Maglev Power Generation - A Review
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Abstract— The paper project purpose dwells on the implementation of an alternate configuration of a wind turbine for power generation purposes. A vertical axis wind turbine (VAWT) is introduced by magnetic levitation technology to optimize the performance. The system utilize nature of permanent magnet as a replacement for ball bearings to levitate the turbine component and thus minimize energy losses while rotating, which is the major problem that faced by conventional wind turbine. The Maglev Wind Turbine is expected to bring wind power technology to the next level. Furthermore, the system can be suited in use for rural and urban areas of low wind speed regions. The selection of magnet materials in the design of wind turbine system will be discussed. A model of wind turbine is built to perform several tests such as starting wind speed, rotational speed at constant wind speed, and time taken to stop rotation completely. The results obtained will be compared with the model of conventional wind turbine. Power will then be generated with an axial flux generator, which incorporates the use of permanent magnets and a set of coils.

Key words: VAWT, Magnate, Magnetic Levitation, Wind Turbine, Blade hub

I. INTRODUCTION
The maglev power generation introduces structure and principle of the proposed magnetic levitation wind turbine for better utilization of wind energy. Maglev Wind turbine has the features of no mechanical contact, no friction etc. minimizing the damping in the magnetic levitation wind turbine, which enables the wind turbine start up with low speed wind and work with breeze. Magnetic Levitation (Maglev) into turbine system in order to increase the efficiency. If the efficiency of a wind turbine is increased, then more power can be generated thus decreasing the need for expensive power generators that cause pollution.

Basic Requirements for generating power;
- Wind energy
- Wind turbine
- Magnetic levitation
- Generators

Various designs have been proposed in order to create a high efficient wind turbine which will be able to generate maximum electric power. They may vary either in the design of shape of the turbine blades, the axis of rotation, and other useful modification.

II. LITERATURE REVIEW

A. Wind Energy:
Wind is known to be another form of solar energy because it comes about as a result of uneven heating of the atmosphere by the sun coupled with the abstract topography of the earth’s surface. With wind turbines, two categories of winds are relevant to their applications, namely local winds and planetary winds. The latter is the most dominant and it is usually a major factor in deciding sites for very effective wind turbines. There are some reasons to support in using the wind energy to produce electricity power. Wind power available in the atmosphere is much greater than current world energy consumption. The exploitation of wind power is only limited by the economic and environmental factors, since the resource available is far larger than any practical means to develop it. Renewable energy produced from the wind has attracted a lot of attention and support in recent years. However, this green energy is often criticized for its low output and lack of reliability.

B. Wind Turbine:
The basic working principle of a wind turbine is: When air moves quickly, in the form of wind, and their kinetic energy is captured by the turbine blades. The blades start to rotate and spin a shaft that leads from the hub of the rotor to a generator and produce electricity. In general, they are two types of wind turbine according to the axis they are rotating about. Horizontal axis wind turbine is the type of wind turbine which has a main rotor shaft and electrical generator at the top of tower and pointed to the direction of wind. Most of them possess a gear box which turns the slow rotation of turbine blades into faster rotation that is more suitable to drive an electrical generator. The main rotor shaft is arranged vertically to allow the turbine blades rotate without facing to the direction of the wind. In this system, the generator and gearbox is placed on the ground rather than on the top. There is no need of the support from a tower make it more accessible for maintenance. [Wind Power Generation and Wind Turbine Design by Wie Tong]

C. Magnetic Levitation:
Magnetic levitation is a method in which an object is suspended with no support other than magnetic fields. The magnetic force produced is used to counteract the effects of the gravitational force and lift up the object. By placing these two 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. There are many advantages for utilizing magnetic levitation that is to minimize friction, make force measurement, design, and entertaining devices. Recently, this advance technology is applied into transportation system in which non-contacting vehicle travel safely at very high speed while suspended, guided, and propelled above a guide way by magnetic fields. The concept of magnetically levitated vehicle stimulates the development of useful application in various fields such as the power generation.

D. Maglev Wind Turbine:
The vertically oriented blades of the wind turbine are suspended in the air above the base of the machine by using permanent magnet which produces magnetic force to lift up the blades. This system does not require the electricity to
operate because no electromagnets are involved. Since the turbine blades are suspended by magnetic force produce by the permanent magnet, there is no need of ball bearing to retain the blades. This allows the friction between the blades and ball bearing can be reduced significantly and thus, minimizes the energy loss. This also helps reduce maintenance costs and increases the life span of the generator. Maglev Wind Turbine Technologies

RFI - Vertical Axis Wind Turbine 200 Mega Watt Off Shore Wind Farm.

III. WORKING PRINCIPLE

![Fig. 1: Maglev Power Generation](image1)

Fig. 1: Maglev Power Generation

![Fig. 2: Block Diagram Maglev Power Generation](image2)

Fig. 2. Block Diagram Maglev Power Generation

Magnetic levitation weight reduction structure for a vertical wind turbine generator includes a frame, a fixed permanent magnet, an axle, a revolving permanent magnet, a blade hub, and a generator. The fixed permanent magnet fixed to the frame has a first repulsive surface. The axle is connected to the frame. The revolving permanent magnet fixed to the axle has a second repulsive surface in relation to the first repulsive surface of the fixed permanent magnet. Both the first and the second repulsive surfaces repel with each other. The blade hub and the generator are connected to the axle. When the revolving permanent magnet is rotated, the axle functions as a balance center. An out structure supports the stator and the rotor is placed over turbine head. The main function of the free spinning roof ventilator is to provide fresh air in roof space and living area all year round 24 hours a day free of charge.

IV. FABRICATION

A. Neodonium Magnate:
The Neodymium metal element is initially separated from refined Rare Earth oxides in an electrolytic furnace. The "Rare Earth" elements are lanthanide and the term arises from the uncommon oxide minerals used to isolate the elements. As the Neodymium powder is pressed by the die, the direction of magnetization is locked in place – the Neodymium magnet has been given a preferred direction of magnetization and is called anisotropic. The magnet must be cleaned to remove any powder from machining. It is then dried thoroughly before being plated. It is imperative that the drying is thorough otherwise water is locked into the plated Neodymium magnet and the magnet will corrode from the inside out. The following were the fabrication techniques involved such as Lathe, Riveting and Drilling.

Type = neodonium, thickness=2cm, internal dia.= 1.2cm.

According to the equilibrium of forces

\[ \Sigma F = 0 \]
\[ mg - F_m = 0 \]
\[ F_m = mg \]

![Fig. 3: Neodonium Magnate](image3)

B. Blade Hub and Base (Frame):
The following properties for blade are light weight, corrosion, resistance, conductivity, reflectivity, etc. The no. of blades hub is 4 selected to use in project.

Width= 0.1cm, breadth= 10cm, height= 38cm.
The Base or frame which is used to mounted to all object related to project i.e. generator, battery. Height= 62cm, length= 38cm, width= 1.5cm.
The below equation how much power being generated can be calculated,

\[ \text{Power in KW (P)} = 2.14 \rho AV^3 \times 10^{-3} \]

![Fig. 4: Blade and Hub](image4)

C. PCB (Printed Circuit Board):

When direct output of the generators is in the form of emf and it will be not store in directly or rechargeable battery. So PCB is used for stored the current in the battery.

![Fig. 5: Block Diagram PCB](image5)
In the printed circuit board there are number of components such as resistance, IC, diode, forward bias, NPN junction. In our project the output current in the PCB should be transferred in 12 V in AC.

IN 4007 (P-N junction diode), LM-317(variable voltage regulator), resistance 180ohm, BC 548(switching transistor), zener diode(6.8 V), resistance 1Kohm, resistance 10ohm, variable 1Kohm.

V. MARKET SURVEY

The basic purpose of the project which type of material is to selected and easily available on it. Neodymium magnate is very essential and easily available on market because this type of magnate good repulsive force as well as good strength, reliability, the shaft material is copper, the motor is CCW motor because this type of motor rotate in clockwise direction, the output of motor called DC generator.

Following specification of all part which is related to the project are as follows.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Components</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SHAFT</td>
<td>COPPER</td>
</tr>
<tr>
<td>2</td>
<td>MOTOR</td>
<td>CCW, 1200RPM</td>
</tr>
<tr>
<td>3</td>
<td>MAGNATE</td>
<td>NEODANIUM MAGNATE</td>
</tr>
<tr>
<td>4</td>
<td>BATTERY</td>
<td>12V DC</td>
</tr>
<tr>
<td>5</td>
<td>BLADE HUB</td>
<td>GALVONISED ALUMINIUM</td>
</tr>
<tr>
<td>6</td>
<td>PCB</td>
<td>COPPER PLATE</td>
</tr>
</tbody>
</table>

Table 1: Specification

VI. FUTURE SCOPE

In future small villages each a house will have own small power generating unit of 500watt for two light, one fan, one motor pump, with equipment negligible maintenance.

In the industries for generating street light power it can be install an every street light with day night controllers.

REFERENCES

[2] Maglev Data Sheets - Nuenergy Technologies