# Vertical Axis Wind Turbine with Maglev Technology

**Amit D. Patil[1] Amit W. Chake[2] Manoj I. Helonde[3] Pravin M. Gupta[4]**
[1,2,3]Student [4]Assistant Professor
[1,2,3,4]Department of Mechanical Engineering
[1,2,3,4]JDCOE, Nagpur

*Abstract*— The paper proposes a method to implementing non-conventional source of energy for the generation of electricity. A vertical axis wind turbine 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. 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:*** Maglev Principle, Fabrication Design, Proposed Model

## I. INTRODUCTION

Wind is a natural power source that can be economically used to generate electricity. The wind turbine is used for conversion of kinetic energy of wind into electrical energy. The wind turns the blades, which spin a shaft, which connects to a generator and makes electricity. In this paper we present on the implementation of wind turbine for power generation purpose.The aim of this major qualifying project is to design and integrate a magnetic levitation technology into turbine system in order to increase the efficiency. Since one of the main complaints about wind turbines is the sound they produce, this is a huge advantage over other Turbine designs The maglev wind turbine is expected take wind power technology to the next level with magnetic levitation. The magnetic levitation is an extremely efficient system for wind energy.

## II. MAGNETIC LEVITATION WIND TURBINE PRINCIPLE

Magnetic levitation, maglev, or magnetic suspension is a method by which an object is suspended above another object with no support other than magnetic fields. The electromagnetic force is used to counteract the effects of the gravitational force.

## III. MODEL WORKING

When the air strike the blade of the turbine, due to the maximum repulsive force of the magnet the rotation of the blade increase which results in large rotation of the driver pulley of the shaft .Larger pulley rotates the smaller pulley which connects the generator shaft. Hence induced emf is generated in the generator which is transfer to the charging circuit. The charging ckt plays an important role to charge the battery and stores a DC power which gives to the destination AC power when needed.

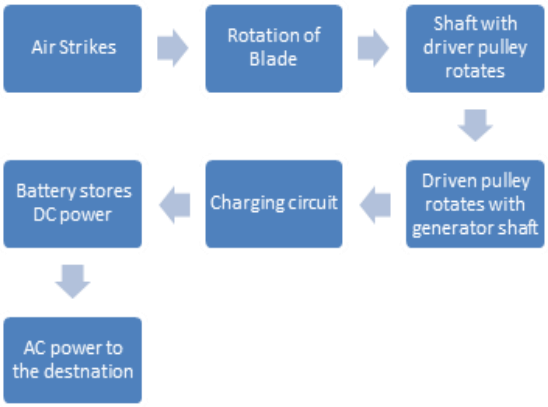


Fig. 1: Basic Diagram (working)

The bearing arrangement is totally replaced by the neodymium magnet which gives high repulsive force. With the help of this force small amount of air pressure gives maximum rotation. Hence results in large power generation.

## IV. FABRICATION

### A. *Neodymium MAGNATE:*

The Neodymium metal element is initially separated from refined Rare Earth oxides in an electrolytic furnace.. 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 following were the fabrication techniques involved such as Lathe, Riveting and Drilling.

Type- neodymium thickness=2cm, internal dia. = 1.2cm, external dia. =2.4cm.According to the equilibrium of forces

$$\Sigma F = 0$$
$$Mg\text{-}Fm = 0$$
$$Fm = mg$$

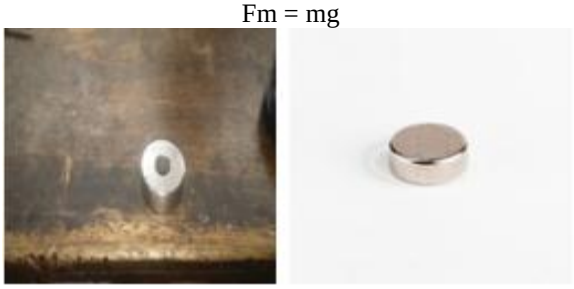

Fig. 2: Neodymium magnet

### B. *Blade Hub and base (Frame):*

Following are the properties of blade which is light weight, corrosion, resistance, conductivity, reflectivity, etc The no. of blades hub is 4 selected to use in project. (Width= 0.1cm, breath= 10cm, height= 26cm.)Other component which is mounted on the base are emf generator, charging ckt, battery. (Model: Height= 45cm, length= 38cm, width=

All rights reserved by www.ijsrd.com 

1.5cm.) . The below equation how much power being generated can be calculated,

Power in KW (P) = 2.14 ρAV3 X 10-3

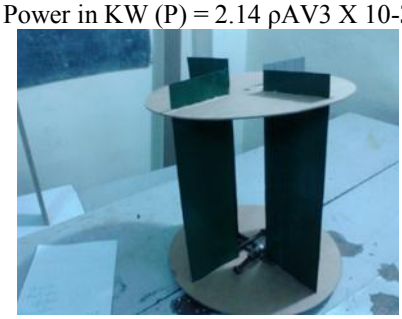

Fig. 3: Blades (model)

*C. Final Model:*

The overall structure of the prototype designed is shown in the figure (D). The output voltage obtained from this prototype is measured using a multi-meter and a maximum of 5volts DC were obtained.

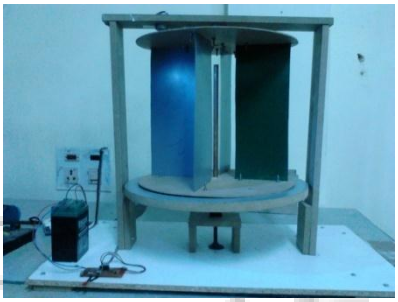

Fig. 4: Fabrication model

## V. MARKET SURVEY

The survey was conducted over petrol motorcycles and electric scooters available in the market.

*A. Anti-Theft System:*

| Components | Approximate costing (in Rs.) |
|---|---|
| Shaft | 400 |
| Motor | 1200 |
| Magnate | 600 |
| Battery | 1000 |
| Ldr | 1500 |
| Bearing | 200 |
| total | 4700 |

Table 1: Anti-Theft System

## VI. PROPOSED MODEL RESULT

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 centre 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.

## VII. FUTURE SCOPE

We can also use this technology in home wind turbine would be in residential areas.. A home owner would be able to extract free clean energy thus experiencing a reduction in their utility cost and also contribute to the "Green Energy" awareness that is increasingly gaining popularity. Also this technology is used in street light on the highway for maximum utilization of air to run this system.

## REFERENCES

[1] Dinesh N Nagarkarand Dr. Z. J. Khan, "Wind Power Plant Using Magnetic Levitation Wind Turbine", International-Journal of Engineering and Innovative Technology (IJEIT) Volume 3, Issue1, July 2013.

[2] Liu Shuqin,"Magnetic Suspension and Self-pitch for Vertical-axis Wind Turbines", ISBN: http://www.intechopen.com/books/fundamental-and-advanced-topics-in-wind-power/magnetic-suspensionand-self-pitch-for-vertical-axis-wind-turbines.2011

[3] Maglev Wind Turbine Technologies, Inc. (MWTT) & Off Grid Technologies, Inc. (OGT)," Vertical Axis Wind Turbine 200 Mega Watt off Shore Wind Farm (VAWT Off Shore JV)-City of Evanston, Illinois Lake Michigan Project".

[4] M. A. Mueller and A. S. McDonald, "A lightweight low speed permanent magnet electrical generator for direct-drive wind turbines", Institute for Energy Systems, Institute for Energy Systems, Edinburgh University, Edinburgh University, Edinburgh, UK.

[5] Vishal D. Dhareppgoaland MaheshwariM Kona-gutti," REGENEDYNE Maglev Wind Power Gen-eration", SARC-IRAJ International Conference, 16th June 2013, Pune, India, ISBN: 978-81-92747-8-3.

All rights reserved by *www.ijsrd.com* 