

HYBRID POWER GENERATION

BY

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PROJECT REPORT COMFORMATION

I hereby declare that the work in this report is my own except for quotations and summaries which have been duly acknowledged.

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Dedicated to,

Thanks to Allah,

For give me a good health and strength while making this report.

My beloved father and mother,

Abdullah Bin Hashim & Rozita Binti Md Hassan

Azhar Bin Arshad & Rozita Binti Mohd Noor

Who has always been my epitome of love and always pray for my strength to finish up this report.

My beloved relatives,

My siblings,

Thank you for your support and pray.

The person who has been very understanding and helpful,

Mister Muhammad Majdi Bin Saad

For the support and guidance. Hope that I always be remembered.

My unforgettable friends,

My housemate, my coursemate and all DEP students intake June 2016,

Our struggle not yet ends.

Finally, friends that always together during this third years study,

Hopefully achieved what we aspired.

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ABSTRACT

One of the nature energy sources that had potential to obtain electricity is wind and solar. Wind and solar energy is another alternative to produce electric beside coal and petroleum. This research aimed to exploit the medium of the wind to generate electricity for industrial needs for lighting. The objective of this research to develop a model of electricity generation using wind and solar energy and also to analyze the functionality model of electricity generation using wind and solar energy and to develop of converter and inverter circuit. The researcher has chosen the wind output from the industrial cooling tower as an energy source. The results of this study have developed designs that can be used as a generator of electricity for lighting system requirements for light industry. The average value of the resulting voltage is 240 VAC. It is hoped that the implications for the development of this system design can be utilized by consumers, especially in the industrial sector as well as reduce production costs.

ABSTRAK

Salah satu sumber tenaga alam semula jadi yang mempunyai potensi untuk mendapatkan elektrik adalah angin dan solar. Angin dan tenaga solar adalah satu lagi alternatif untuk menghasilkan elektrik bersebelahan arang batu dan petroleum. Kajian ini bertujuan untuk mengeksploitasi sederhana angin untuk menjana elektrik untuk keperluan industri untuk pencahayaan. Objektif kajian ini untuk membangunkan model penjanaan elektrik menggunakan angin dan tenaga solar dan juga untuk menganalisis model fungsi yang penjanaan elektrik menggunakan angin dan tenaga solar dan untuk membangunkan penukar dan litar inverter. Pengkaji telah memilih output angin dari menara penyejuk perindustrian sebagai sumber tenaga. Hasil kajian ini telah membangunkan reka bentuk yang boleh digunakan sebagai penjana elektrik untuk keperluan sistem pencahayaan untuk industri ringan. Nilai purata voltan yang terhasil adalah 240 VAC. Adalah diharapkan bahawa implikasi kepada pembangunan reka bentuk sistem ini boleh digunakan oleh pengguna, terutamanya dalam sektor industri serta mengurangkan kos pengeluaran.

Project Identification

The final semester project is one of the compulsory subjects for all students in their final semester engineering is done in groups or individually and by type, size, cost of project expenses incurred. The purpose of this final semester project is to give students the opportunity to take advantage of all the knowledge acquired throughout the course and the students' creativity to produce a strong and beneficial.

The results of the discussions and the views expressed by the supervisor has decided to make a project of Hybrid Power Generator. Where the purpose of the project is to help people in rural areas, especially her. This project serves as an electric generator which uses wind and sunlight. Wind power using a DC motor as a generator, fan blade used to trap wind and DC motor will rotate where it will generate an electric energy. Sunlight also use diesel fuel as a power generator

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Chapter 1

Introduction

1.1 Introduction

The energy we use in everyday life comes in many forms. Among them the power of gasoline to drive a car and to generate machine in factories. We also use natural gas for heating homes and powering equipment. We are very dependent on electricity to illuminate the house every day and it is becoming a necessity in today's world. Most of the activities and daily life cannot be carried out smoothly in the event of power failure. This phenomenon proves that the existence of an important electricity and provide maximum impact on the convenience and comfort of people in carrying out work and daily routine.

Along with the country's economic growth is rapidly increasing the use of energy sources that includes the use of electricity-based sources of oil and coal also increased in order to generate economic growth. Power generation based on fossil energy sources like oil gas and coal also gives a lot of benefit to human life and national development (Yusof 2008).

The supply of electricity to users generally have to go through three important stages namely the generation of electricity in power stations transmission and distribution of electricity to consumers. Electrical energy is generated in power stations and improved voltage substation before being sent to the main entrance at certain destinations. Voltage will be revealed prior to the 415 V / 240 V before it is distributed to users according to specific needs.

As we all know electricity has really revolutionized the methods of travel and transport as well. It has allowed the movement of people everywhere easily and quickly. But we know that the resources to generate electricity is limited and it would lead to a national crisis. In this scenario we need to generate electricity from renewable resources.

1.2 Problem Background

Energy sources is key to the progress of industry around the world today. To acquire new sources of energy and provide sufficient energy in the future and to produce energy from one form to another is a challenge to the world now. The pace of industrial development in fact requires a lot of electricity consumption regardless of where the energy source is coming. Among the most pressing challenges that need to be dealt with is the energy crisis. According to Jaafar (2009) the possibility of an energy crisis if countries continue to rely on fossil fuels and if not perform any action. Today the world is too dependent on sources of fossil such as coal petroleum and natural gas to generate electricity in addition to nuclear energy which may be exhausted someday.

According Shobi (2011) in general the use of replacement workers is important as a source of fossil fuels especially oil is decreasing. This happened because of a lack of oil resources dug with so much in a short time causing this source can not regenerate. Therefore human society now need to use replacement workers for the purpose of survival. The next problem is related to the environment. As often discussed the combustion of petroleum or other fossil fuels such as coal bring particular environmental impact. Burning these fuels produces a variety of greenhouse gases especially carbon which affect air quality and the ozone layer. Moreover these problems also increase the temperature of the world and affect the lives of humans through contaminated air agricultural failure rising sea levels and so on. After more than 200 years of power generation based on fossil fuels such as oil gas and coal used the world is now faced with a shortage of energy resources and the negative impact of energy consumption based on fossil materials on the environment unfolded through air pollution acid rain and global warming (Yusof 2008). Due to the nature of these fuels is very limited and can not be created easily arena issues of world energy resources is heavily dependent on fossil fuels. Obviously this is a pretty big impact on the economy social and political world.

The increase in fuel prices in the market will affect everyone especially to low-income communities. Energy sources such as non-renewable fossil fuels is expensive because resources are limited and will run out one day. More and more use of fossil fuels it will contribute more to air pollution. Existing energy sources are not consistent in terms of the economy but also face challenges in the future. To cover the entire population of the world the use of energy sources that are available today are not quite effective when evaluated in terms of cost and economy.

As we know the number of electric users is increasing day by day. The increasing number of building and residential area whether in rural area or town cause a lot of electric use. despite that it can generate a new form of electrical energy through solar plate and wind power turbine on all building. Electricity generated from solar and power

turbine can be used for different purposes such as exterior lighting in the area parked in shopping centers and other uses.

Because of this researchers are working to develop effective new technology for electricity generation will reduce electrical energy crisis in the future. A large amount of electrical energy can be generated to cover the amount of energy that may have been used. For example solar plate can casting light energy produced by sun that can be used for electricity generation . The area that set with a large amount of solar plate offer a high amount of kinetic energy that can be considered as a source of electricity generation. The electricity generated can be used in everyday life such as street lights and traffic signals. (Hossam-E-Haider & Rokonuzzaman 2015).

The emphasis on the generation of electricity using light and wind energy should be a concern. Users need to be exposed to operating processes that occur in the process of generating electricity using a solar and wind speed of electricity generation such as renewable and unlimited source. This energy can be used for street lights signs and traffic signals. Therefore we can save energy used for lighting. It is designed for busy streets shopping and parking etc.

1.3 Problem Statement

Based on the background issues that have been discussed it was found that the fuel consumption of fossil fuels such as coal petroleum and gas to generate electricity will cause problems for which energy sources will be exhausted one day. In the last 10 years the country may face an energy crisis if it continues to rely on coal and gas as the main source of electricity generation. In addition the use of fossil fuels pollutes the air and the environment due to the release of chemicals that affect the Earth's ecosystems such as carbon dioxide nitric gas and so on. Furthermore demand for electricity is increasing since the late and erratic weather changes for the acquisition of solar energy and the expensive cost to income. Accordingly researchers have expressed the idea of generating energy with a maximum efficiency of the design is very simple and effective way to generate electricity using the light and wind energy.

1.4 Research

The aim of this study was to design and analyze the functionality of electric power generation system using a hybrid power source for powering street lights signs and traffic signals.

1.5 Research objective

The objectives to be achieved in the production of electric energy generation projects using a hybrid power source is

- a) They form a mechanism for the generation of electricity using hybrid power source.
- b) Develop a prototype generating electricity using hybrid power source.
- c) Test the functionality for the generation of electricity using hybrid power source.

1.6 Research questions

In order to achieve the objectives of the study a number of projects designed to answer the question of the objectives that have been set. Research questions related to the development of this design are as follows

- a) Is the design of hybrid power source suitable for generating electricity?
- b) Is the appropriate components to develop a prototype electric power generation using a hybrid power source?
- c) Have developed a prototype that can generate electricity as in the design shape?

1.7 Scope and Limitations of Study

To ensure that the study carried out smoothly the scope of the study defined as the study guide that is designing and developing the prototype for generating electricity from the power source hybrid uses an electric motor and can generate a form of renewable energy.

Limitations of the study the generation of electricity using hybrid power source is more directed to the use of small-scale only where it can be used for street lighting traffic signs and signals parking.

1.8 Research interests

Income mechanisms to generate electricity from hybrid power source is not directly applicable to solving problems at the moment and also can benefit several parties among them

- (a) Parking Manager
 - i) Can reduce expenses for payment of electrical energy.
- (b) Building owner
 - i) With a renewable energy source home owners can prevent a variety of other costs the may be charged.
- (c) Community
 - i) Getting more renewable energy that is clean safe and sustainable.
- (d) Deepening residents fishermen and traders night market.
 - i) Can reduce capital and finance and can save gasoline.

1.9 Term Definition

In this study there are some key terms used in defining key terms that are often used in the study. Therefore some of these terms are stated and explained to facilitate the understanding of the design of the study and carried out.

- (a) Solar and wind turbine
 - i) In the context of this study, Solar and wind turbine refers to a device or means to generate electricity on the road.
- b) Prototype
 - i) In the context of this study, the prototype refers to the arrangement or joint parts work together in a prototype.
- c) Mekanisme
 - i) In the context of this study, the mechanism refers to the arrangement or joint parts work together in a prototype.

1.10 Conclusion

Design and production of electric energy generation projects using the speed casting can reduce the dependence on other sources of energy that may be restricted and consequently produce a form of renewable energy replacement.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

One of the initial activities that need to be done in the research process is to do a literature review of the basis of the information related to the study based on the research problem. Given this assessment the process will be carried out more systematically.

The literature review was to focus on the theoretical aspects of the use of electrical and mechanical components used for the production of the project according to specifications.

In this chapter the technology and components used to develop an electric generator and classifications of electricity using wind generator will be described. An understanding of how to operate electric power generation and also the components that are used to generate electricity should be explored to design a model of continuous generation of electricity using wind

2.2 The importance and advantages of wind energy in the generation process electrical industry.

Wind energy is classified into green energy technology because it only resulted in a small negative impact on the environment. Wind power plant poses no pollution or greenhouse gases. Therefore the power generated from the wind will not cause any negative impact on the environment. Wind energy is being used extensively in various fields such as in Denmark Germany Spain India and in some parts of the United States. This is one of the largest green energy used in the world at this point. The advantages of wind power in the electricity generation process (D'Silva 2010).

- (a) The wind is free and does not require fuel.
- (b) Does not generate waste greenhouse gases.
- (c) A good way to supply energy to rural areas a relatively isolated city.
- (d) The technology is not complicated.
- (e) Easy to operate.

2.3 Solar plate

Solar panels collect heat energy from the sun. This is called, “solar thermal energy”. Solar panels convert light into electricity. A solar panel is basically a collection of solar cells. The more light that hits a cell, the more electricity is generated. Solar cells are wafers made of a semi conductive material like silicon combined with boron. The silicon will grab the energy from the sun and traps it to be used for electricity. The boron’s job is to excite the molecules and intensify the energy that is coming into the cell. When the sun’s rays hit the silicon, it is channeled through an attached electrical circuit, which creates electricity. ("AE Kids : Solar Power. 6 Oct. 2011).



Figure 2.12: Solar Plate

2.4 Windmill (wind turbine)

In the past wind power is used as a water pump. Although the use of water pumps is very important especially in developing countries it is now one of the ways to generate electricity. In each process generation the turbine is a component of the main and most important. Turbines or windmills transform the kinetic energy of the wind into mechanical work. Three rotor blades is the most important and obvious part can be seen from the wind turbine (Stiesdal 1999). As you are aware is the driving force to a turbine generator. The wind will rotate the turbine blades which will also rotate the generator and produces electricity. The generator must rotate at a constant speed to memalarkan voltage and frequency. So this turbine power plants should be built on high ground and the field where the wind is more readily available as shown in Figure 2.6. Some countries

windmills installed at sea because the sea in the area of high wind power but not suitable for a high cost and environmentally unfriendly.



Figure 2.6: Wind Turbine ([http://www.google.com.my/imgres?q=wind+turbine](http://www.google.com.my/imgres?q=wind+turbine&start=22&num=10&m=1&hl=en&rlz) &start=22&num=10 & m=1&hl=en&rlz dicapai pada Februari 16, 2011)

2.5 Components of electrical generators using wind

Wind energy or wind power is a process that occurs in which the wind is used to generate mechanical power or electricity. Wind turbines convert the kinetic energy obtained from the wind into mechanical energy. This mechanical energy is converted into electrical energy. The aerodynamic properties of the turbine blades plays an important role for the forces generated by the rotation of the air flow (Stiesdal 1999). Operating wind turbine is operating in reverse or opposite to the fan in which the fan rotates using electricity while using wind turbines to generate electricity. Wind turbine blades will rotate which will be connected with the generator to produce electrical power.

2.5.1 Turbine

The turbine blades are made of high density wood or glass fiber which aims to produce electricity. The wind turbine was originally created to facilitate the needs of farmers in rice mills irrigation requirements and so on. Previous wind turbines are built in Denmark the Netherlands and other European countries more familiar with Windmill. Now more widely used wind turbines for public facilities electricity needs. According to the Teachers Resource Book wind turbines can be used alone unit or it is connected to a power grid users and also combined with photovoltaic system (solar cells). There are two types of configurations in turbine design either using the horizontal axis (horizontal-axis wind turbine HAWT) or vertical axis (vertical-axis wind turbine VAWT). According to Celia (2011) the turbine blades will spin when the wind is blowing and the wind factor affecting the speed of the turbine blades. The design of turbine blades must also be suitable for producing strong spin turbines or produce a maximum speed of rotation. The rotational speed of the turbine blades and also the function of each internal component structure also affects the production of turbine electric power generation as shown in Figure 2.7.

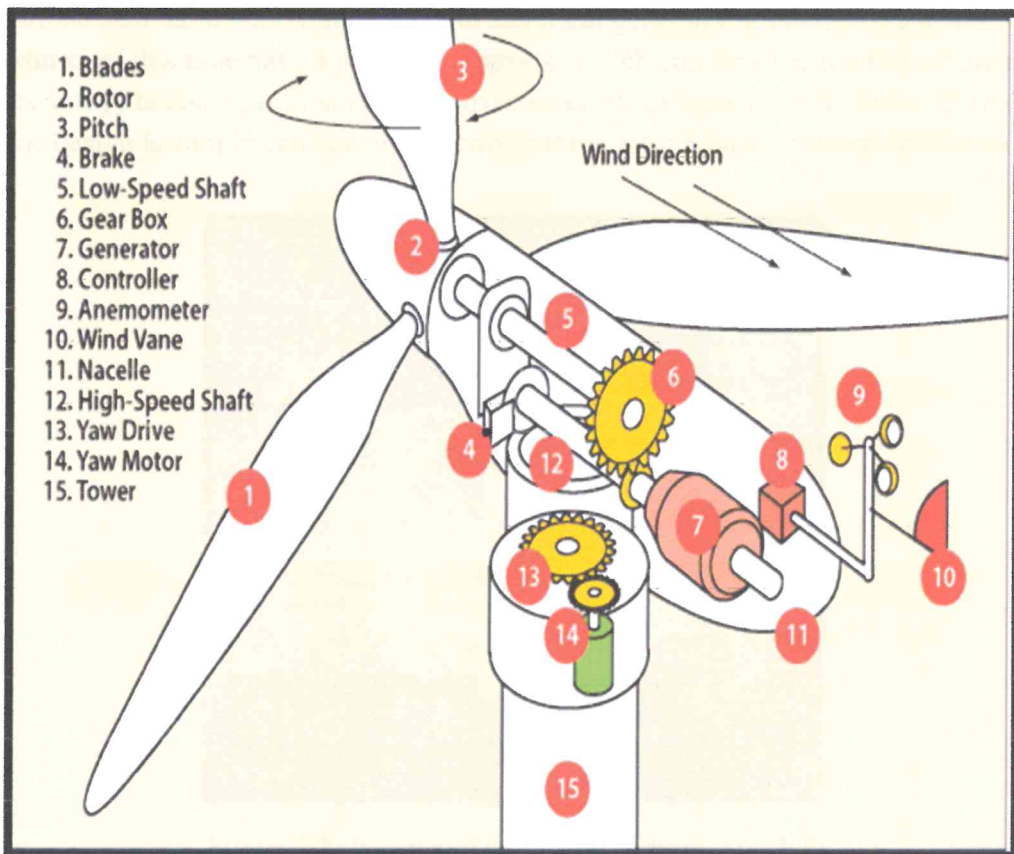


Figure 2.7: Turbine Structure (<http://www.alternative-energy-news.info/technology/wind-power/wind-turbines> dicapai pada Februari 26, 2011)

2.5.1.1 Types of turbines

The design of modern wind turbines are much lighter than the turbine used in the old days. Normally the wind turbine consists of three rotor blades. James et al. (2009) explains that there are two types of modern wind turbines are used at present namely the horizontal axis wind turbine (HAWT) and vertical axis wind turbine (VAWT). Wind turbines are the most popular and more practical is a horizontal axis wind turbine.

(i) horizontal axis wind turbine (HAWT)

Horizontal axis wind turbines more popular compared with vertical wind turbines because it's more efficient and more cost effective. This turbine has a different size but larger models are the most efficient and produce more energy (Celia 2011). In addition the turbine also has a main rotor shaft and electrical generator at the top of a tower. Most of turbines of this type have a gearbox (gearbox) which converts the rotation of the rotor blades slowly become faster suitable to drive an electrical generator (Elsevier 2010). The turbine design is simple dah consists of two or three rotor blades as shown in Figure 2.8.



Figure 2.8: horizontal axis wind turbine (HAWT)
(<http://www.google.com.my/imgres?q=wind+turbine&start=22&num=10> dicapai pada Februari 26, 2011)

(ii) the vertical axis wind turbine (VAWT)

Canada is a leading pioneer in the design of this vertical-axis wind turbine in the early 1970s. According to Celia (2011) although vertical wind turbines are less popular because less efficient but the design and the new model will be produced. One of the basic ideas for the design of vertical wind turbines is to reduce noise pollution. This wind turbine has a bar and designs vary. One design is the vertical Darrieus wind turbine as shown in Figure 2.9. Darrieus turbine airfoil has a design that uses the power of the aerodynamic forces to move much like an airplane wing. Darrieus turbines are less efficient in producing enough wind power to produce electricity. The benefit of this turbine is that it can transmit power to the ground. The cost to build is low because it does not require a lot of material and the turbine blades do not need to be changed. In Figure 2.10 shows the configuration of the wind turbine and the difference between horizontal and vertical axes.

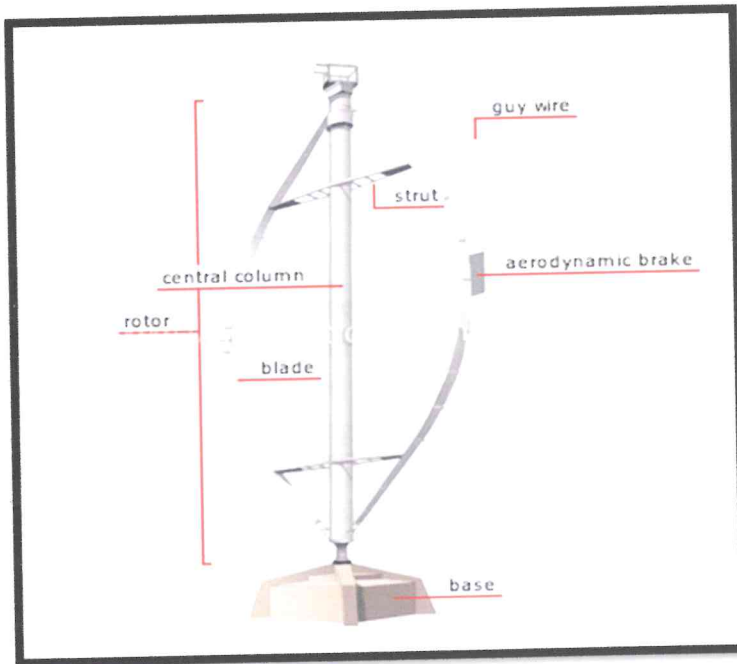


Figure 2.9: the vertical axis wind turbine (VAWT)
(<http://www.google.com.my/imgres?q=vertical+axis+turbine&num=10&um=1&hl=en&rlz> dicapai pada Februari 26, 2011)

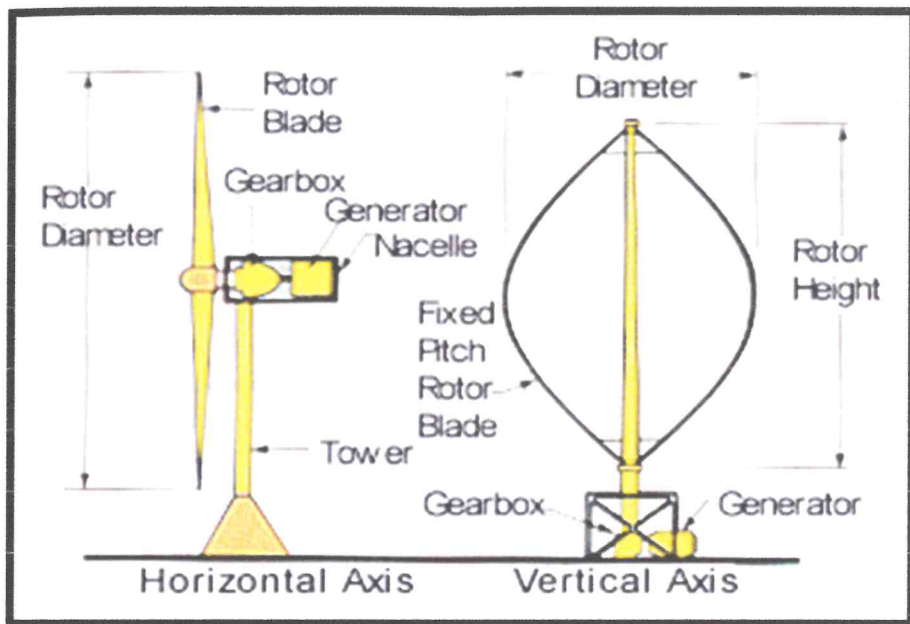


Figure 2.10: Horizontal axis wind turbine configurations and vertical (<http://www.google.com.my/imgres?q=Horizontal+axis+wind> dicapai pada Februari 26, 2011)

2.6 Generators

Generator (generator) is a machine that is used to convert mechanical energy to electrical energy (Isa et al. 2002). Electromotive force (d.g.e.) will be induced across a conductor when the conductor was cut and the magnitude of the magnetic flux d.g.e. will be directly proportional to the rate of change of magnetic flux. Inside the generator the magnetic field generated by current flowing in the coil of wire in a generator or by coils and permanent magnets to produce electricity as shown in Figure 2.7. The magnetic field acts to generate a magnetic attraction and repulsion mechanical torque and also serves induces a voltage in the coil of wire.

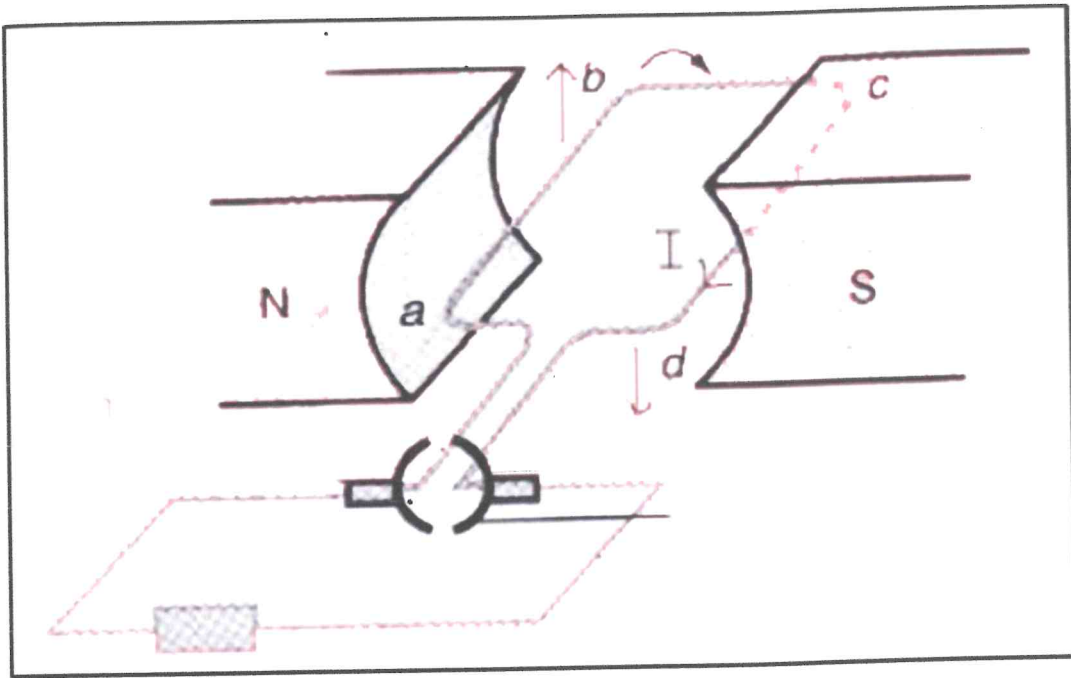


Figure 2.4 Structure generator

2.7 transformer

The transformer is a device which is capable of transferring energy from one system A.U. A.U to another system. Isa et al. (2002) define the transformer as an electrical device that uses the principle of electromagnetic induction to transfer electrical energy from one circuit to another circuit on the same frequency. The main use in electronic circuits electrical transformer is a component which can change the voltage value can increase or decrease the voltage. According Khairani (2004) the transformer is a transformer that is used to raise or lower the supply voltage A.C. by decreasing or increasing flows. Section known as the primary transformer input and the output as the secondary. Figure 2.8 shows a type of transformer.

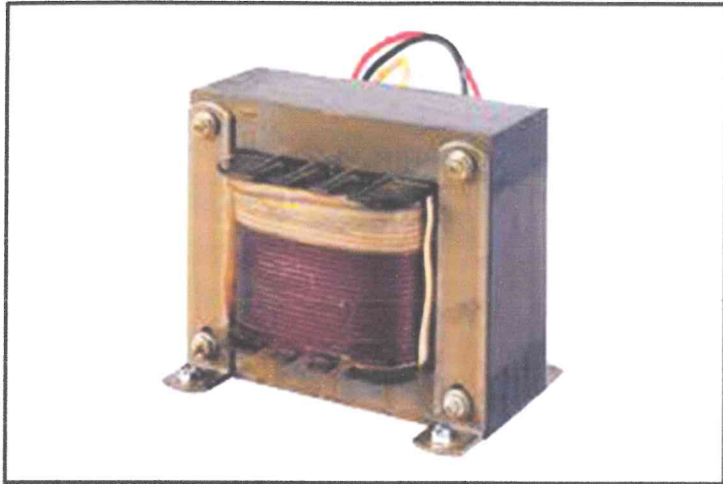
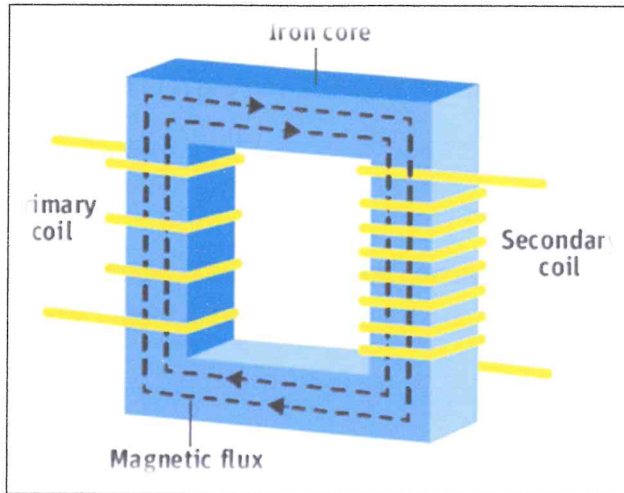


Figure 2.5 The transformer

2.7.1 Build of transformer

Basic building transformer is that it is made of thin iron listing the many and laminated together into one solid iron core. This transformer construction consists of two separate insulated wire coil wrapped on an iron core as shown in Figure 2.9. The lamination is to reduce the effects of eddy currents that occur in the core of which will cause the core to heat and reduce the efficiency of the transformer. In both loops mutual inductance is high. If the main loop (primary coil) is connected to the supply A.U. current will flow and creating a shuttle flux in the core. Isa et al. (2002) explains that the name and type of transformer depends on how the windings are made of copper conductor and core type is used.



2.8.1 Build of transformer

2.8 Battery

The battery comes from the French word meaning "action hit". The battery consists of two electrodes separated by a separator and immersed in the electrolyte to promote the movement of ions. Every battery has two terminals. One terminal is marked (+) or positive while the other is marked (-). If there is a connection between the two terminals with a wire a circuit is formed. Electrons flow from the negative to the positive end. Connectivity in the event of a negative to a positive. In order to properly take advantage of the electric charge generated by the battery must make a connection to the load. Charges may be something like a light bulb a motor or an electronic circuit like a radio.

The work of the internal battery is usually placed in metal or plastic containers. In this case is the cathode which connects to the positive terminal and the anode which connects to the negative terminal. Components of the more common known as electrodes occupying most of the space in the battery and the place where a chemical reaction occurs. A separator creating a barrier between the cathode and anode preventing electrodes from touching while allowing electrical charges to flow freely between them. Medium that allows electrical charge to flow between the cathode and anode known as the electrolyte. (Witkin 2011).

2.8.1 Types of Batteries

Batteries are available in several types according to the functions and their uses.

a) Zinc Batteries

Carbon or carbon battery normal. Zinc and carbon commonly used in ordinary dry cell batteries AA C and D (see Figure 2.10).

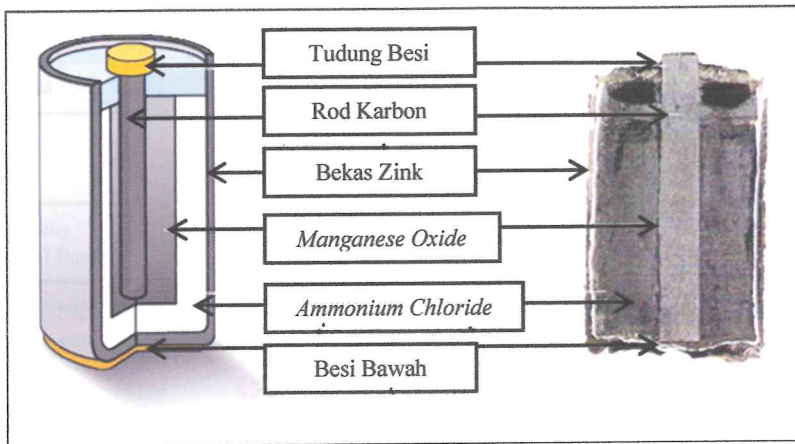


Figure 2.10: Zinc Battery

b) Alkaline Batteries

Commonly used in Duracell and Energizer batteries (see Figure 2.11).

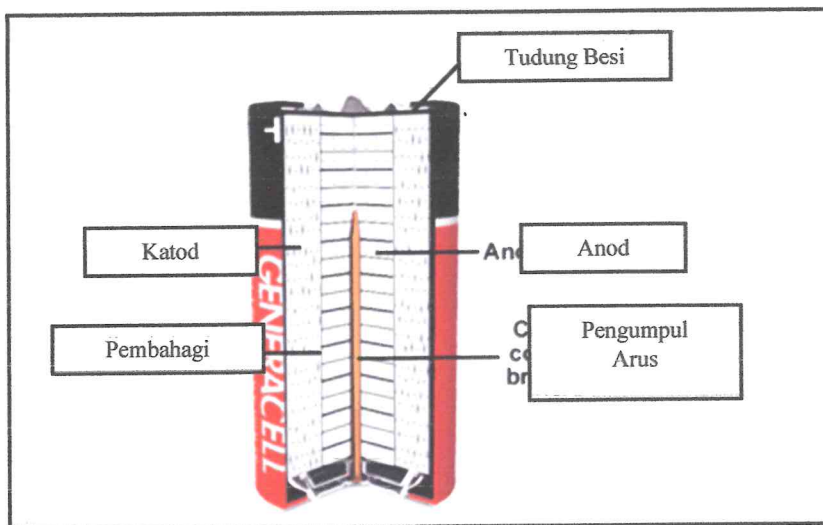


Figure 2.11: Alkaline Battery

c) Lithium battery

Regular use of the camera to light bulbs transmitter (see Figure 2.12).

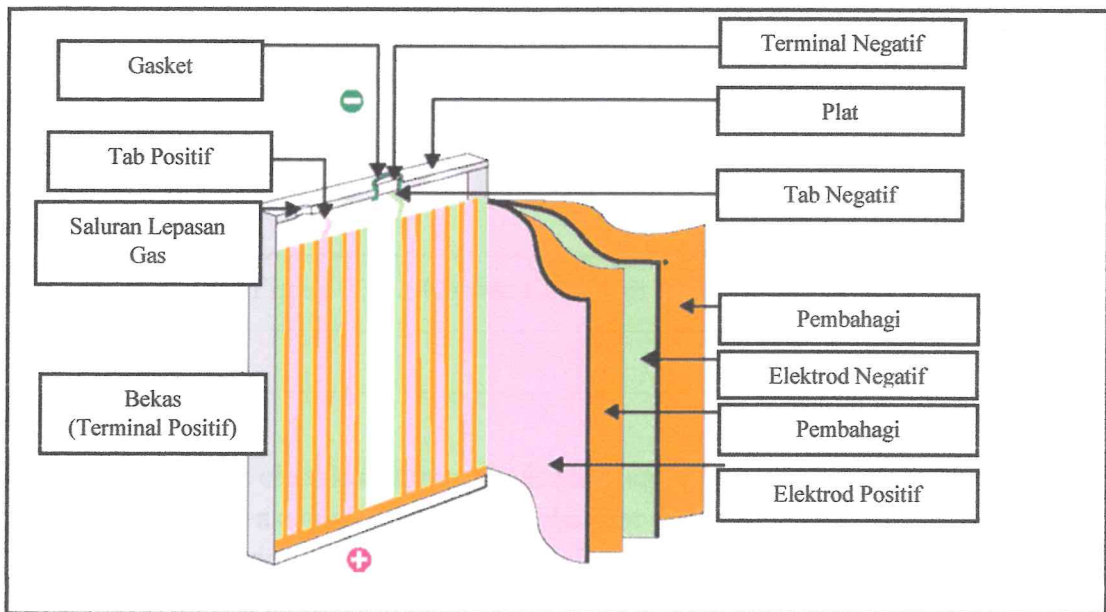


Figure 2.12 : Lithium battery

d) Copper-Cadmium batteries or NiCad

Electrodes are nickel-hydroxide and cadmium. The electrolyte is potassium-hydroxide. This type of battery can be recharged (see Figure 2.13).

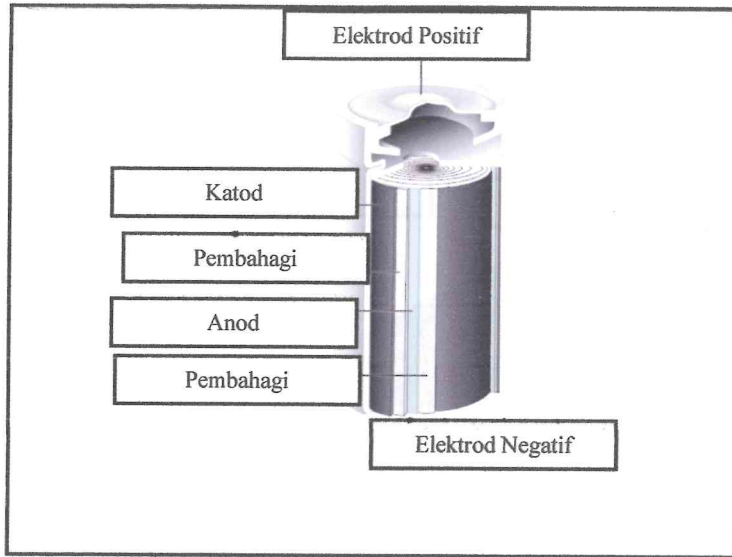


Figure 2.13 : Copper-Cadmium batteries or NiCad

e) Lead Acid Batteries

Lead-acid battery is the electrical storage device that uses a chemical reaction to the energy savings. It uses a combination of lead plates or grids and an electrolyte comprising dilute sulfuric acid to convert electrical energy into chemical energy with high potential (see Figure 2.14).

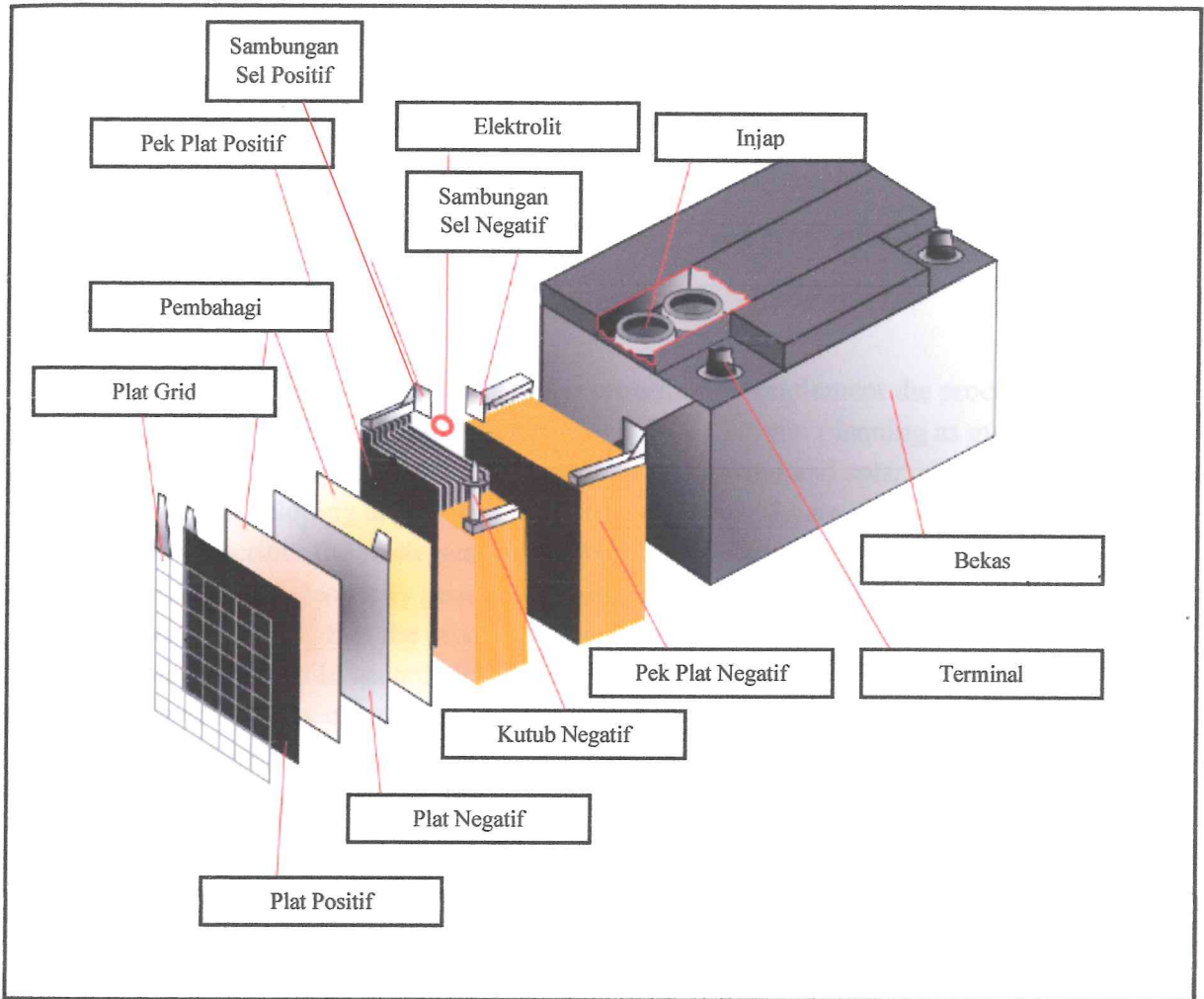


Figure 2.14: Lead Acid Batteries

2.9 Summary

Literature has discussed the study that will be created. It aims to enable researchers to know more about a component or equipment that will be used to complete the development of electricity generation using wind model. In addition the researchers also focused on the advantages and disadvantages in order to minimize development costs. Researchers also looked at previous studies on the development of this model for enabling business model quality improvement and quality of electricity generation using wind.

CHAPTER 3

METHODOLOGY

3.1 Introduction

The research methodology refers to the procedure to implement the process of reviewing the study until the objective is achieved. It is a careful planning as guidelines to researchers to model the generation of electricity using wind and solar. The methodology for developing this project is focused on the hardware design of model design. It also describes the strategies and methods of implementation studies. Design development model of electricity generation using wind and solar has to go through several phases or steps so that the process of finalizing the design of this model can be carried out smoothly and in accordance with a predetermined time. The researcher has designed a modified flow chart of the ADDIE model in which phases or steps involved is the analysis (analysis) design (design) development (development) implementation (implementation) and assessment (evaluation).

3.2 Flow Chart of Income Project

Good research requires systematic planning for the project to be produced to meet the objectives. Planning is done according to a predetermined phase of the ADDIE. The design of the study are summarized in the flow chart (see Figure 3.1).