

# Wind Power Plant Using Magnetic Levitation Wind Turbine

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*Abstract: Wind is a non-conventional source of energy, by which the electricity can be obtained by converting kinetic energy of wind into electrical energy by using wind turbine. There are two types of wind turbine, one is conventional wind turbine and other is maglev wind turbine, but generation of electricity using maglev technology is now becoming more competitive. It works on the principle of electromagnetism. It has colossal structure. It has several advantages over conventional wind turbine and has certain applications.*

## I. INTRODUCTION

Wind is a form of solar energy. It is a natural power source that can be economically used to generate electricity. The way in which wind is created is from the atmosphere of the sun causing areas of uneven heating. In conjunction with the uneven heating of the sun, rotation of the earth and the rockiness of the earth's surface winds are formed. The terms wind energy or wind power describes the process by which the wind is used to generate mechanical power or electricity. Wind turbines convert the kinetic energy in the wind into mechanical power. This mechanical power can be used for specific tasks (such as grinding grain or pumping water) or a generator can convert this mechanical power into 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. A wind turbine is used to generate electricity in bulk. Several wind turbines, grouped together, form a wind farm. The electrical power that is generated from the turbines is distributed to customers from a utility grid. The utility grid works much in the same way as a conventional power plant. The cost of generating wind power comes from the cost of machinery, installation and site preparation. These three factors make up over eighty percent of the initial start up cost. The cost of wind energy used over the course of a lifetime though, is lower than using fossil-fueled systems. This is because there are minimum operating expenses and there is no fuel to purchase. So in the long run wind power is cheaper than other forms of energy. The renewable energy produced from wind has garnered much attention in recent years but is often criticized for its low output and lack of reliability. 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. CONSTRUCTION

The area of land required for one maglev wind turbine is less than 100 acres. The cylinder is 1,000 feet or more in diameter at the base and standing 1,500 feet or more in height and whole structure is floating in air, levitated by permanent magnets. The materials used are the lightest possible but still gives the massive size of the structure. The maglev wind turbine is in the shape of a vertical cylinder or truncated cone with the bottom wider than the top. The blades are placed vertically along the outer rim of the cylinder. Since the whole assemblage is levitated by permanent magnets there is no friction. The absence of friction allows the wind turbine to transform all the wind energy into electrical energy thus increasing output and reducing cost.



**Fig: 1 Maglev Wind Turbine**

The magnetic levitation used, is between the rotating shaft and the fixed base of the machine, basically taking the place of ball bearings. Such magnetic bearings have been used for decades in smaller turbines and pumps. Magnetic bearings generally require actively controlled electromagnets. The turbine operates via "full-permanent" magnets, electromagnets eliminating the need for electricity to run the machine. Magnetic bearings have been around for a while, and SKF bearings use a non-contact technology, which means negligible friction loss, little wear, and higher reliability. This type of bearing also enables previously unachievable surface speeds to be attained, and lubrication is eliminated. However, these Magnetic bearings are electromagnetic suspension and a control system is needed to regulate the current and provide stability of the forces and position of the rotor.



**Fig: 2 Magnetic Bearings**

The full-permanent magnets consist of neodymium magnets of the rare earth metals, which lose no energy through friction. This combination of magnetic components and reduction of moving parts should reduce maintenance costs and increase the life of the turbine. Also one thing that can be done is to replace the rigid vertical blades with flexible sails of extremely light weight made out of silk or some kind of synthetics reinforced by carbon threads to make them very strong. These sails can be controlled by computer so that they can be deployed in any direction to best catch the full force of even the slightest breeze or retracted during storms.

#### IV. WORKING

A turbine is used in order to harness the power of the wind into the mechanical power of electricity. The term wind energy is the process of converting wind into a valuable power source. The wind turbine is designed to take the kinetic energy of the wind and turn it into pure mechanical power. The power of the wind can be used in many different ways. The kinetic energy of the wind can be used on a farm for pumping water or grinding grain. When the natural energy of the wind is transferred to a generator the power is used as electricity for businesses, homes and schools etc. A wind turbine resembles the propeller blades. The propeller blades of the turbine rotate because of the moving air. The rotation of the propellers powers an electric generator and then generator supplies a home with electric current. To simplify the process the wind rotates the blades, the rotation causes a shaft to spin, and the shaft connects to a generator to make electricity. Maglev wind turbine has several advantages over conventional wind turbine. For instant they are able to use winds with starting speed as low as 1.5m/s, also they could operate in winds exceeding 40 m/s. currently the largest conventional wind turbines in the world produce only 5 MW of power. However, one large maglev wind turbine could generate 1 GW of clean power, enough to supply energy to 7,50,000 homes. It also increases generator capacity by 20% over conventional wind turbine and decreases operational cost by 50%. The maglev wind turbine will be operated for about 500 years, but the wind will blow only intermittently and unpredictably. Therefore, it is

necessary to store the electricity produced when the wind is blowing and then release it at a steady rate to maintain a steady supply of electricity to the consumers hence for this purpose it s can also be used in conjunction with hydroelectricity. An area may have some water but not enough to generate a large amount of electricity continuously. Maglev wind turbines can be installed to pump the water from the lower level reservoir to the upper level reservoir during the night so that there will be enough water to activate the electric generators during the day. Such combination of wind turbine and hydroelectric generation could supply electricity to many towns and cities.

#### V. MAGLEV WIND GENERATOR CHARACTERISTICS

Micro-friction full permanent suspension bearings not only balance the horizontal wind pressure & vertical main load, but also have perfect stabilizing effect on axial direction of rotor system. The start- Rotating torque is 28% of that of the preview same size unit. The rotating speed is increased 10% under the same wind speed. The power output actual is raised evenly 20% under the same wind speed.

#### VI. ADVANTAGES

The biggest advantages of using wind energy, as a power source is that wind is a free, renewable resource. This is a reliable energy supply for the future. This is a power source that is non-polluting and clean. Magnetic levitation is an extremely efficient system for wind energy. It uses the repelling properties of magnets to lift an object off the ground. The benefit of having it floating in midair is that it cuts down on the friction that causes so much inefficiency in the traditional windmill. It would also increase generation capacity by 20% over conventional wind turbines and decrease operational costs by 50%. It reduces maintenance costs and increases the lifespan of the generator.

#### VII. APPLICATIONS

The demand for electric power from regional power grids is not constant, but varies substantially with time. Typically, power demand is low during the night time, increasing substantially during the day. Most of the time, electrical grids experience two distinct peak demand periods, the first in the morning and the second in the afternoon. It would be expensive, and technically difficult to have coal and nuclear power plants go up and down in power output to meet the fluctuating load demand. The cost of wind generation of electricity using maglev technology is once seen as prohibitive, but is now becoming more competitive. wind energy can be used to generate electrical power that could be stored for introduction into the power grid as needed. It thus would be desirable to provide a new energy storage technology that can provide a low cost, near term method of storing

large amounts of electrical energy and delivering it rapidly and in the amounts needed to the grid. 70 million households in China lack access to electricity, with most of them living in areas unconnected to power grids. The widely scattered nature of rural localities makes it difficult to supply grid-based power to these areas. The use of the full-permanent Maglav generator could potentially fill the power void in these locations by harnessing low-speed wind resources. The technology is expected to create new opportunities in low-wind-speed areas worldwide such as mountain regions, islands, observatories and television transfer stations. In addition, the Maglev generator will be able to provide roadside lighting along highways by utilizing the airflow generated from vehicles passing by.

### VIII. CONCLUSION

Sustainable generation of electric power is the key to realizing the vision of a world free from dependency on fossil fuels – the challenge is to ramp up the production of electricity to a level that can begin to approach the energy we get from burning coal and oil, without the perceived dangers of going nuclear. One of the most important factors is to supply an adequate amount of energy to the residences as well as to supply the energy for the production of all the goods and services that the residents will need. If large scale maglev wind turbines can supply vast amount of electricity at economic cost then the advance of maglev wind turbine is a very timely developed. It plays a major role in the development of world. Magnetic levitation is an important development to reduce stress from the mechanical load on the wind turbine.

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