Automatic Energy Harvesting Using Maglev And Wind Turbine

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ABSTRACT: Magnetic levitation, maglev, or magnetic suspension is defined by which an object is suspended with a support of magnetic fields. Maglev windmill power generation system used for analyzes the optimum power output. Conventional wind turbine and Maglev wind turbines are the two types of wind turbines. Maglev wind turbines have more advantages than the conventional wind turbines. For instance, maglev makes the rotation possible in very low wind speed but conventional wind turbine rotates in high speed.
Keywords: Neodymium magnets, system architecture, conventional wind turbines.

I. INTRODUCTION

Wind is a form of solar energy. It is a natural power source that can be used to generate electricity. The atmosphere of the sun causing areas of uneven heating. In the uneven heating of the sun creates a rotation of the earth and the rockiness of the earth's surface on that way wind is formed. Wind turbines are used to convert the kinetic energy into mechanical energy. This mechanical energy is used for some task like grinding grain or a generator can convert into kinetic energy. Wind energy is a renewable, non-polluting, scarce and scot-free form of energy so non -polluted the global environment. According to the direction of the circumduction axis, wind turbine generator can be classified as two types, one is horizontal wind turbine and other is vertical axis wind turbine. The staid magnet windmill generator is putative because of low cost, high power density, high torque and variable speed.

When the mechanical friction is totally eliminated on that condition rotor is floating in the air due to levitation. That makes the rotation possible in wind speeds as low as 1.5 meters per second (m/s).The main drawback of this vertical axis wind turbines is not use for large scale industry because when increase the size of the rotor and also increase the cost [1].Finding the Capacity factors of the optimum windmill. Long term wind speed data of the sites were used, considered the wind speed is high, the wind turbine size will be a bigger and the capacity factor decreases and vice-versa [2]. Low speed and capacity multipolar synchronous generator system is applied in the Vertical axis windmill because it has low noise, vibration, number of rotation. The generator is produced by a magnetic powder. Magnetic powder core is used for made the stator because less cost. Magnetic powder core has not used for electric tool [3].The intra-cavity wind energy is developed by vertical axial wind turbine of three hastate windmill. Vertical axial windmill of three hastate is coaxial with the permanent magnet generator has many advantages such as low power consumption, low noise and low cost. Vertical axial windmill of three hastate and closed cavities.it remove the eddy current loss [4].Permanent magnet generator with small scale windmill is increase the electrification ratio. The permanent magnet and the electric machine are 350 Watt brushless direct current motor at rotor. The electric machine is used as electric generator [5]. Wind turbines are used to convert the kinetic energy into mechanical energy. This mechanical energy is used for some task like grinding grain or a generator can convert into kinetic energy. Maglev wind turbines have more advantages than the conventional wind turbines [6].Vertical low wind speed magnetic levitation wind turbine and the traditional vertical wind turbine is similar but only the traditional mechanical bearings instead of using magnetic bearings this helps to elimination of mechanical friction [7]. Design the maglev vertical axis wind turbine with modified magnetic circuit generator and this analysis is used for test the generating capability of the wind turbine. A dual magnetic surface is attached into the structure through an external mechanical structure to reduce the mechanical oscillation [8].

The all above methods are following drawbacks are not use for large scale industry, magnetic permeability is low and hysteresis loss is large in magnetic powder. To overcome this we have developed another new technology are cost reduction, one time investment, used for both AC and DC applications.

II.WIND SYSTEM ARCHITECTURE

The architecture of wind system has described below:

A.Copper coils arrangements

The 4 sets of copper coil is used in this system of 1500 turns with 26 guage wires on bobbin for power generation.These coils are arranged in the periphery of the stator exactly in a line to the arranged disc magnets.The coils are raised to a certain height for maximum utilization of the magnetic flux.Each set of such coils are connected in star and delta aiding to obtain maximum output voltage.The series connections of the coils are preferred over the parallel connection for optimizating a level between the output current and voltage.

Fig.1 Copper coils are placed in circular fashion.

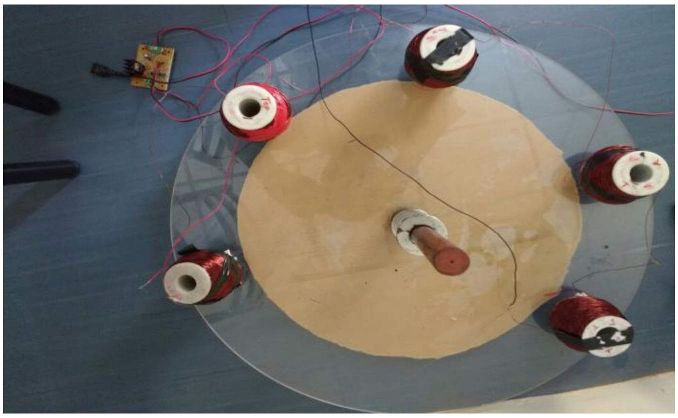

Fig.2 Top view of copper coils are placed in circular fashion with central axis wood rod

B.Disc and Ring magnets arrangements in the system

A magnet produces a magnetic field around the material. Magnet can be classified into two types: permanent magnets and electromagnets. Permanent magnet are made from hard ferromagnetic material (alnico, ferrite), constant magnetic field. In this system we have used ring neodymium magnet and disc magnet only the shape will be change: they are disc but with a hole in the middle are shown in the fig 2.

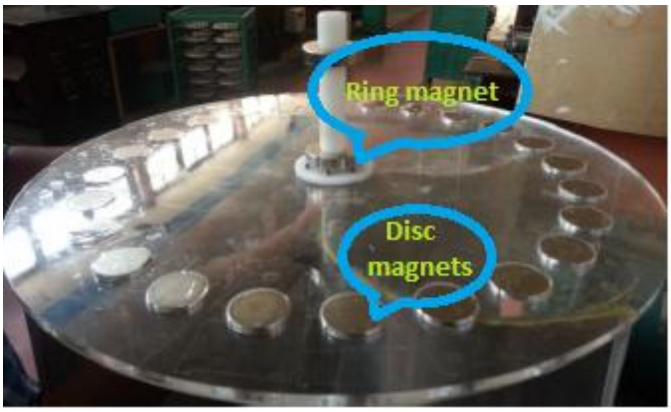

Fig.3 Ring and disc magnets are placed in circular fashion.

Ring and Disc type neodymium magnet is a permanent magnet. It is also a most powerful magnet in the world. Ring magnet used in this system because required levitation obtained in between the stator and rotor. There are many grade of neodymium magnets but in this system we use N42 ring type neodymium magnet because low cost and good performance. Disc magnets are arranged as alternate poles one after the other and placed along the periphery of the rotor is shown in fig 2. It will attract each other and to produce the flux.

Acrylic polymers (fiber, plastic glass) are a transparency, elasticity, lightweight, shatter resistant, resistance to breakage and also high molecular weight. These sheets made up of acrylic acid and polymethyl methacrylate acrylic. This sheet used to place the disc magnets and copper coils are shown in fig 1 and fig 3 and we have also used for turbine blades applications is in fig 4.

The blades are made up of acrylic sheet because for flexibility and cut out into three triangular shapes.These acrylic sheet blades are placed in the rotor and also attached to the shaft with 120degree apart from each other.dimention each triangular shaped blade is 12,10 and 8.

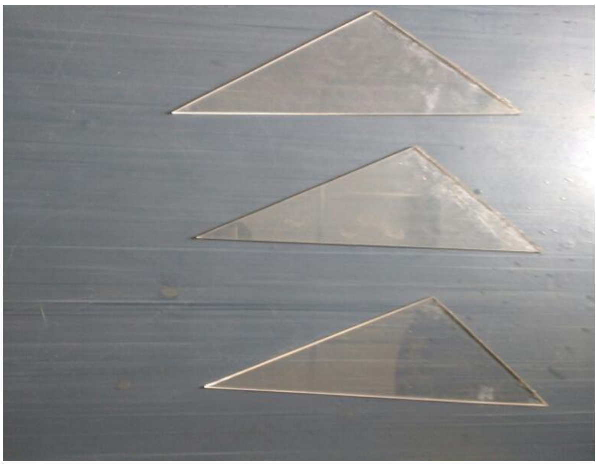

Fig.4 Triangular shaped acrylic sheet for turbine

III. FUNCTIONIG OF PROPOSED METHODOLOGY

The maglev windmill consists of two ring type neodymium (NdFeB) magnets of grade N42 of outer diameter 40mm, inner diameter 20mm and thickness 10mm are placed at the Centre of the shaft by which the required levitation between the stator and rotor is obtained . These magnets are responsible for the useful flux that is going to be utilized by the power generation system.26 gauge wires of 1500 turns each are used as coils for power generation. Four sets of such coils are used in the prototype; these coils are arranged in the periphery of the stator exactly in a line to the arranged disc magnets. The coils are raised to a certain height for maximum utilization of the magnetic flux. Each set of such coils are connected in star and delta aiding to obtain maximum output voltage. The series connections of the coils are preferred over the parallel connection for optimizing a level between the output current and voltage.

In the designed prototype, the stator and rotor are separated in the air using the principle or magnetic levitation. The rotor is lifted by a certain centimeters in the air by the magnetic pull forces created by the ring type neodymium magnets. This is the principal advantage of a maglev windmill from a conventional one. That is, as the rotor is floating in the air due to levitation, mechanical friction is totally eliminated. That makes the rotation possible in very low wind speeds. The output voltage obtained from this system is measured using a multimeter and a maximum of 6 volts DC were obtained.

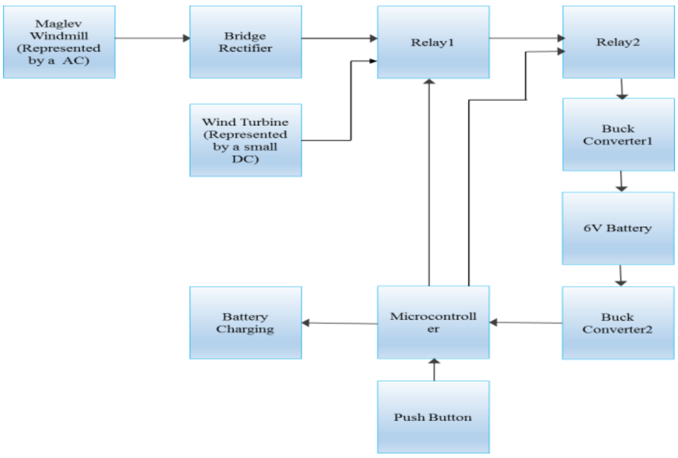

Fig.5 Block diagram of Maglev wind mill system

The block diagram of wind mill system as shown in fig 5.The output of the maglev windmill is connected to the NC (Normally Close) contact of the relay1 (power selection relay) through the bridge rectifier which converts the generated 12AC voltage into pulsating 6DC voltage. Similarly the conventional wind turbine requires a high speed to generate the electric power. In this prototype a small DC motor is used to represent the conventional wind turbines. A small fan is attached to the shaft of the DC motor which starts rotating when the wind energy passes through the leaf of the fan. The maximum output voltage generated by the DC motor is 1.5voltage is connected to the NO (Normally Open) contact of the relay1.The final output is taken from the common contact of the relay1, which is further connected to common contact of relay2. Relay2 is a power control relay which is used to connect the generating power either from maglev wind mill of from wind turbine to the buck converter1 is to reduce the input voltage coming either from windmill or from wind turbine and to charge the battery and then connect power to buck converter2 is to convert 6V DC coming from the battery into a 5VDC for the microcontroller works with a maximum of 5V DC supply. Two push button switches are used for this purpose. Push button1 is a power selection push button used to select the power either from windmill or from wind turbine.

As we studied, the maglev windmill generates power event at low wind speed. We assume that whenever the power selection push button is released (not pressed) the wind speed is low, hence the power from the maglev windmill flows to battery for charging via relay1, relay2 and a buck converter circuit. Whenever the selection pushbutton is pressed, the relay1 is off so disconnects the power from maglev windmill and relay2 is on connect to the wind turbine (DC motor), this is the case we can say the wind speed is high. The second push button is a power control push button. We can make the battery gets charged by pressing this push button. The output LED continuously blinks when this push button is pressed .If the battery is completely charged, we can disconnect the power to the battery by releasing this push button, at this time the output LED will not glow, indicates the battery is fully charged. The system will produce the output according to flow graph as shown in fig 7.

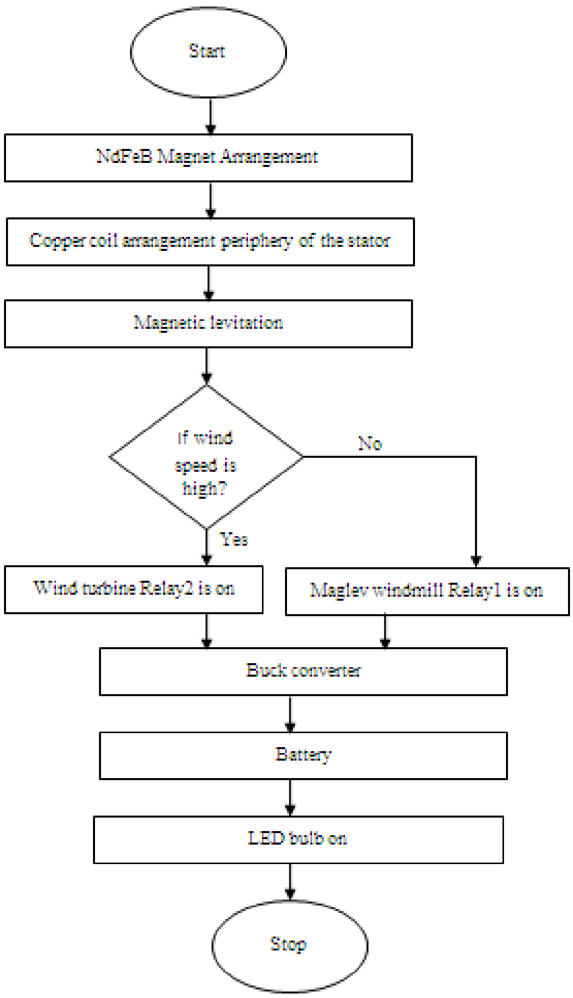

Fig.6 Flow chart of Maglev wind mill system

IV. RESULTS AND CONCLUSION

Now way day's power is major parameter in the daily life. To produce power we have many methods, wind energy is the one of them. In this system, maglev works in low wind speed when relay 1 is ON to produce Voltages as shown in fig 7, conventional wind turbine works in high wind speed during relay2 is ON to produce 1.5V DC.

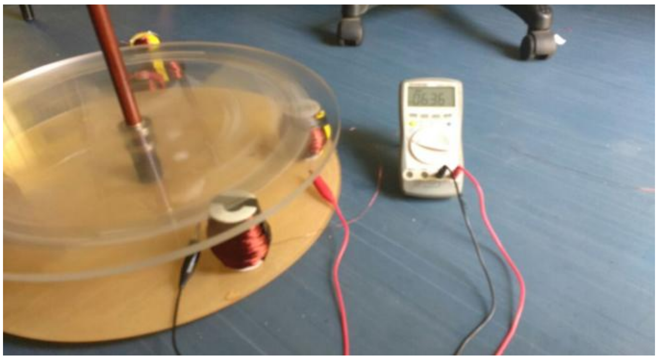

Fig.7 Meeasurement of output voltage in Maglev wind mill system

Rotor is rotate in clockwise direction because the magnets arranged such a manner like North Pole and South Pole so we obtain the positive voltage. These voltages used for Some applications of 6 VDC is used to burn LED, operate microcontroller application, mobile charging purposes, microprocessor application, R&D department and arduino board application.

V.FUTURE WORK

In this paper maglev vertical wind turbine it generate maximum 10v (dc) and alternative current (Ac) is 20 voltage because this size of maglev is very less so solve this problem in future to increase the size of the maglev windmill such as rotor, stator, and blades made up of acrylic sheet, use more powerful ring magnet and disc magnet than to get more voltage and used for more application according into voltage.

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