Electricity Production by Magnet (Maglev Mill)

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Abstract— India has the fifth largest power generation portfolio in the world and its current renewable energy contribution stands at 44.812 GW which includes 27.441 GW of Wind power and 8.062 GW of Solar power installed capacity in the country. (As on 31.07.2016). It is a world of renewable energy because we care having source freely available in bulk. We believe in "GO GREEN" theory. So we are trying to implement a new vertical axis wind turbine by using magnetic levitation. This paper represents maglev windmill concept. The main concept is magnetic levitation. These concepts introduced in windmill for maximization of the energy production & reduced friction. In wind turbine stator and rotor are magnetically levitated such that no physical contact between them and avoiding friction. When air comes in contact with blade it starts rotating and electromagnetic generation activates in levitation area. Its bearing less levitation avoids overheating and increases efficiency. A prototype version of project will built which could generate voltage from the turbine even in low as well as high rotational speed.

Key words: Renewable, Energy, Vertical, Axis, Windmill, Magnetic Levitation, Reduced Friction, Electromagnetic Generation

I. INTRODUCTION

India was the first country in the world to set up a ministry of non-conventional energy resources, in early 1980s. As of September 30, 2016 India's cumulative grid interactive or grid tied renewable energy capacity (excluding large hydro) reached about 44.24 GW.[1][2][3] 61% of the renewable power came from wind, while solar contributed nearly 19%.[4][5]

A Renewable resource is a resource which can be used repeatedly because it is replaced naturally. Renewable resources are usually much cleaner. Renewable energy is generally electricity supplied from sources, such as wind power, solar power, geothermal energy, hydro power and various forms of biomass. This sources have been coined renewable due to there continues replenishment and availability for use over and over again. From 2008 to 2012, the U.S. doubled renewable generation from wind, solar, and geothermal sources, and America is now home to some of the largest wind and solar farms in the world.

II. CONVENTIONAL METHOD

Now we study about wind energy. In wind resources the main part is a wind turbine. Wind turbine further classify into types 1) Vertical axis wind turbine 2) Horizontal axis wind turbine.

Vertical-axis wind turbine is a type of wind turbine which have two or three blades and in which the main rotor shaft runs vertically. Vertical-axis wind turbines (VAWTs) are a type of wind turbine where the main rotor shaft is set transverse to the wind while the main components are located at the base of the turbine.

Horizontal-axis wind turbines have the main rotor shaft and electrical generator at the top of a tower, and may be pointed into or out of the wind. Most have a gearbox, which turns the slow rotation of the blades into a quicker rotation that is more suitable to drive an electrical generator.

III. PROPOSED TOPOLOGIES

Maglev wind turbines have several advantages over conventional wind turbines. They are able to use winds with starting speeds as low as 1.5 meters per second (m/s). Also, they could operate in winds exceeding 40 m/s. This makes the efficiency of the system higher than conventional wind turbine.

The Maglev wind turbine design is a different from conventional designs. Its main advantages are that it uses frictionless bearings and a magnetic levitation design and it does not need to more spaces required by more conventional wind turbines. It also requires less maintenance.

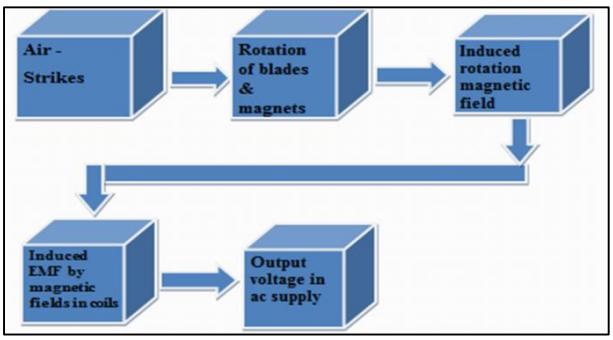

Fig. 1: Block Diagram of Maglev Windmill

The unique operating principle behind this type of design is magnetic levitation. Magnetic levitation is an extremely efficient system for wind energy. This design is levitated via maglev (magnetic levitation) vertically on a rotor shaft. Maglev phenomenon operates on the repulsion characteristics of permanent magnets.

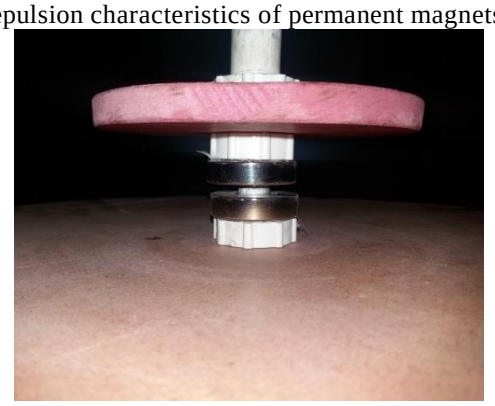

Fig. 2: Magnetic Levitation

In this project, we expect to implement this technology for the purpose of achieving vertical orientation with our rotors as well as the axial flux generator. These generators have air gap surface perpendicular to the rotating axis and the air gap generates magnetic fluxes parallel to the axis.

Fig. 3: Different Type Neodymium Magnets

By placing two magnets like neodymium magnets on top of each other with like polarities facing each other, the magnetic repulsion will be strong enough to keep both magnets at a distance away from each other. The force created as a result of this repulsion can be used for suspension purposes and is strong enough to balance the weight of an object depending on the threshold of the magnets.

Two base plate made up of wooden, on the bottom plate coils are arrange in series connection and output is taken from one end. Between these two base plates, two ring type neodymium kept such that both are in repulsion force. Due to these magnetic suspension is created between two plates and friction loss is reduced. Then the upper plate is connected with the rotating wind turbine blades.

Fig. 4: Coil Arrangment

The axial flux generator uses the changing magnetic flux to produce a voltage. The voltage produced by each coil can be calculated using Faraday's law of induction,

$$V= -N(d\varphi/dt)$$

An induced EMF is produced by a time varying magnetic field. Michael Faraday performed experiments with steady currents and a simple transformer in hopes of producing a voltage from a magnetic field. It is this relative motion of a magnetic field producing a voltage that allows us to be creative in the ways we produce electricity.

Fig. 5: Final Hardware

IV. CONCLUSION

At the end of the project, the magnetically levitated vertical axis wind turbine was a success. The rotors that were designed harnessed enough air to rotate at low and high wind speeds while keeping the center of mass closer to the base yielding stability. The wind turbine rotor levitated properly using permanent magnets, which allowed for a smooth rotation with negligible friction. Overall, the magnetic levitation wind turbine was a successful model.

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