INSTALLATION OF VERTICAL AXIS WIND MILL (300 WATT)

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***Abstract*: Wind energy is one of the non-conventional forms of energy and it is available in affluence. Electricity can be generated with the help of vertical axis wind turbine. This projects aims of utilizing this wind energy in most effective manner to get the maximum electric output, and therefore we selected rural area as our installation site. In the present work, turbine is design and fabricated as per the specifications, the blades used are semi-circular shape and are connected to the disc which is connected to shaft. Shaft is then coupled with pulley with the help of bearing, and then pulley is connected to the alternator, which generates the power. The power developed is stored in battery. In this project a small model has been created for testing purpose. This project also aims for maximum output with minimum cost indulges, so that the government can think over this project and can implement this type of vertical axis wind turbine on Rural Area at low cost.**

***Keywords:* Vertical axis wind turbine, design, fabrication.**

1. INTRODUCTION

Wind is caused due to uneven heating of earth's surface, atmosphere, irregularities of earth's surface and rotation of the earth about its own axis. The amount of wind flow depends on various factors such as earth's rotation speed and difference in temperature of places. Energy produced by this blowing wind is called as wind energy.

Electricity plays and vital role for development of the country, so the production of electricity is one of the main aims of the country. About 68% of the production of electric energy is based on thermal power plant, where fossil fuels, coals, diesel are used for power generation and which is very less available and this fuels also creates pollution, greenhouse effect and global warming. Therefore power generation with the help of non-conventional resource such as wind is increasing day by day and this type of power generation is very clean and safe. The wind turbines are basically of two types 1) Horizontal axis wind turbine (HAWT). 2) Vertical axis wind turbine (VAWT). HAWT has successfully evolved in making of electricity from wind. However, recently working on VAWT has also been started due to its additional advantage over HAWT such as it does not require yaw mechanism because it can produce power independent of wind direction. VAWT can be produced at low cost then HAWT and also affordable maintenance cost.[1]

2. LITERATURE SURVEY

The Darrius rotor was researched and developed extensively by Sandia National Laborato-ries in the USA in the 1980's. New concepts of vertical axis wind machines are being introduced such as the helical types particularly for use in urban environments where they would be consid-ered safer due to their lower rotational speeds avoiding the risk of blade ejection and since they can catch the wind from all directions However, small vertical axis wind turbines are more suited to urban areas as they have a low noise level and because of the reduced risk associated with their slower rates of rotation. Savonius type rotor used for converting the force of the wind into torque on a rotating shaft. The turbine consists of a number of aero foils, usually but not always vertical mounted on a rotating shaft or framework, either ground stationed in airborne systems. [3]

In the original versions of the Darrieus design, the aerofoils are arranged so that they are symmetrical and have zero rigging angle, that is, the angle that the aerofoils are set relative to the structure on which they are mounted. This arrangement is equally effective no matter which direc-tion the wind is blowing in contrast to the conventional type, which must be rotated to face into the wind. When the Darrieus rotor is spinning, the aerofoils are moving forward through the air in a circular path. Relative to the blade, this oncoming airflow is added vectorially to the wind, so that the resultant airflow creates a varying small positive angle of attack to the blade. This gener-ates a net force pointing obliquely forwards along a certain 'line-of-action'. This force can be pro-jected inwards past the turbine axis at a certain distance, giving a positive torque to the shaft, thus helping it to rotate in the direction it is already travelling in.[4]

As the aerofoil moves around the back of the apparatus, the angle of attack changes to the opposite sign, but the generated force is still obliquely in the direction of rotation, because the wings are symmetrical and the rigging angle is zero. The rotor spins at a rate unrelated to the wind speed, and usually many times faster. The energy arising from the torque and speed may be ex-tracted and converted into useful power by using an electrical generator. [5]

3. METHODOLOGY

Block diagram

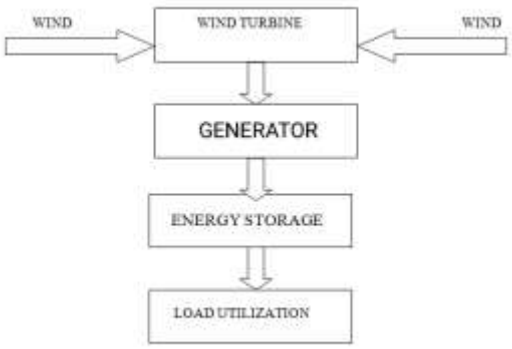


Figure 3.1 Basic Block Diagram of VAWT

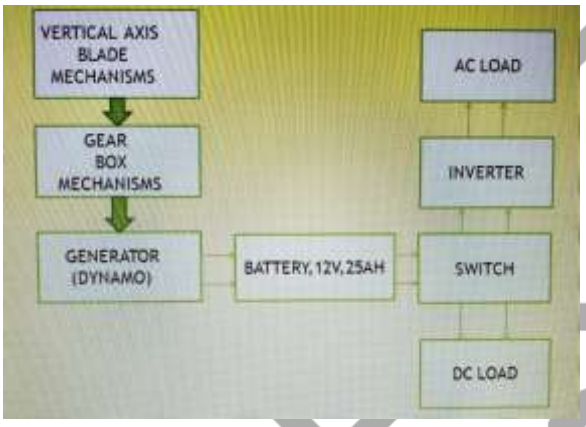


Figure 3.2 Overall System of Small VAWT

This block diagram contains overall system main components. Vertical axis wind turbine is main components of the system. They are convert kinetic energy (wind energy) to electric energy with the help of Generator. Generator produced 12V of DC output, at rotate its specific rpm. Battery is main components of storage of this system, they stored DC voltage. Load demand is DC, so battery is directly using the load. But in case of load demand is AC voltage, they this DC voltage is convert AC voltage with the help of Inverter.[6]

Any direction of wind is suitable for the VAWT. This is the most important advantages of this system.

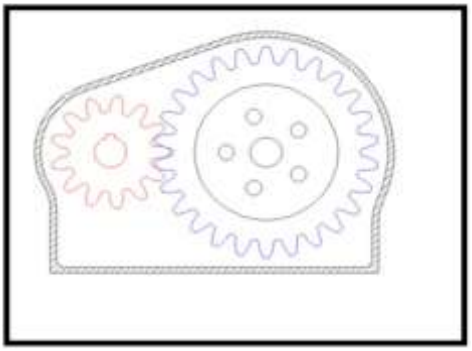
4. COMPONENTS:

4.1 GENERATOR (DYNAMO):

The electric dynamo uses rotating coils of wire and magnetic fields to convert mechanical rotation into a pulsing direct electric current through Faraday's law of induction. A dynamo ma-chine consists of a stationary structure, called the stator, which provides

a constant magnetic field, and a set of rotating windings called the armature which turn within that field. Due to Faraday's law of induction the motion of the wire within the magnetic field creates an electromotive force which pushes on the electrons in the metal, creating an electric current in the wire. On small machines the constant magnetic field may be provided by one or more permanent magnets; larger machines have the constant magnetic field provided by one or more electromagnets, which are usually called field coils

4.2 GEARBOX MECHANISMS:



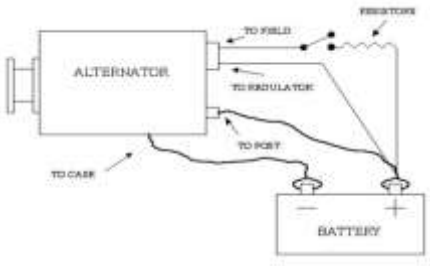
The power from the rotation of the wind turbine rotor is transferred to the generator through the power train, i.e. through the main shaft, the gearbox and the high speed shaft, as we saw on the page with the Components of a Wind Turbine. *But why use a gearbox?* Couldn't we just drive the generator directly with the power from the main shaft? Because, gear box is a specific gear ratio. They help to the increase speed (rpm) of shaft, this shaft are connected to the generator. Increase mechanical input of generator, and produced large electrical output. Less Torque, More Speed With a gearbox you convert between slowly rotating, high torque power which you get from the wind turbine rotor - and high speed, low torque power, which you use for the generator.

4.3 INVERTER CIRCUIT:

4.4 DC FUSE:

A fuse is an electrical safety device that operates to provide over current protection of an electrical circuit. It's essential components is metal wire or strip that metal when too much current flow through it, thereby interrupting the current. Its few sacrificial device, once a fuse has operated it is an open circuit, and its must be replaced or rewires, depending on type.

4.5 GENERATOR CONNECTION:



4.6 VERTICAL AXIAL BLADE:

A vertical axis wind turbine comprising a turbine rotor having an axis of rotation and at least one blade spaced from and mounted for rotation about the rotation axis of the turbine. The blade has at least one longitudinal surface substantially parallel to the rotation axis and for engage-ment in use with wind incident on the turbine rotor. The blade is a two part blade with a first leading blade portion pivotal connected to a second trailing blade portion. The pitch control means is a pivot on the first leading blade portion with the pitch pivot being guidable along a pitch path defined by a first physical pathway component and the camber control means is a camber pivot on the second trailing blade portion the camber pivot being guidable around a camber path defined by a second physical pathway component[7]

4.7 BATTERY:

Lead Gel 12V 25Ah GF121025YG dry fit battery sonnenschein lead Gel, the GF-Y dry range batteries are particularly adapted to the uses on disable chairs, electrical vehicle, boats, golf candies.

5. ADVANTAGES AND APPLICATION

5.1 ADVANTAGES:

- No requirements of license if a person instead to generate and distribute power in rural area
- The biggest advantages of wind energy are that wind energy is renewable energy source, so a wind turbine essentially has an operation cost of zero.
- Wind turbine generator does not emit green house gases or any other pollutants during operation.
- Wind is also renewable resource that is in c. onstant supply as long as the wind blows, unlike the finite supply of the fossil fuels.
- Wind turbine do not require very much land space o do constructed, so they do very little to occupy farmland in rural settings.
- Wind is a free resource and is available for many locations

5.2 APPLICATIONS:

- This project idea is very simple, where it focuses on utilizing the wind energy by designing and manufacturing VAWT.
- This can be installed across the public facilities. Facilities such as public parks, college, in the top of the stadium where wind is very high.
- Does not have to be pointed towards the wind to be effective. This creates flexible locations for placements of the turbine in an area with varying wind direction.

6. CONCLUSION

Vertical axis wind turbine offer economically viable energy solution for remote areas away from the integrated electricity grid systems. Blade design plays critical role for performance and energy extraction from Turbine. In order to spread the use of VAWT, the problems associated with various configurations, i.e. poor self starting and low initial torque, low coefficient of power, poor building integration should be overcome. With the assumption of placing the turbine in a location with moderate wind availability with optimized blade parameters and design specifications, high power generation is achieved with vertical axis wind turbine and can be serving as energy generation unit for remote areas.

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