



PORTABLE ENERGY GENERATOR USING TURBINE



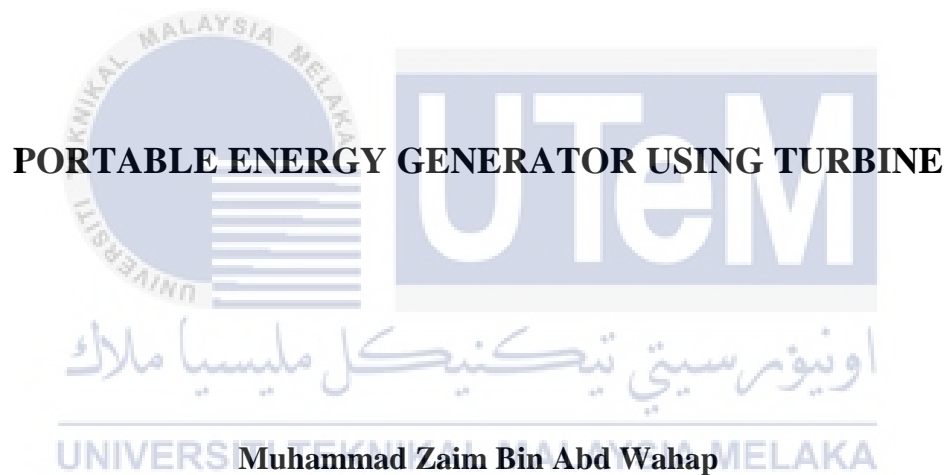
MUHAMMAD ZAIM BIN ABD WAHAP

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

2020



Faculty of Electrical and Electronic Engineering Technology



**Bachelor Of Electrical Engineering Technology (Industrial Automation & Robotics)
With Honours**

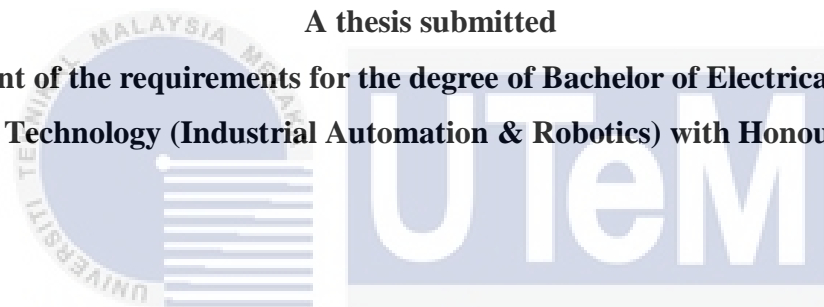
2020

PORTABLE ENERGY GENERATOR USING TURBINE

MUHAMMAD ZAIM BIN ABD WAHAP

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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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2020

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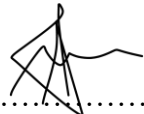


APPROVAL

This report is submitted to the Faculty of Technology Electrical Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electrical Engineering Technology (Industrial Automation And Robotics) With Honours. The member of the supervisory is as follow:


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ABSTRAK

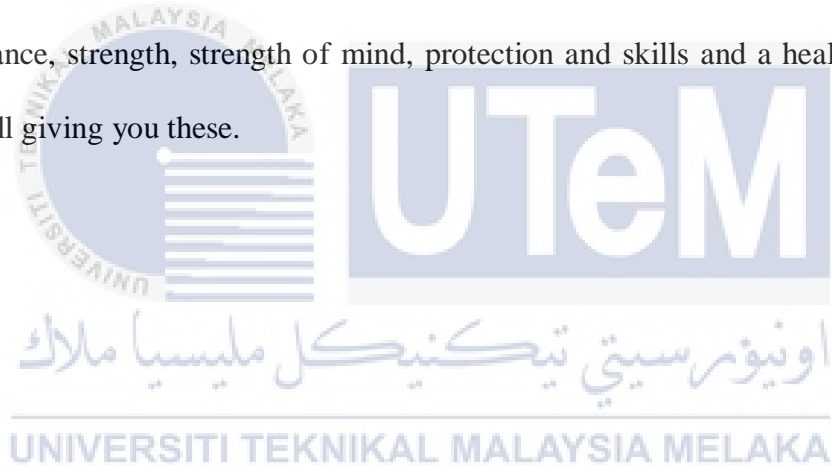
Sumber tenaga boleh diperbaharui adalah istilah yang digunakan untuk menerangkan sumber tenaga semula jadi, berterusan, tersedia secara meluas. Sumber tenaga boleh diperbaharui sentiasa tersedia dan tidak habis, kerana sifat asalnya sentiasa menambah dengan kadar yang sama atau lebih cepat daripada yang 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. Akhirk kata, 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 produce voltage 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 maximum input 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 be perfect.

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.



ACKNOWLEDGEMENT

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.

I feel honoured to take this opportunity to express my sincere thanks to Puan Rohaina Binti Jaafar as my project supervisor and special thanks to TS Saleha Binti Mohamad as my PA and Encik Arman Hadi Bin Azahar as my co-supervisor. Finally, I 'm thankful to my lectures and friends who helped and supported me this year. I don't have a meaningful word to express my gratitude, but my heart is always full of every person's favours.

TABLE OF CONTENTS

	PAGE
ABSTRAK	vi
ABSTRACT	vii
DEDICATION	viii
ACKNOWLEDGEMENT	ix
TABLE OF CONTENTS	x
LIST OF TABLES	xiv
LIST OF FIGURES	xv
LIST OF APPENDICES	xviii
LIST OF SYMBOLS	xix
LIST OF ABBREVIATIONS	xx
CHAPTER 1 INTRODUCTION	1
1.1 Background	1
1.2 Problem Statement	4
1.3 Objective of The Project	5
1.4 Scope	5
1.5 Significant of the study	5
1.6 Report Outline	6

CHAPTER 2	LITERATURE REVIEW	7
2.1	Energy Generator	7
2.2	Energy Generator issues	8
2.3	Factor That Affecting Energy Generator Using Wind and Hydro Turbine	9
2.3.1	Wind speed	11
2.3.2	Air Density	13
2.3.3	Design of The Blade Turbine	14
2.3.4	Weather Condition	21
2.4	Past and current energy generator (wind and hydro turbine)	21
CHAPTER 3	METHODOLOGY	25
3.1	Introduction	25
3.2	Project Methodology	26
3.3	The measurement device used to collect the data	28
3.3.1	Multimeter	28
3.3.2	Anemometer	29
3.4	The component that been used in this project	30
3.4.1	Lithium battery	30
3.4.2	TP4056	30
3.4.3	Turbine blade	32
3.4.4	MT3608	32

3.4.5	Energy Storage Circuit	33
3.4.6	Arduino Uno	34
3.4.7	Buck DC-DC Step Down Converter	34
3.4.8	ina219	35
3.4.9	SSH1106 OLED Display	35
3.5	Design of Project	36
3.5.1	Circuit design	36
3.6	Gantt Chart	37
CHAPTER 4	RESULT ANALYSIS	38
4.1	Introduction	38
4.2	Analysis of Turbine power generator	38
4.2.1	Analysis of charging (Low Input)	39
4.2.2	Analysis of charging (Medium input)	40
4.2.3	Analysis of charging (Maximum input)	42
4.3	Final Hardware Design	43
CHAPTER 5	CONCLUSION & REECOMENDATION	46
5.1	CONCLUSION	46
5.2	RESEARCH SUMMARY	46
5.3	OBJECTIVE ACHIVEMENTS	47
5.4	RECOMMENDATIONS FOR FUTURE WORKS	47

REFERENCES

48

APPENDIX

51



LIST OF TABLES

TABLE	TITLE	PAGE
Table 2. 1:	The Different between Generator and Inverter	23
Table 4. 1:	Analysis of low charging, voltage and wind speed	39
Table 4. 2:	Analysis of medium charging, voltage and wind speed	41
Table 4. 3:	Analysis of maximum charging, voltage and wind speed	42



LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 1. 1:	Renewable Energy Chart by Lifecycle Greenhouse Gas Emissions (Olotu Yahaya, A E Akhigbe, F I Izuagie, 2011)	2
Figure 2. 1:	Relationship Between Wind Speed and Power For A Typical Wind Turbine	11
Figure 2. 2:	The Air Density and Specific Weight at Atmospheric Pressure	14
Figure 2. 3:	Wind Turbine	15
Figure 2. 4:	Wind Turbine Blade Design	16
Figure 2. 5:	Result of Blade Size on Wind Turbine Generator	17
Figure 2. 6:	Typical Water Turbine Design	18
Figure 2. 7:	Relationship between blades and the torque (Sritram and Suntivarakorn, 2019)	20
Figure 2. 8:	Sketches of water direction impacting the blades of the turbines from 2 blades until 7 blades. (Sritram and Suntivarakorn, 2019)	20
Figure 2. 9:	The Evolution of the Turbine Blade That Have Been Modified to Improve the Efficiency of The Hydro Turbine System	24
Figure 3. 1:	Project Development Flowchart	26

Figure 3. 2: Flow chart of process	27
Figure 3. 3: Multimeter	28
Figure 3. 4: Digital Anemometer	29
Figure 3. 5: Lithium-ion battery	30
Figure 3. 6: TP4056	31
Figure 3. 7: Turbine blade (a) is for water turbine condition and turbine blade (b) is for wind turbine condition	32
Figure 3. 8: MT3608	33
Figure 3. 9: Energy Storage Circuit	33
Figure 3. 10: Arduino Uno	34
Figure 3. 11: DC-DC Buck Step Down Converter	34
Figure 3. 12: INA219	35
Figure 3. 13: SSH1106 OLED Display	35
Figure 3. 14: Circuit Design	36
Figure 4. 1: Analysis of Charging in low condition, voltage output vs wind speed.	40
Figure 4. 2: Analysis of charging in medium condition, voltage output vs wind speed.	41
Figure 4. 3: Analysis of charging in maximum condition, voltage output vs wind speed.	43
Figure 4. 4: Water turbine system	43
Figure 4. 5: Wind turbine system	44

Figure 4. 6: Wind and water turbine system

44

Figure 4. 7: Circuit design

45



LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix 1:	Arduino Uno Datasheet	51
Appendix 2:	Gantt Chart	52
Appendix 3:	Data sheet of INA219	53
Appendix 4:	Data sheet of MT3608	54
Appendix 5:	Data sheet of TP4056	55



LIST OF SYMBOLS

D, d	-	Diameter
F	-	Force
g	-	Gravity = 9.81 m/s
I	-	Moment of inertia
l	-	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

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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. Such gasses 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 once you 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.

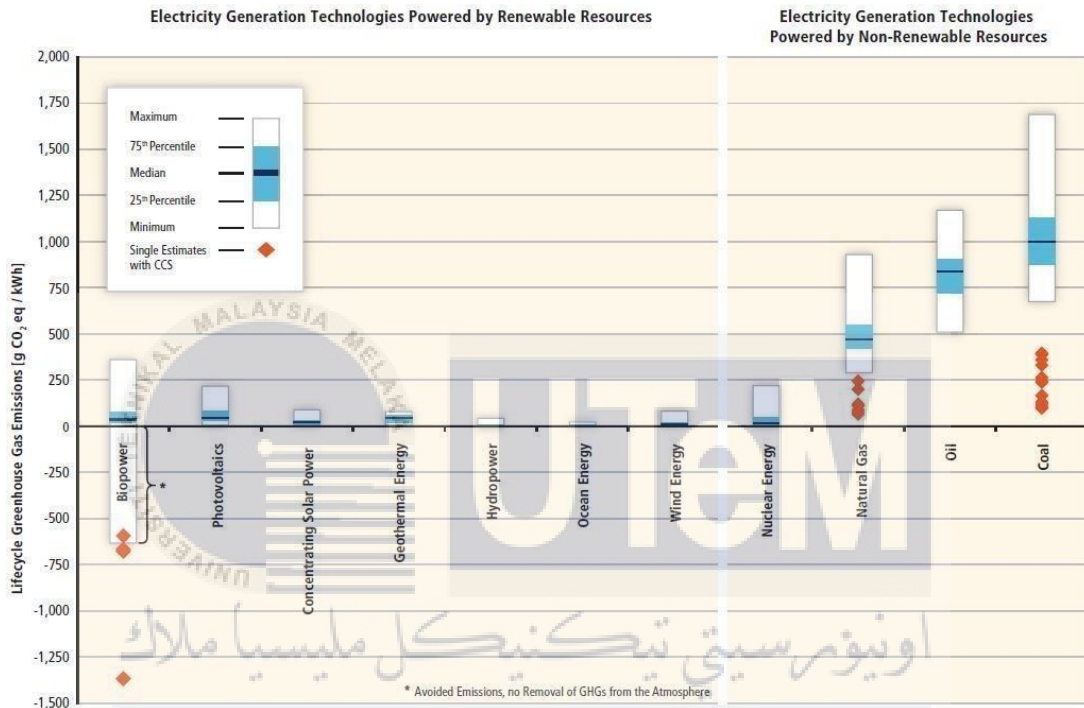


Figure 1. 1: Renewable Energy Chart by Lifecycle Greenhouse Gas Emissions

(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.