

Power Generation Using Maglev Windmill

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Abstract

Magnetic levitation or maglev technology is a technique which is used to lift the objects with the help of magnetic fields. Pressure of the magnetic field is used to suppress the effect of gravitational and other forces. As wind is a form of renewable source of energy, it can be used to generate electricity by converting kinetic energy into electric energy with the help of wind turbine. The advantage of a maglev windmill over a conventional one is, mechanical friction is totally eliminated as the rotor is floating in the air due to levitation.

Keywords- Maglev, Wind Turbine, Electricity Generation, Magnets

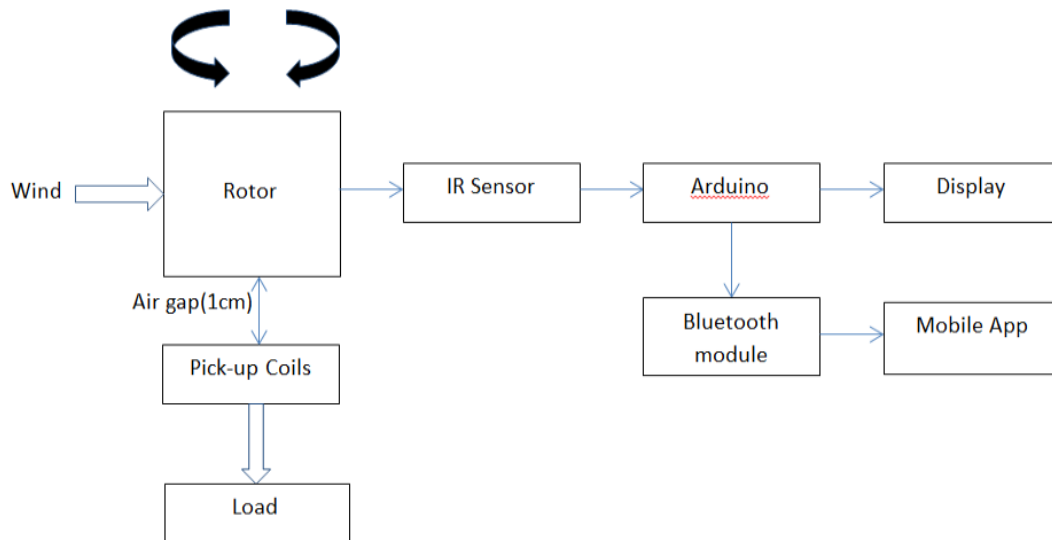
I. INTRODUCTION

In order to do work energy is very important aspect. There are basically two types of energy available such as renewable and non-renewable. The renewable energy is those which are unlimited and never runs out. For example, solar energy, wind energy, tidal energy. These sources never run out and we can use them without any adverse effects on environment. Unlike renewable energy sources the non-renewable sources are limited and which cannot be used continuously. Examples are fossil fuels, natural gas etc.in order to produce energy from these sources, huge amount of time required so renewable energy sources must be utilised. Our paper aims to use wind energy to generate electricity using maglev technique.in order to generate electricity

various traditional methods are used such as thermal power plant, hydro-electric power plant, nuclear power plant. But they also have adverse effect on environment such as thermal power plant produces air pollution, hydro-electric has wastage of water and nuclear power plant may have hazard of radioactive elements like uranium and thorium on environment. so we are using wind energy because it does not have any hazard on environment and have large benefits.

Many studies have been done on maglev windmill to generate electricity[1]-[4]. aluminium sheet metal with angular shapes cut out blades are used, but the voltage only up to 45 volt DC was generated[2]. the turbine gave maximum voltage of 7.6V at 2150 RPM[4]. aluminium is a very light metal and it naturally generates a protective coating of oxide and also is highly resistant to corrosion, so blade made up of aluminium can work effectively[5]. Solar panel along with the maglev vertical axis wind turbine are used in which solar panels generated average 12V in bright sunlight[6]. first, the types of wind turbine are presented. Next, the analysis is carried out for blade structure, voltage generation from each coil. Then, the analysis is carried to determine the distance between stator and rotor due to levitation. After implementing whole setup voltage at different wind speeds is monitored and utilised for working of load.

II. SYSTEM ARCHITECTURE



Fig(a). Block Diagram:

Now days due to limited resources of oil, gas and fossil fuels the need of use of renewable energy source is extensively increasing. So we can generate electricity using wind energy.

III. SYSTEM COMPONENTS

Types of windmill:-

There are two types of wind turbines available for uses which are horizontal wind turbine and vertical wind turbine. The horizontal wind turbine consists of two to three propeller shaped blades connected to a horizontally and are mounted to the support tower with the help of bearings. Horizontal axial wind turbine works only on wind from one direction but in vertical axial wind turbine, the wind power from any direction is utilized for electricity generation.

Rotor

Rotor is actuating part or may say rotating part which rotates according to wind speed. The rotor has circular disk placed upward and downward and in between that blades are placed. These blades are placed at 45° angle apart from each other. This mounting makes the blades to rotate even at small wind speed.

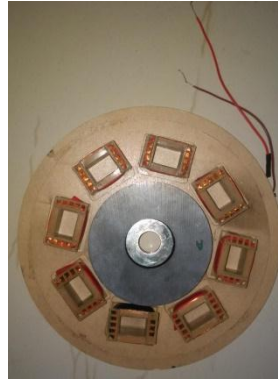


Fig(b). Rotor Assembly

The rotor assembly is made up of acrylic sheet. The reason behind using this material is that, making rotor as light as possible. The rotor is supported by the wooden rod at the centre of assembly. At the bottom of rotor disk several neo-magnets are attached. At the centre of rotor one permanent magnet is attached. The neo-magnet is type of permanent magnet that has better magnetism property as well as the very strong magnetic field. One of the neo-magnet is attached to both stator and rotor to help this permanent magnet to retain property.

Stator

The Stator is stationary part of system. At the centre of the stator the permanent magnet is placed and around this permanent magnet several coils are placed. The 12 gauge wire is used for coil.



Fig(c). Stator coils

The magnetic field is induced according to faraday's law of induction.

The voltage induced is given by

$$V=N \cdot dB/dt \cdot A \dots\dots(1)$$

Where $d\phi/dt$ is change in magnetic field

N =Number of turns

A =Coil area

Area=width*length

$$=2.4*1.5$$

$$=3.6\text{cm}$$

$$A =0.036\text{m}^2$$

The numbers of turns of coils are 2800.

The change in magnetic field of neo-magnet is 0.27tesla.

Therefore, $dB/dt=0.27$

Now substitute the value in equation (1),

We get ,

$$V=20.16\text{V.}$$

So, the each coil produces 20.16V. We used 8 coils in series so theoretically it should produce 160V.

IV. WORKING OF SYSTEM

The rotor assembly placed with help of wooden rod over stator due to two permanent magnets placed at centre of stator and rotor, it provides repulsive force, so the rotor and stator is magnetically levitated because of strong repulsive force. Hence, no desired contact between stator and rotor as well as the whole assembly become frictionless.

As soon as rotor rotates due to wind the magnetic field of small neo-magnets placed at bottom of assembly gets induced in coils, so due to change in magnetic field the AC voltage obtained at output of coils.

The output voltage is function of wind speed, the voltage gets varied according to movement of rotor due to wind speed. The more is the rotation of rotor, more is the output voltage and vice versa.

In addition, the RPM of rotor is measured using Arduino UNO controller. The IR sensor counts the rotation of blades and RPM is measured. This RPM is displayed on the LCD display as well as send to the mobile through Bluetooth module.



Fig(d). Final Assembly

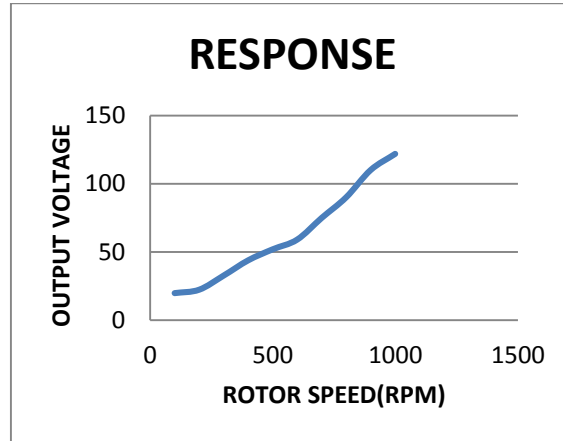
V. CONCLUSION

Power generation using maglev windmill has been described. It appears to be an effective and efficient system for generating power for household applications. Neo magnets worked effectively to produce expected output voltage.

VI. RESULTS AND FINDINGS

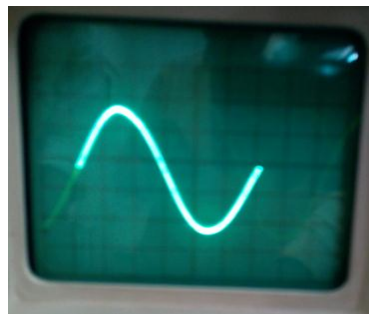
By making the project we come to know that about 120 volts AC is generated at the output of coils and it varies according to the wind speed; as soon as the rotation of rotor increases the output voltage also increase and vice versa. This generated voltage

can be used to drive loads like bulb, fan etc. and also for the battery charging. Also the rotor speed in RPM is measured and displayed on the LCD and Mobile through Bluetooth module.



Fig(e). Relation between Rotor Speed vs. output voltage

Also we checked the output response of windmill on Cathode Ray Oscilloscope(CRO) And we get the AC sine wave at output which shows this maglev windmill generates Ac output voltage according to wind speed.



Fig(f). Output Response On CRO

VII. FUTURE SCOPE

As we have developed a prototype, this prototype provides about 3W load drive.in order to drive more heavy load the much larger assembly required.so if it built in very large scale it will provide electricity for nearly 5000 houses.

VIII. ACKNOWLEDGEMENT

In our life, to make it a successful one, we need to have a good guide. To complete this project, we have the pleasure of being advised eminent personalities. We wish to convey our deep sense of gratitude to all of them. We express our sincere thanks to our project guide respected Mr.S.C.Rajgade, Dept. of Instrumentation Engineering. For his valuable guidance and support and continuous support without his inspiration and help it would not have been possible for us to complete this project. We take this sincere to thank respected. Prof. Mr. H.P. Chaudhari, H.O.D. of Instrumentation Engineering Department for his keen interest and suggestions that helped us to make a great success.

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