International Journal of Emerging Technologies in Engineering Research (IJETER)
Volume 5, Issue 4, April (2017) www.ijeter.everscience.org

An Innovative Way of Generation of Power by Using Magnetic Power Based Windmill

Mrunal D. Palsapure
Department of Mechanical Engineering, DES'sCOET Dhamangaon Rly, Maharastra, India.

Jayant R. Mundre
Department of Mechanical Engineering, DES'sCOET Dhamangaon Rly, Maharastra, India.

Sanket C. Pant
Department of Mechanical Engineering, DES'sCOET Dhamangaon Rly, Maharastra, India.

Aktar kha A. Pathan
Department of Mechanical Engineering, DES'sCOET Dhamangaon Rly, Maharastra, India.

Roshansing R. More
Assistant Professor, Department Mechanical Engineering, DES'sCOET Dhamangaon Rly, Maharashtra, India.

Abstract – This paper presents the design component aspect of a magnetic powered based horizontal axis wind turbine. This project dwells on the implementation of an alternate configuration of a wind turbine for power generation purposes. Using the effects of magnetic repulsion, multi blades will be fitted on a rod for stability during rotation and suspended on magnets. Power will then be generated with an axial flux generator, which incorporates the use of permanent magnets and a set of coils. A SEPIC converter will then be used to regulate the varying voltage from the rectifier to output a steady DC voltage. This will further used to charge batteries and run the electrical appliances. Using the effects of magnetic repulsion, wind turbine blades will be fitted on a rod for stability during rotation and suspended on magnets. Magnetic power based wind turbines have several advantages over conventional wind turbines. This type of wind setup does not require any significant land for installation, as it can be easily incorporated in rooftop, tower, and buildings.

Index Terms – Generator, Magnetic levitation, Neodymium magnets, Permanent magnets, Yawing assembly.

1. INTRODUCTION

Wind power has been utilized for thousands of years, starting with the invention of sail boats as the first and most obvious example of making use of wind energy. The maglev wind turbine is a vast departure from conventional propeller design. Its main advantage is that it uses frictionless bearing and magnetic levitation design and is does not need a vast space required by more conventional wind turbine. It also requires little if any maintenance. Currently the largest conventional wind turbines in the world produce only five megawatts of power. However, one large maglev wind turbine could generate one GW of clean power, enough to supply energy to 750,000 homes. Energy is important for the development of human civilization for a long time and the associated technology is more advanced than other clean energies. Nowadays wind power increasingly attracts interests and its utilization has entered a rapid development stage. As conventional energy exhausts, the development of clean and renewable energy, such as wind and solar becomes ever important to people's live.

2. MAGNETIC LEVITATION

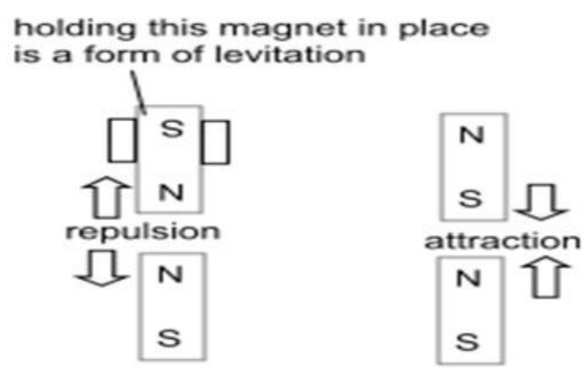

Fig. 1: A Simple Form of Magnetic Levitation

Also known as maglev, this phenomenon operates on the repulsion characteristics of permanent magnets. This technology has been predominantly utilized in the rail industry in the Fareast to provide very fast and reliable transportation on maglev trains and with ongoing research its popularity is increasingly attaining new heights. Using a pair of permanent magnets like neodymium magnets and substantial support magnetic levitation can easily be experienced. 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. 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. In this project, we expect to implement this technology form the purpose of achieving horizontal orientation with our rotors.

3. MAGNETIC SELECTION

Certain materials found in nature exhibit a tendency to attract or repeal each other. These materials called magnets, are also called ferromagnetic because they include the element iron as one of their constituting elements. Magnets always have two poles north & south. Like poles always repel each other. However, unlike poles attract each other. A magnetic field is defined as a physical field established between two poles. Its intensity and direction determine the forces of attraction or repulsion existing between the two magnets. Some factors need to be considered in choosing the permanent magnet selection that would be best to implement the maglev portion of the design. Understanding the characteristics of magnet materials and the different assortment of sizes, shapes and materials is critical.

3.1 Neodymium Magnet

A neodymium magnet (also known as Nd-Fe-B, Nib or Neo magnet), the most widely used type of rare-earth magnet, is a permanent magnet made from an alloy of neodymium, iron and boron to form the Nd2Fe14B tetragonal crystalline structure.

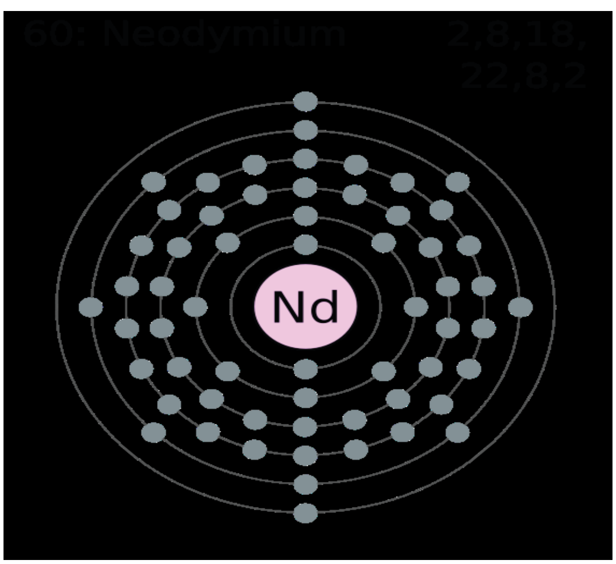

Fig. 2: Neodymium Magnet Shell Structure

Fig. 3: Disc Type Neodymium Magnet

Neodymium magnets are metal, and they are colored silver, like most other metals. Neodymium magnets are graded according to their maximum energy product. Higher values indicate stronger magnets and range from N35 up to N52. This is the most powerful permanent magnet humans have discovered so, per unit of size,

Nd-Fe-B magnets provide the strongest magnetic field available without the use of an electro-magnet.

A neodymium magnet can lift more than any other type of magnet of the same size.

4. MAGNET PLACEMENT

In the designed prototype, the stator and rotor are separated in the air using the principle of 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.

5. EXPERIMENTAL SETUP

This project works on the principle of magnetic levitation. One of the fastest growing renewable energy sources in the world is wind energy source. With the use of magnetic levitation the efficiency of the wind turbine can be increased and losses minimized. It also increases the life span of the generator. Magnetic Suspension Wind Power Generators, represent a very promising future for wind power generation.

Components used:

A system consist of following components

- Generator
- Magnetic levitation assembly
- Shaft
- Blade and repulsion magnet assembly
- DC-DC Conversion Circuit

- Yawing assembly

6. CONSTRUCTION

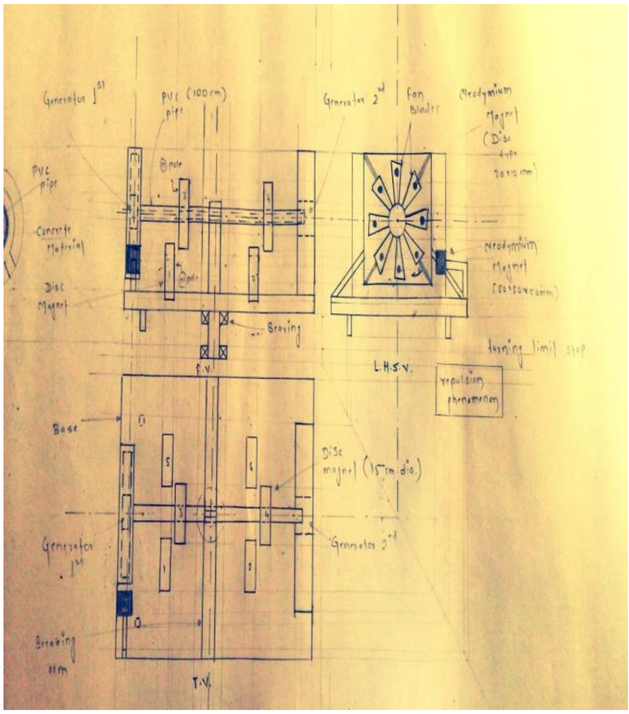

Fig. 4: Constructional Details of Magnetic Power Based Windmill

7. WORKING

When low velocity wind about 6 Km/Hr to 8 Km/Hr empennages on the blades it starts to rotate. This rotary motion transmitted to the shaft. Shaft having permanent magnets assembly on it. With base assembly of permanent magnets and magnets on shaft tend to floats the shaft.

Fig. 5: Magnetic setup for levitation

This will makes shaft frictionless and transmits maximum amount of power to generator when it get rotates due to incoming wind. With the help of repulsion magnet and neodymium magnet which are mounted on blade increases the starting torque of rotation at the starting condition. The shaft is kept floating because of the permanent magnets arrangement tends to rotate with generators. As the middle section is concern there is breaking system which will helps for breaking purpose. The yawing system helps to set the front face of blade assembly toward direction of the wind. During power generation both generators are in working condition which generate fluctuating D.C. current which will convert into constant D.C. current by using D.C. converter efficiently. This current will save in battery or use directly to run appliances.

8. CONCLUSION

Magnetic levitation possesses numerous applications in various fields of modern engineering designs and technologies. The paper also help the pedagogy to understand various principles and concepts of magnetism experimentally, in addition to the realization of principles behind potential maglev applications such as maglev trains, flying cars, maglev wind turbines and magnetic bearings, thereby, this may hopefully actuate them to pursue research on maglev technologies to meet the magnetic demands of the society at present and also in the future. The focus of this article is primarily to demonstrate magnetic levitation phenomenon in a very simple way to enable science and engineering pedagogy to experimentally realize magnetic levitation and its potential applications.

9. ACKNOWLEDGEMENT

We would like to express special thanks of gratitude to our project guide, Prof. Roshansing R. More as well as others professors from the department for their assistance who helped us to do a lot of Research and we came to know about so many new things. We are really thankful to them.

REFERENCES

[1] Minu John, Rohit John, Syamily P.S, MAGLEV WINDMILL "International Journal of Research in Engineering and Technology" Vol. 3, Issue 5, May 2014.

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

[3] Dr. Aravind CV, Dr. JagadeeswaranA, Dr. RN Firdaus, "Design Analysis of MAGLEV-VAWT with Modified Magnetic Circuit Generator", 2nd International Conference on Electrical Energy Systems, (ASME).

[4] Dr. Aravind CV, Dr. JagadeeswaranA, Dr. RN Firdaus, "Design Analysis of MAGLEV-VAWT with Modified Magnetic Circuit Generator", 2nd International Conference on Electrical Energy Systems, (ASME).

[5] Dr. Bittumon, Dr. Amith Raju, Dr. Harish Abraham Mammen, Dr. Abhy Thamby, Dr. Aby K Abraham,"Design and Analysis of Maglev Vertical Axis Wind Turbine", International Journal of Emerging Technology and Advanced Engineering, Vol. 4, Issue 4, April 2014.

Authors

Mr. Mrunal D.Palsapure

He was born in Pulgaon, Dist. Wardha, Maharashtra, India He completed his Diploma with First Class Division in Mechanical Engineering from L.A.M.I.T. Dhamangaon (Rly) and pursuing B.E Degree in Mechanical Engineering from Sant Gadge Baba Amravati University (SGBAU), Amravati, India, in 2014-2017.

Mr. Jayant R. Mundre

He was born in Umarkhed Post. Nimbhora, Tq. Tiosa, Dist.Amravati, Maharashtra, India. He completed his 12th science with first Class Division and pursuing B.E Degree in Mechanical Engineering from Sant Gadge Baba Amravati University (SGBAU), Amravati, India, in 2014-2017.

Mr. Sanket C. Pant

He was born in Amravati Dist. Maharashtra,India.

He completed his 12th science with first Class Division and pursuing B.E Degree in Mechanical Engineering from Sant Gadge Baba Amravati University (SGBAU), Amravati, India, in 2014-2017.

Mr. Aktar Kha A. Pathan

He was born in Zada,Tq Dhamangaon Railway, Amaravati, Maharashtra, India. He completed his 12th science with first Class Division and pursuing B.E Degree in Mechanical Engineering from Sant Gadge Baba Amravati University (SGBAU), Amravati, India, in 2014-2017.

Prof. Roshansing R. More

He completed his B.E. in Mechanical Engineering from PRMIT&R Collage of Engg. Badnera, Amravati. He also completed his M.E. in SSPACE, Wardha, Maharashtra, India.