OPTIMIZATION OF WIND SOURSE FOR MAXIMUM ELECTRIC POWER GENERATION

ALI NORDIN BIN ISMAIL

This report is submitted in partial fulfillment of the requirements for the award of Bachelor of Electronics Engineering (Industrial Electronics) With Honours

Faculty of Electronic and Computer Engineering
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UNIVERSTI TEKNIKAL MALAYSIA MELAKA
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ABSTRAK

Angin boleh dijadikan sebagai sumber gantian untuk menjana tenaga elektrik yang semakin meningkat permintaannya oleh pengguna. Tenaga angin berkembang pada kadar 30 peratus setiap tahun. Berhadapan dengan krisis tentang kesukaran menghasilkan tenaga yang mencukupi, dimana kos pengeluaran tenaga elektrik yang semangkin meningkat, usaha mendapat penghasilan tenaga elektrik dari sumber yang percuma dan tidak terhad seperti tenaga solar, tenaga angin, tenaga biomass dan lain-lain semakin diberi perhatian. Sebagai memastikan alam sekitar terus dipelihara, tenaga angin sebagai alternatif yang menarik, murah dan mesra alam bakal membawa menafaat yang besar kepada masyarakat manusia. Projek ini diselidik dan dikembangkan sebagai satu rakabentuk prototaip penghasilan tenaga elektrik dari angin atau udara bergerak yang akan dioptimumkan sebaik mungkin sebagai satu sumber tenaga elektrik. Kajian pembelajaran dan analisis terhadap bekalan angin, propeller dan kipas angin, yang akan menukarkan tenaga angin kepada sumber tenaga elektrik dan cara penyimpananya.

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ABSTRACT

Wind source can be an excellent complement to today's high demand of electric power requirement by the consumers. Wind power utilization is increasing at the rate of 30 percent annually. With the energy coming to a near crisis, where the cost of producing electricity is sky-rocketing, renewable energy from natural resources such as solar power, wind power, biomass, etc is seriously considered. In addition to the growing concern for the environment, this interest in wind power as an alternative, a free and environmentally friendly source will bring great benefit to mankind. This project will study and develop a prototype wind power generation system that will optimize wind source for maximum efficiency electric energy generation. Areas to be studied and analyzed include wind sources, propellers and wind turbines, rate of conversion and renewable energy and storage.

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LIST OF ABBREVIATIONS

PCB	-	Printed Circuit Board
PM	-	Permanent Magnet
RPM	-	Round per Minute
DC	-	Direct Current
AC	-	Alternating Current
MOSFET		Mode Silicon Semiconductor Field Effect Transistor
CMOS	-	C Mode Silicon
LED	-	Light Emitting Diode
IC	-	Integrated Circuit
SPDT	-	Single Pole Double Through

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CHAPTER 1

INTRODUCTION

1.1 Introduction of the project

Even today, in many remote areas, there is no electricity being supplied to the people living there. No electricity means less pollution to the environment, as the generation of electricity by conventional means, very often, contributes to the ecological imbalance to the area and the surrounding areas bringing along air pollution and water pollution. However, nobody can deny that it will be convenient to have at least a little electricity to light up the house when it is dark. As the cost of generating electricity is constantly on the rise and it brings negative impact to the environment, the obvious potential of electricity is the natural wind or the artificial moving air caused by the air-condition ducting or from the exhaust fan. Almost from the start, the idea of putting up a wind turbine to generate some electricity was pursued. Wind source can be an excellent complement to electric power requirement. Wind power is growing at the rate of 30 percent annually. With the world's generation of energy is coming to a near crisis where the cost of producing electricity is sky-rocketing, renewable energy from natural resources is an alternative. However, in this country, to depend on the wind is very unreliable as it is very unpredictable. This project proposed to work on renewable energy of Optimization of Wind Source for Maximum Electric Power Generation from wind power made readily available by the modest exhaust fan to the powerful wind

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blowers installed in the premises. In addition to the growing concern for the environment, this idea of converting this moving air, otherwise wasted, is an interesting alternative which is free and environmentally friendly and is bound to benefit mankind to a great extent.

1.2. Objectives of the Project

1.2.1 This project will study and develop a prototype wind power generation system that will optimize wind source for maximum efficiency electric energy generation.

1.2.2 In the process, the analysis conducted will include wind sources, propellers and wind turbines, rate of conversion, renewable energy and energy storage.

1.3 Problem Statement

Wind source can be an excellent complement to today's high demand of electric power requirement. Renewable energy from natural resources such as wind power is given serious attention and consideration. This project will study and develop a prototype wind power generation system that will capitalize wind source from moving air outlets available in many buildings. Producing electricity from renewable sources will not produce harmful pollutants or emissions and will not harm the ecosystem. Renewable Energy is also called "clean" or "green" power. The use of renewable energy is increasing at a very fast pace, but we cannot rely exclusively on renewable energy to meet all of our demand for electricity. Renewable energy can be stored in battery packs and the electric energy can be quite constant as the stream of moving air is constantly blowing most of the time as long as the building is occupied.

Renewable energy emphasizes on cheaper electricity generation rather than using the conventional energy sources. However, as technology for renewable energy improves, renewable energy will become competitive and cheaper than energy generated fossil fuels.

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1.4 Scope

This project includes the explanation on the function of the generator to generate the electricity. Then, by using the Multisim, Protel 99Se and other related software, the circuit will be designed and simulated to ensure that the result is almost the same with the theoretical results. A prototype circuit will be built and tested in order to make sure the circuit works properly. In the end, the comparisons between the simulated and the experimental results are analyzed and correlated.

1.5 Methodology

A comprehensive review on the existing technology on wind turbines was conducted. The understanding on how to build the appropriate wind turbine to suit the proposed project and its objectives was required. Beginning with looking up into books and journals, the information on the various available wind turbines will assist in deciding on the specifications and capacity of the wind turbine. Web-sites are very convenient information sources but the data and performance have to be scrutinized before they can be used as references. There are a wide range of home built wind turbines from those built by home hobbyists to the huge wind turbines built commercially to generate electricity to power a farm, village, town or county such as in Holland. Information on charge controllers and custom design of the power generation system is easily available from the internet. From the major literature reviews, there are a lot of the technology being used and there are amazing varieties of wind turbines, both in designs and as well as complexities. However, all of them have SIX things in common. They are:

1. Wind Blades
2. Electronic Controller System
3. Inverter
4. A generator
5. A blower to get it up into the wind
6. Batteries and or batteries bank

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CHAPTER 2

LITEREATURE RIVIEW

Energy has become one of the key issues for future world development. Both developing and newly industrializing regions have to cope and cater for a regionally extraordinary increasing energy demand, e.g. in China and Brazil. As the cost for conventional generation of electric is increasing at an alarming rate, these societies have to explore and access modern forms of energy for the more than two billion people, especially in Southern Asia and Sub-Sahara Africa. Particularly so, if people from these countries are to keep abreast with modern development, such an important utility like electricity is a necessity, otherwise these people will face the risk of being excluded and marginalized from proper access to communication, education and health care.

Environmental damages, ranging from local and regional pollution to a global climatic change to a certain extent have been contributed by fossil energy sources of oil, gas and coal. As ensure that future generations enjoy the same environmental quality, such detrimental consequences to the world have to be controlled and stopped before it is too late. Power generation by fossil energy has to be controlled and reduced significantly and the energy systems all over the world have to be addressed and be reorganized. Serious effort is required by the major energy suppliers to venture into renewal energy from natural sources such as the sun, the wind and water.

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2.1 The research

In the last number of years, the research in renewable energy systems has been concentrated on wind energy, in particular on wind resource assessment and on the integration of wind energy into power systems, batteries bank and energy storage plus distribution levels and energy consumption.

2.2 Renewal Energy

At present, the world relies heavily on coal, oil and natural gas for its energy fossil fuels which are non-renewable. These fuels draw on the earth's finite resources that will eventually run out, becoming increasingly expensive and too environmentally damaging to extract as time goes on.

The use of fossil fuels has now been accepted worldwide as one of the reasons that contribute to global warming and climate change. As the world is now beginning to realize such the negative effect on mankind, it is high time that renewable energy from the sun, wind, water and biomass which are plentifully available, is considered and fully pursued. The sun is the main solar system and will never run out. Most renewable energy comes either directly or indirectly from the sun.

Solar energy can be used directly for generating electricity, hot water heating and solar cooling, and is suitable for a variety of domestic, commercial and industrial uses. The heat from the sun creates the winds, and this wind energy is captured by turbines which produce electricity. Sunlight also causes plants to grow. The organic matter produced by plants is known as biomass. Biomass can be used to produce electricity, heat and transportation fuels such as bio-diesel.

The energy from water flows in streams and rivers comes from the sun and the hydrological cycles are driven by evaporation - and can be tapped to generate power via water turbines, thus enabling the production of hydro-electricity. Wave power is generated by winds, which are created by the heat from the sun, whereas tidal power is driven by gravitational energy affected by the sun’s mass.

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The special features of wind turbines are their ability to generate electricity from the wind, have a small ecological footprint, occupying very little ground space and can co-exist with livestock and crops.

2.3 Wind energy

Wind represents a vast source of energy and has been used for hundreds of years to grind corn and pump water. It can now be used to generate electricity and, for onshore installations, it is one of the cheapest sources to derive from. Wind power is one of the most promising renewable energy technologies and is currently providing electricity to many areas in the world.

2.4 How Does A Wind Machine Work?

Like old fashioned windmills, today's wind machines use blades to collect the wind's kinetic energy. Windmills work by slowing down the speed of the wind. The wind flows over the airfoil shaped blades causing the lift, like the effect on airplane wings, causing them to turn. The blades are connected to a drive shaft that turns an electric generator to produce electricity. With the wind machines, they are only functional when there is wind and nothing much can be achieved when the wind isn't blowing. The situation is rendered hopeless when the energy is required to power plants and other applications at the time when there is no wind. Thus, energy from wind machine is unreliable.

2.5 Types of Wind Machines

There are two types of wind machines (turbines) used today based on the direction of the rotating shaft (axis); horizontal axis wind machines and vertical-axis

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