, means water. The natural cycle of continuous part of the fall and the movement of water called the water cycle. Water vapour generated from solar energy to evaporate water in Earth's oceans and rivers and pull up. When the water vapour reaches the cold air in the atmosphere, it condenses and forms clouds. Presence of moisture eventually fall to earth as rain or snow. This will add it back in the ocean and river. Gravity refused to move the water, carried from the highlands to the lowlands. Energy-moving water can be very powerful. Hydropower is called a renewable energy source because the water on Earth is constantly replenished by rain. As long as the water. This cycle continues, we will not run out of this energy source (Hydropower, 2009).

Hydropower reliable and cost effective renewable energy generation technology available and is the most mature power. Hydropower is the largest renewable energy source, and it generates about 16% of electricity in the world and more than four-fifths of renewable electricity in the world. At present, more than 25 countries around the world rely on hydropower for 90% of their electricity supply (99.3% in Norway), and 12 countries are 100% dependent on hydropower.

Hydro generates most of the electricity in 65 countries and played a number of roles in more than 150 countries. Canada, China and the United States are the countries that have the largest hydropower generating capacity (IRENA, 2012).

2.2.4 Biomass power

Waste, trees and plants always exist and can produce a renewable source of energy known as biomass. It is organic material made from plants and animals where chemical energy in plants transferred to the animals and people that eat them. Plants absorb the sun's energy known as photosynthesis. Biomass contains stored energy from the sun. Wood, crops, manure, and some garbage are examples of biomass fuels for this. To get electrical power to biomass is to burn wood waste or garbage and it produce steam or heat. There are also other ways to release this biomass energy. Biomass can be converted to other usable forms of energy like methane gas or transportation fuels like ethanol and biodiesel.

The main ingredient of natural gas is methane. To produce transportation fuel, ethanol-smelling stuff, like rotting garbage, and agricultural and human waste, release methane gas. It's also called "landfill gas" or "biogas" crops such as corn and sugar cane can be fermented and produce fuel (Matter, n.d.).

According from (Christian, 2000), fossil fuels coal, petroleum crude oil and natural gas as a source of thermal energy; gas, liquid and solid fuels and chemicals needed in world energy markets. To form fossil fuels on earth it requires millions of years. Biomass is the only natural, renewable source of carbon known as large enough to be used as a substitute for fossil fuels. It also includes all organisms in the aquatic and terrestrial environment, plants, and trees, or biomass virgin, and all the others who died and biomass such as municipal solid waste (MSW), biosolids (sewage) and animal waste (feces) and materials waste, forestry and agricultural residues, and certain types of industrial wastes. Only a short time

is required by yourself biomass fuels to replace what is used as a source of energy and renewable energy.

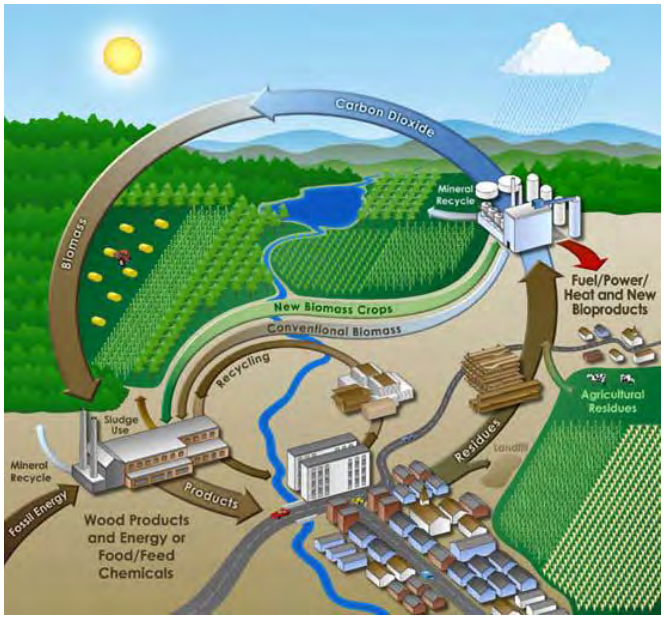

Figure 2.2 : Biomass Energy Cycle (Sriram & Shahidehpour, 2005).

2.2.5 Geothermal power

Earth that generates geological phenomena of heat contained in it. Heat is a form of energy and geothermal energy. This energy is often used nowadays. However, to show that part of the Earth's heat that can, or could, be recovered and exploited by man and it is in this sense that we will use the term from now (H.Mary & Fanelli, 2006).

Geothermal Power Works In this flash steam power plants. This is because the hot water depressurized or "leaders" will be a vapour that can then be used to drive the turbine. Rotating turbines would generate electric energy. Geothermal energy is also friendly renewable energy. It also dampens the environment from air pollution that will be generated compared to using fossil fuels as an energy source.

According to the study (H.Mary & Fanelli, 2006), geothermal history has led our ancestors to surmise that parts of the interior of the Earth is too hot to presence of volcanoes, hot springs and other thermal phenomena. The most common type of geothermal power plant in the world is a single cycle flash. The new easy way for the use of the effect of the heat contained in the hot liquid for geothermal wellheads superheated saturated steam enters the turbine is presented. Steam enthalpy and temperature wellhead wellhead geofluid are varied to see the effect on net power output and turbine exhaust pressure separator quality (Huddlestone-Holmes & Hayward, 2011).

2.3 Type of Hydropower

2.3.1 Run-of-river

Run-of-river small hydro mostly as any dam or a meal is very little power. Small hydro is also one of the renewable energy sources of the earliest known. According to (Oliver Paish, n.d.), this technology was initially used in Himalayan villages in the form of a water wheel. It's to provide motive power for running devices like blenders. In addition, shortly after the commissioning of the first plant in the world hydro power in Appleton United States in 1882, small hydro power technology was introduced in Darjeeling, India. it is the first plant of small hydro power plant in India was built in 1897 in rural areas in less developed countries in small-scale Hydropower is one of the most cost-effective energy that can be used (Bhat & Prakash, 2008).

Figure 2.3: Run–of–river.

2.3.2 Pumped Storage

Pumped storage is being used to the diversity of renewable energy sources in addition to other sources such as wind and solar generation. Pumped storage is a type of hydroelectric power generation. They are used to store energy in the form of water in the upper reservoir. Then the water is pumped from the reservoir at a lower altitude. Conventional hydropower stations in the same way during high electricity demand periods in which water is stored released through turbine. At evenings and weekends, storage pump is used to recharge the reservoir by pumping the water back to the upper reservoir. Back pump / turbine and motor / generator assemblies used in the pump storage system serves as both pumps and turbines. Pumped storage can absorb excess generation (or a negative charge) at times of high yield and low demand. Then for a technology that allows the penetration of wind power increases, pumped storage releasing the stored energy during periods of peak demand. it is proven to enable penetration of wind power in the United States company energy supply system (Miller & Winters, 2008).