UNIVERSITI TEKNIKAL MALAYSIA MELAKA

THE DEVELOPMENT OF POWER GENERATION ROOF VENTILATOR FOR EMERGENCY LIGHT

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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FACULTY OF ENGINEERING TECHNOLOGY

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SESI PENGAJIAN: **2016/17 Semester 2**

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APPROVAL

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……

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ABSTRAK

Tenaga angin dan tenaga solar adalah tenaga kitar semula, yang boleh digunakan dan tidak mencemarkan alam sekitar. Oleh itu, ia digunakan untuk menggantikan orang dan minyak mentah kerana ia mencemarkan alam sekitar. Kebanyakkan di kilang dan di rumah, sudah memansang ruang pengudaraan atap untuk menghilangkan panas dalam sesuatu kawasan. Dengan menambah generator pada alat tersebut, ia dapat menghasilkan elektrik dan dapat menjana kepada peralatan seperti lampu kecemasan. Kuasa eletrik boleh dihasilkan selagi mana generator dapat berfungsi dengan baik. Tujuan utama projek ini adalah untuk mereka generator pengudaraan atap yang baik, menyiasat mengenai suhu, dan tempat yang sesuai untuk aplikasi sistem ini. Sistem ini perlulah dapat menjana kuasa elektrik untuk alatan seperti lampu kecemasan misalnya. Terdapat banyak faktor yang mempengaruhi kuasa keluaran seperti kelajuan turbin berpusing, keadaan suhu sekeliling, dan kelajuan angin. Kunci paling utama ialah mengenal factor yang mempengaruhi kuasa keluaran sistem ini. Saiz dan kepanjangan bilah kipas pengudaraan dalam eksperimen ini menyumbang kepada aksi generator untuk menghasilkan jumlah tenaga optimum. Aksi kuasa keluaran generator ini bercanggah disebabkan faktor pembolehubah manipulasi. Sistem ini dapat menjimatkan penggunaan tenaga kerana ianya berkesan.. Sebagai contoh, penjanaan kuasa pengudaraan atap dapat menghasilkan tenaga elektrik yang boleh diguna oleh lampu kecemasan, dan ia dapat menjimatkan pengunaan tenaga elektrik serta menjimaatkan perbelanjaan.

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ABSTRACT

Wind energy and Solar energy are type of the renewable energy that does not pollute environment. Therefore, there is a lot of wind generation replace fossil energy such as oil and charcoal cause its pollute. Mostly at home and some of factory, developer already install roof ventilator to remove heat from premise. By adding generator, electrical power may be supply to any instrument such as emergency light. The power can be produce as long as the generator works without a problem. The objective of this project is to design best roof ventilation generator, temperature and suitable area to install. The system must be able to generate power to supply to any suitable electrical appliances as emergency light. There is a lot factor that determine power output which is speed of turbine, temperature surrounding, type of blade of turbine, and speed of air. The important key is to identify the basic factor the affect the output power generate from roof ventilation generator. The suitable size of ventilator, long of fan blade for this experiment will contribute the performances of roof ventilator generator to produce the optimum output power. From the result, the significant finding for all graph pattern is bell shape. The performance of power generation roof ventilator is varied and depend on the manipulated variable. This system can save a lot of energy to reduce usage of power. For example, generating power from roof ventilator and supply to electrical appliance such as emergency light can save a lot of cost since it is renewable energy that people does not own.

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DEDICATION

To my beloved family, Rusni Bin Abd Raof, Sohor Bt Hamid, Suriani Bt Rusni, Mokd Fikri Bin Rusni, Nur Fadzilah Bt Rusni, and Siti Nurhana Bt Rusni.

I am no one without all of you.

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To those who supported, encourage, and help me. My big thanks to UTeM and my honorable coordinator, Pn Emy Zairah Binti Ahmad and my supervisor, En Shahrudin Bin Zakaria. Without their guidance, passionate and love, the project and proposal are hard to complete. Many thanks to my beloved family, my happening classmate, and housemate for support and direct me to the right path.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

Al	-	Aluminium
A	-	Ampere
Cl	-	Chlorine
IT	-	Information Technology
M	-	Million
MITC	-	Melaka International Trade Centre
MU	-	Moderately Used
NU	-	Not Used
RM	-	Malaysian Ringgit
SD	-	Standard Deviations
V	-	Voltage
W	-	Watt

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CHAPTER 1
INTRODUCTION

1.0 Introduction

This project are about how to use a renewable energy as secondary source in home or premises. By using turbine ventilation generator, a small power can be supply to some appliance or be stored into battery. Turbine vent is place on the rooftop of building in order to remove heat properly and for wind to spin turbine faster. When dynamo or motor is rotating, current is generated and flow to appliances. When there is electrical shortage, emergency light can be supply by turbine vents since its never stop rotating. Power will always be produce and store.

1.1 Background

Malaysia is one of small country and at Mediterranean line which make the weather only has hot and rain throughout the whole year. Situated between 1° and 6°N, the whole of Malaysia has a classic equatorial climate, with high temperatures and wet months throughout the year. Temperatures at sea level range from 21°C to 32°C, whilst at higher elevations it is much cooler, with temperatures ranging from 15°C to 25°C. Annual rainfall varies from 2,000mm to 2,500mm. This situation has driven Malaysian houses to install turbine ventilation since it can remove hot air in their houses. This mechanical type equipment works diligently to remove heat and working

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non-stop during day or night. As we know, natural gas, coal and oil are depleted energy sources and it is a bit costly for consumption. By using heat and wind to generate electrical power using turbine ventilation, we are able to obtain the benefits of electrical power as a secondary main supply.

This project is to develop simple turbine ventilation generator that can produce electrical power to supply to any instrument that capable receive this power. The system must be able to generate at least 12 volts and 0.06u amp electricity by using 22-inch ventilator, and 36 fan blade. The data will be collected from field test and laboratory test. This project focus on the temperature surrounding that make roof ventilator move faster. The speed rotation also depends on how fast wind in the area. This is almost same kind to wind turbine, except this project almost depend on temperature and heat. When heat in house greater than the outside, the hot air flow through roof ventilator, and generate the turbine, or dynamo to produce electrical power. Then, the air will keep coming through ventilator which make the turbine or dynamo run non-stop and produce more electrical power. This generator provides a very useful solution to the problem of local generation, because it has a very wide capture range a low speed requirement; however, it takes a lot of training to install.

The system consists of ventilator, turbine and motor, battery, emergency light, electrical circuit. The body motor to stator of ventilator so it is firm and do not collapse when the ventilator spinning. The rotor of motor will be attach to the upper centre part of ventilator, so it will rotate at best speed. The process is to convert kinetic to mechanical work in the ventilator to producing electrical power in the process. The specific speed of a turbine is defined as the speed of an ideal, geometrically similar turbine, which yields one unit of power when supplied with one unit of head. Another invention uses four separate, independently turning turbines to capture energy from multiple directions; the multi-directional reduces the resistance of the turbine compared to single-direction turbines when wind goes against their angle

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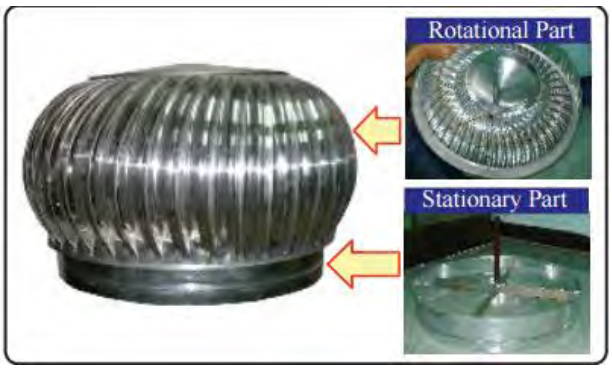

Figure 1.1.1 Roof ventilator

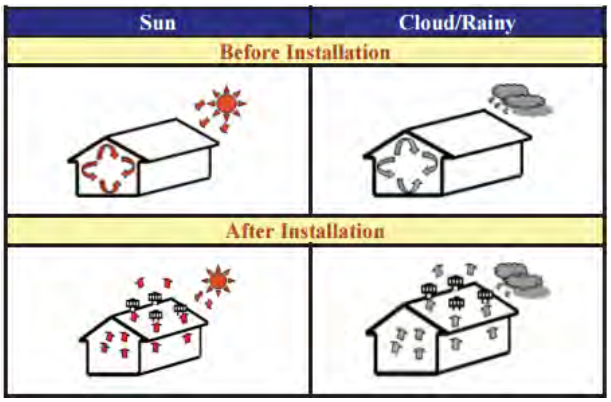

Figure 1.1.2 Roof ventilator concept

1.2 Problem Statement

From my literature review, there is two part of problem statement which is general and specifics. Generally, most home or premises always has electrical shortage problem during rain or natural disaster. By several hours, most of electrical instrument with battery will run out. By installing this type of generator, electrical supply will never run out even though the supply is small. This can be apply to emergency light which is important component if there is electrical shortage problem. Specifically, most home or factory has this turbine ventilation but the kinetic energy produce by it has never been use. This is such a loss. The energy should be convert into electrical power so it can be use for a good purpose. This will saving cost and electrical power a lot. Other than that, most of house in the village still has no electrical supply. By implying this project to a house, power can be stored into battery and can be useful for any purpose.

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1.3 Objective

The aim of the project is to use renewable energy as secondary source to supplying power. The main objective can be broken down to 3 specifics objective that would be able to achieve aim of the projects as follows:

1. Supply power from roof turbine ventilator generator, which use renewable energy type of supply.
2. Reduce power usage for home or premises by install wind turbine generator.
3. Prevent shortage of electrical supply during blackout (Emergency light).

1.4 Scope

This project is about to use renewable energy as secondary electrical source for home or premises. The scope of project can be divided into three parts which is, design and development, testing data collection, and analysis data. For design and development stage, it can be divided into two phase which is model selection, and designation phase. It will take time to design and select the best position or condition for turbine ventilation generator to work. For the testing and data collection stage, data will be taking to compare the best output result that turbine can work. Data collection will be taken through experimental and calculation test.

This project will prove that unused roof ventilator power has a good potential as secondary supply or can be used as renewable energy resources. The very advantages are that it can save cost, save energy, and have back up electrical sources. The instrument and device can be locally find in our country, and can save energy.

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CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

Malaysia is one of many countries that does not use nuclear power as electrical sources. Water turbine, and on 29 September 1992, Malaysia suffered a long and total power blackout caused by lightning striking a transmission facility and causing a rolling failure in the transmission and distribution system. According Tan Sri Ani Arope in his memory book, the incident was actually planned and executed by YTL, an IPP company just to prove that how Malaysia really needs an IPP company. The 1996 Peninsular Malaysia electricity blackout crisis was a power outage in Malaysia. It occurred at 17:17 on 3 August 1996. The whole of Peninsular Malaysia including Kuala Lumpur, Selangor, Putrajaya, Johor, Melaka, and Negeri Sembilan plunged into darkness for several hours.

A transmission line near Sultan Ismail Power Station in Paka, Terengganu tripped at 5:17pm causing all power stations in Peninsular Malaysia to collapse resulting in a massive power failure. Supply was back to normal by 11pm. The weekend power outage was the third in the past four years, and the worst since a 1992 blackout left Malaysia without electricity for up to two days. In the wake of that capacity-related stumble, the government moved to allow five independent power producers to enter the electricity-generation business. After this blackout, utility giant Tenaga Nasional's stock fell considerably. Due to this problem, the benefits from use of renewable energy have been recognized. Most people try to invent many

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type of renewable energy such as wind, water and much more. By applying this idea, a lot of money and electrical power can be save.

By having this new era type of electrical energy supply, electrical power has back up if the main electrical power supply by provider having breakdown. This renewable energy can be install anywhere if the place has potential to produce great non-stop electrical power. Out of three energies, wind energy can be the best renewable energy based on Malaysia weather, which is very windy even at day or night, during hot or rainy day.

2.1 Implementation of Power Generation Roof Ventilator

Thailand, Malaysia, Laos and Cambodia are the country in the tropical zone. There are high humidity and warm weather all of year. Especially in Summer on April and May, Day time temperature may be increasing to 45 OC or 39-41 OC for the average temperature at noon all of the year. It effects to decreasing work efficiency of worker or damage product for some business. So, air-conditioner in all this country the best seller for residence but not for industrial because it must pay a lot of cost as such as electric charge and maintenance cost. The concept of natural ventilation without using electric energy is leading to be the roof ventilator. This technology is popular using by install on the roof in warehouse, workshop, industrial building and including to residence. The picture shows roof ventilator place on any premise to remove heat.

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Figure 2.1.1 Roof ventilator apply to industrial building.

Focusing on the implementation of this system at any premise that using roof ventilator since the place has potential of heat and wind energy. For example, most houses, building and factory in Malaysia has roof ventilator due to temperature during day time is high. This concept is very suitable to apply since there is a lot roof ventilator place on one building, which can produce more electrical power, if all generator rotates and produce power at the same time. Premise can have back up power supply for charging important electrical device or component such as emergency light. This green scheme offers a cheap, reliable, and cost effective of alternative energy. Before this, a group from Universiti Malaysia Perlis (UniMAP) developed power generation roof ventilator at one of building in Perlis. Their system able to produce 13.9V at speed 1200 rpm, by adding more fin to roof ventilator. Their new invention of the extra fins helps the roof ventilator to spin faster and more efficient. By some changes, it manages to produce the best for producing electrical power. The figure below show roof ventilator has been renovate by UniMAP group.

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Figure 2.1.2 : Roof ventilator renovation fins.

For implementation of Power Generation Roof Ventilator by UniMAP group, it is place at the house or any factory that use a lot of roof ventilator. By installing this system, it can show that they can be used for practical application. The generator can generate about 12 volt and 0.2 ampere current. This is for one unit of roof turbine generator. If factory has a lot of roof ventilator, it can generate more electrical power and can be supply to any electrical instrument with battery. The efficiency of generator is 32% and can generate the power constantly until the generator breakdown or having damage. This experimental system was recorded based on research data. The speed of roof ventilator is about 100 to 500 rpm depend on the temperature surrounding, wind speed, and the size of turbine blade. By adding generator, it might reduce it speed since the load is apply to the rotation part. By testing the generator both outside and inside laboratory using electrical instrument, the result for efficiency, voltage, and current can be obtained as shown in Figure.

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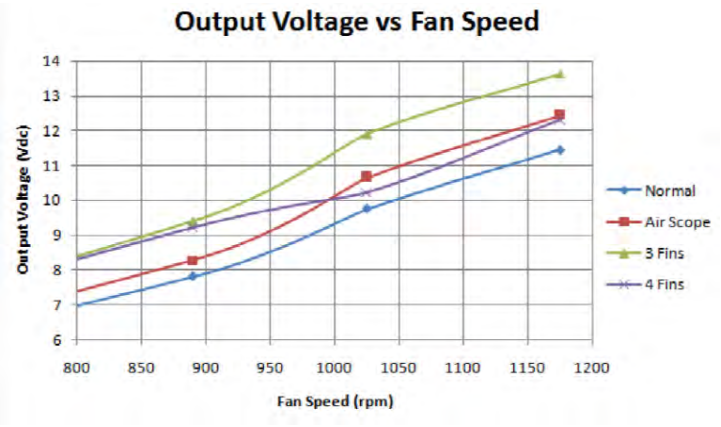

Figure 2.1.3

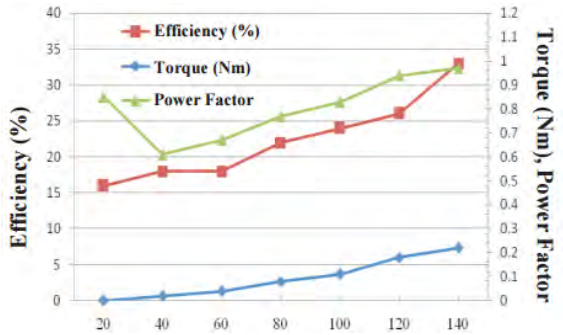

Figure 2.1.4

The result is taking from laboratory shown that this system can generate a good and usable electrical power. Based on result from laboratory, this is quite good for supplying electrical power and can be used practically by people. There is power factor since the group using three phase type generator, but it come with a good result. The study case shows that this system is possible for practical uses of Power Generation Roof Ventilator.

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2.2 Classification of Power Generation Roof Ventilator

Table 2.2.1 Type of roof ventilator and drawn out Voltage and Current

Size	**Voltage**	**Current**
Small	6.6V	30mA
Medium	7.6V	42mA
Large	9.8V	70mA
Super Large	12V	102mA

Table 2.2.2 Generator Motor with no load for Voltage and Current

Speed	Voltage	Current
3400rpm	12V	35mA
4500rpm	12V	50mA
5000rpm	12V	78mA
6000rpm	12V	110mA

The size roof ventilator effects the output of the current and voltage. The bigger size might have high torque power that driven motor to generate more power. The speed of rotation also effects the output power. The roof ventilator is placed at the top of building, since the hot air go up and make the fan spin. By having fast wind speed and high temperature, it will generate more power from generator.

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