UNIVERSITI TEKNIKAL MALAYSIA MELAKA

PORTABLE ENERGY GENERATOR USING TURBINE

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BACHELOR OF ELECTRICAL ENGINEERING TECHNOLOGY (Industrial Automation & Robotics) WITH HONOURS

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Faculty of Electrical and Electronic Engineering Technology

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A thesis submitted

in fulfillment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Automation & Robotics) with Honours

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APPROVAL

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ABSTRAK

Sumber tenaga boleh diperbaharui adalah istilah yang digunakan untuk menerangkan sumber tenaga semula jadi, berterusan, tersedia secara meluas. Sumber tenaga boleh diperbaharui sentiasa tersedia dan tidak habis, kerana sifat asalnya sentiasa menambah dengan kadar yang sama atau lebih cepat daripada yang habis. Projek ini memfokuskan pada sistem turbin dan bertujuan untuk membuat penjana tenaga mudah alih menggunakan turbin. Untuk sistem turbin, kajian projek ini mengenai turbin angin dan sistem turbin hidro, untuk turbin angin kelajuan angin dibahagikan kepada empat kategori, berdasarkan operasi turbin angin. Pertama, ini adalah kelajuan permulaan, inilah kadar di mana pemasangan pemutar dan bilah mula berputar. Kedua, ini adalah kelajuan pemotongan, kelajuan pemotongan adalah kelajuan angin minimum di mana turbin angin menghasilkan tenaga yang boleh digunakan. Bagi turbin hidro, ia bergantung pada keadaan cuaca, seperti hujan, suhu, kelembapan, dan faktor lain selain sistem itu sendiri. Pemasangan rotor terdiri daripada beberapa bilah (biasanya tiga bilah) yang disambungkan ke inti bersama, kon hidung, dan pengikat. Dari hasil yang telah dikumpulkan, turbin ini akan mula berfungsi untuk mengecas bateri apabila turbin bilah mencapai kelajuan sekurang-kurangnya 5.6 knot dengan julat voltan pada 3.676V. Output terbaik dan paling efisien adalah ketika turbin bergerak laju mencapai 8.4 knot dan menghasilkan output voltan sekitar 4.012V. Selain itu , kecekapan projek ini adalah dapat mengecas telefon bimbit dalam setiap 1% kenaikan bersamaan dengan masa 5 minit yang diambil dari input maksimum generator, projek ini berjaya mencapai semua objektif yang diperlukan. Akhirkata, penambahan sistem IOT dan ringkas sangat digalakkan.

ABSTRACT

Renewable Energy Sources is the term used to describe natural, continuous, widely available, and environmentally benign energy sources. Renewable energy sources are constantly available and do not run out, as mother nature continually replenishes them at the same rate or faster than they are consumed or used up. This project is focusing on the turbine system and aim for making a portable energy generator using turbine. For the turbine system, this project study on wind turbine and hydro turbine system, for wind turbine the wind speed is divided into four categories, based on wind turbine operation. Firstly, it is a start-up speed, this is the rate at which the assembly of the rotor and blade begins to rotate. Secondly, it is a cut-in speed, Cut-in speed is the minimum wind velocity at which the wind turbine produces usable energy. As for hydro turbine, it is dependent on weather conditions, such as rainfall, temperature, humidity, and other factors besides the system itself. The assembly of the rotor consists of several blades (usually three blades) connected to a common core, a nose cone, and fasteners. As from the result that have been collected, this turbine will start functioning to charging the battery when the blade turbine reaches the speed at least 5.6 knots with voltage range at 3.676V. The best and most efficient output are when the speed turbine reaches 8.4 knot and producevoltage output around 4.012V. As for the conclusion, this project efficiency is that it can charging the mobile phone each 1% equivalent to 5-minute time taken from the maximuminput of the generator. As for the conclusion, this project is successfully achieving all the objective. Lastly, for the improvement this project need to be more compact and an addition of using IOT would beperfect.

DEDICATION

This study is dedicated wholeheartedly to our beloved parents, who have been our source of inspiration and give us strength when we give up, who provide their moral, spiritual, emotional, and financial support continuously. To finish this study, our brothers, sisters, relatives, mentor, friends, and classmates share their words of advice and encouragement. And finally, we dedicated this book to the God of all power. Thank you for guidance, strength, strength of mind, protection and skills and a healthy life for us. We are all giving you these.

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There is a race of life in the present world of competition in which those eager to succeed. Project is like a bridge between practice and theoretical work. With that willingness I have joined this project. Firstly, I would like to thank the Almighty God, the supreme power, who is obviously the one who has always guided me to work on the right part of life. This dream could not become a possibility without His grace. Next to him are my parents who have taken me up to this point with love and support, and I am very grateful to them.

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LIST OF SYMBOLS

D, d	-	Diameter
F	-	Force
g	-	Gravity = 9.81 m/s
I	-	Moment of inertia
1	-	Length
m	-	Mass
N	-	Rotational velocity
P	-	Pressure
Q	-	Volumetric flow-rate
r	-	Radius
T	-	Torque
Re	-	Reynold number
V	-	Velocity
w	-	Angular velocity
x	-	Displacement
z	-	Height
q	-	Angle

LIST OF ABBREVIATIONS

PCA	Principal Component Analysis
GPS	Global Positioning System
WTGS	West Texas Geological Society
WEC	World Energy Council
SVAT	Soil-Vegetation-Atmosphere-Transfer
ISA	International Standard Atmosphere
TSR	The optimum tip speed ratio
DMM	Digital multimeters
DVOM	Digital Volt Ohm Meter
LIB	Lithium-Ion Battery

CHAPTER 1

INTRODUCTION

1.1 Background

Renewable energy is energy obtained from human-scale renewable resources, such as sunlight, wind, rain, tides, waves, and geothermal heat. Renewable technology also provides resources in four primary areas: power supply, air and water heating / cooling, transportation, and energy infrastructure in rural (off-grid). Based on (Al Jaber *et al.*, 2010) report, Renewable energy contributed 19.3 per cent to human global energy consumption and 24.5 per cent to their electricity production in 2015 and 2016, respectively. This energy consumption is divided into 8.9% by conventional biomass, 4.2% by heat energy (modern biomass, geothermal and solar heat), 3.9% by hydroelectricity and the remaining 2.2% by wind, solar, geothermal, and other forms of biomass electricity.

Human action is overpowering our world with carbon emissions and other global warming contaminants. Such gasses serve as a fire-piercing shield. Suchgasses serve as a fire-piercing shield. The effect is a system of significant and dangerous impacts, ranging from heavier, more intense storms to drought, rising sea levels and extinction. Our carbon sector accounts for about 29 per cent of global warming pollution in the United States. Most of those pollutants come from fossil fuels like coal and natural gas. Burning natural gas for energy releases between 0.6 and 2 pounds of carbon dioxide equivalent per kilowatt-hour (CO2E / kWh); carbon emissions between 1.4 and 3.6 pounds CO2E / kWh becomes apparent onceyou look

at the numbers. In contrast, Wind is responsible for only 0.02 to 0.04 pounds of CO2E / kWh on a life-cycle basis; Solar 0.07 to 0.2; Geothermal 0.1 to 0.2; and hydroelectric between 0.1 and 0.5.

Figure 1.1 shows that the most lifecycle Greenhouse Gas Emissions is the coal and the least is hydropower.

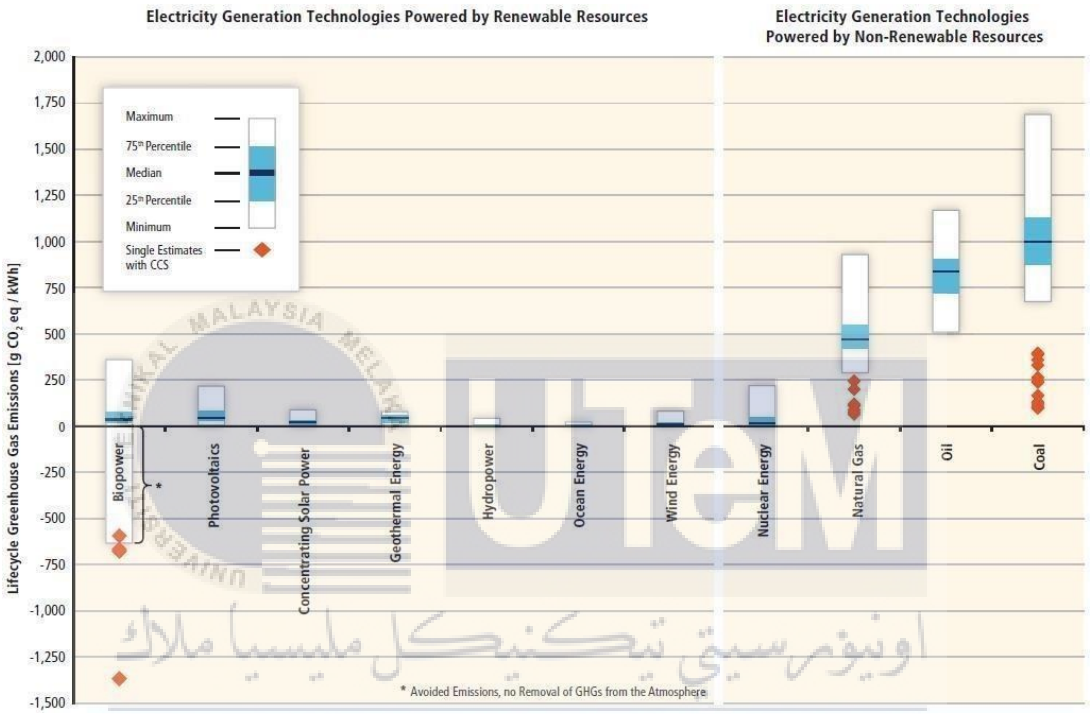

Figure 1. 1: Renewable Energy Chart by Lifecycle Greenhouse Gas Emissions

(Olotu Yahaya, A E Akhigbe, F I Izuagie, 2011)

The concept of this renewable energy is using a natural energy or also can be called elemental energy for example using air flow as the source that make the mechanism to move, can be called turbine and when it move it produce an another type of energy that is converted from mechanical energy to electrical energy. Besides that, for solar energy, it is use sun light as the source and a solar panel as the converter to convert the energy from the sun to an electrical energy as the output.