Vertical Axis Wind Mill By Using Gearless Technology

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ABSTRACT
The main objective of this paper is to study and develop wind turbine which work on low height effectively and enhance power generation capacity of wind mills. To design and develop such wind mills which gives output at low height effectively, we are going to design vertical axis wind mill which works on gearless technology. Prior to the implementation of vertical axis wind mills with gearless technology, power generation from wind is done by horizontal axis wind mills with gear box or vertical axis with gear box. These were inefficient and because of large rotating gear parts they require lots of maintenance and got damaged quickly. This structure has reluctance to catch wind with different direction and speed. This proposed system demonstrates vertical axis wind mills with gearless technology.

Keywords
Gearless generator, low air velocity, vertical axis wind turbine, voltage regulator, battery, rectifier and control circuit, LED, Wires.

1. INTRODUCTION
The availability of non conventional energy sources in the world are limited, therefore the world takes initiative to generate an electrical energy by using conventional energy sources like wind, geothermal, ocean, tidal, hydro, solar, biogas etc. and stepped towards the non polluting world. There are various technologies are permits to design various types of generators with gears and without gears. By using geared technology most amount of power can be generated but the plants located at hilly areas, where large amount air present and away from local areas. There are different disadvantages like wear and tear, friction, bearing loss, excitation loss and so on. To overcome the above problem, we developed gearless generator which works on low air velocity and easy to installed on building roof, collage area, on high ways and energy crisis area. The benefits of gearless generator such as elimination of excitation losses and the reduction of weight of machine.

Our aim was to prepare small scale wind turbine which run on low air velocity and can be install on roof top of building and charges a 12 volt battery and runs various 12 volt appliances without invertors or run home appliance with the use of inverter. By prepare this paper we want drive the attention of peoples towards power generation through renewable sources so as to tackle problem of power in our country which is suffering from power shortages. With the help of such paper various sections like residential, industrial, commercial etc. can become independent from supply of power from electricity board unto certain mete.

2. BLOCK DIAGRAM

3. COMPONENTS
3.1 Gearless generator  
3.2 Rectifier  
3.3 Filter  
3.4 Battery  
3.5 Control circuit  
3.6 Inverter (for AC application)

3.1 Gearless generator
Gearless wind turbines (also called direct drive) get rid of the gearbox completely. Instead, the rotor shaft is attached directly to the generator, which spins at the same speed as the blades. Gearless wind turbines are often heavier than gear based wind turbines. Experts from Technical University of Denmark estimate that a geared generator with permanent magnets may use 25 kg/MW of the rare earth element Neodymium, while a gearless may use 250 kg/MW.

The direct drive (gearless) wind turbine is the low-speed generator that eliminates the need for a gearbox from the turbine’s drive train. These turbines have advantages such as these are lighter as compared to conventional turbine; these
have significantly lower maintenance costs, and it is not needed to replace gearbox as these are gearless turbines. The most preferred direct drive wind turbine generator is the permanent magnet type generator, as it is lighter in weight and possesses high reliability for offshore applications.

3.2 Rectifier
A rectifier is an electrical device that converts alternating current (AC), to direct current (DC), which flows in only one direction. The process is known as rectification. Physically, rectifiers take various forms, including vacuum tube diodes, mercury arc diodes, copper and selenium oxide rectifiers, semiconductor diodes, silicon controlled rectifier and other silicon-based semiconductor switches. Here we used rectifier to convert the output of gearless (direct drive) generator which is in the form of alternating current to direct current which is required for the various application, they are in the form of DC.

3.3 Filter
Filter is the circuit which performs signal processing functions, specifically to remove unwanted frequency components from the signal, to enhance wanted ones, or both. It is sometimes desirable to have circuit capable of selectivity filtering one frequency or range of frequencies out of different frequencies in the circuit. A circuit designed to perform this frequency selection is called a filter circuit or simply a filter.

3.4 Battery
Battery is as part of a circuit that provides the electricity. Battery can be said as the source to provide electricity to the circuit. The purpose of the battery in a series circuit is to give the circuit a source of energy. The purpose of a switch in a series circuit is to make it easy to open or close the electrical circuit, turning the flow of electricity on or off. A light bulb in a series circuit is used to determine whether or not electricity is flowing. The purpose of the wires in a series circuit is to allow the electricity to flow from one device to the next. Wire is used to carry the flow of electrons. Metal wire is a very good conductor. Materials that do not allow electricity to flow through are called insulators or non-conductors.

3.5 Control circuit
A control circuit is also known as ‘charge controller’ or ‘battery controller’ limits rate at which electric current is added to or drawn from electric batteries. It prevents overcharging and may protect against overvoltage, which can reduce battery performance or lifespan, and may pose a safety risk. A control circuit used to control the charging and discharging the battery it is depend upon the battery technology to protect battery life. A control circuitry integrated within a battery pack, battery-powered device or battery charger.

3.6 Inverter circuit
An inverter is a device that converted D.C. voltage into A.C. voltage. A direct current (D.C.) is a current that flows in only one direction, while an alternating current (A.C.) is that which flows in both positive and negative directions. At the early stage, sun was the source of energy for generating power. Due to the inadequacy of the power generated through this source, there was a need to find other ways to improve the power supply when the generating station could not meet the demand of the people. To inverted circuits added to use of the D.C. supply into A.C supply. It is so named because early mechanical AC to DC converters was made to work in reverse, and thus was “inverted”, to convert DC to AC.

4. GENERATOR DESIGN
Instead of using readymade alternator we decided to use permanent magnet generator according to design requirement. In this type of generator neodynamium permanent magnet is used, this is for increasing the output with same size rotor. The numbers of poles used in this are 8 in each stage respectively. The single phase connection is drawn from the coils and this output can store in battery. This type generator is generally designed when there is special requirement of power.

5. FUTURE SCOPE
These days, the wind industry is all about scaling up, cutting costs, and improving reliability. One way to do that, at least according to Siemens and GE, is to replace the traditional gearboxes and high-speed generators with bigger low-speed generators that don't necessitate a geared transmission (that's why they call it 'direct drive'). Here's why this might be the future of wind turbine design...So while the current gearbox-systems can do the job reliably, direct drive mechanisms that use about half as many parts should be even more reliable and thus reduce operating costs over the long-term, making electricity from wind farms even more competitive. This is especially important for offshore wind farms because doing maintenance at sea is a lot more complex and expensive than on the ground. Production and installation costs should also be lower once production of direct drive turbines scales up; the example above about the 100W turbines.

6. CONCLUSION
There are number of sources for generation of power but in the recent years wind energy shown its potential as the clean source of energy and contributing to the high energy demands of the world. Vertical axis wind turbine by using gearless generator is the best option for the area which are under load shading The vertical axis wind turbine using gearless technology is a small power generating unit with the help of free source of wind energy. It is designed under consideration of household use. The analysis results of the wind turbine governs that the design is under safe limit.

7. ACKNOWLEDGMENT
We would like to express our gratitude for all the people who extended unending support at all stages of our paper work. This paper is product of not only our sincere efforts but also the guidance and moral support given by faculty of Electrical department, NESGOI College. We take immense pleasure in thanking Prof. Pramod V. Jalamkar, Head of the Electrical Department for having permitted us to carry out this paper. We express our sincere gratitude to our paper guide Prof. S.V. Tayade, Professor for sparing valuable time in giving guidance & suggestions all through, for successful completion of the paper.

8. REFERENCES
