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REGENERATION OF ENERGY USING MAGLEV TURBINE AND SOLAR PANEL

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ABSTRACT:
Wind and solar are non-conventional sources of energy, by which the electricity can be obtained by converting kinetic energy of wind into electrical energy by using wind turbine and by converting the solar energy from the sun into electrical energy by using photovoltaic panels. 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 several advantages over conventional wind turbine and has certain applications.

KEYWORDS:*Maglev turbine, photovoltaic panel, electromagnetism*

1. Introduction

Regenedyne Maglev Wind Power Generation (RMWPG) is the advanced method of converting the kinetic energy of wind. The word Regenedyne means generation by renewable source (wind) and in this type of generation the spinning turbine floats on the magnetic cushion, just as the high-speed train floats above the rail track hence the name REGENEDYNE MAGLEV WIND POWER GENERATION. Its main advantages are that it uses frictionless bearings and a magnetic levitation design and it does not need to vast spaces required by more conventional wind turbines. It also requires little if any maintenance. The Maglev wind turbine was first unveiled at the Wind Power Asia exhibition in Beijing 2007. The unique operating principle behind this design is through magnetic levitation. Magnetic levitation is supposedly an extremely efficient system for wind energy. The vertically oriented blades of the wind turbine are suspended in the air replacing any need for ball bearings.

Maglev (derived from magnetic levitation), is a system of transportation that suspends, guides and propels vehicles, predominantly trains, using magnetic levitation from a very large number of magnets for lift and propulsion. This method has the potential to be faster, quieter and smoother than wheeled mass transit systems. The power needed for levitation is usually not a particularly large percentage of the overall consumption; most of the power used is needed to overcome air drag, as with any other high speed train. One such technology is Magnetic Levitation, or Maglev, which has the promise of becoming the largest development in transportation since the wheel. As a matter of fact, Maglev does away with the wheel and all the problems inherent with it (friction, noise, energy use, safety, and so forth) by using magnetism to levitate a vehicle above a track and to move it from one place to another. The greatest advantage to this is the absence of friction. Since Maglev vehicles float above tracks instead of riding on wheels, the vehicles do not come into contact with the track or roadbed; thus, they eliminate friction. Transportation systems that use Maglev have been implemented in airports for ground transportation and in major metropolitan cities for light rail systems.

Basically, street lighting is one of the important parts of a city's infrastructure where the main function is to illuminate the city's streets during dark hours of the day. Previously, the number of streets in the town and city is very small. Therefore, the street lamps are relatively simple but with the development of urbanization, the number of streets increases rapidly with high traffic density. There are several factors need to be considered in order to design a good street lighting system such as night-time safety for community members and road users, provide public lighting at cost effective, the reduction of crime and minimizing it is effect on the environment. At the beginning, street lamps were controlled by manual control where a control switch is set in each of the street lamps. It is called first generation of the

original street light. After that, another method that has been used was optical- control method.
Meanwhile, street lighting technology can be classified according to the type of lamps used such as incandescent light, mercury vapourlight, metal halide light, high pressure sodium light, low pressure sodium light, fluorescent light, compact fluorescent light, induction light and LED light.
Solar panels are devices that convert light into electricity. They are called "solar" panels because most of the time, the most powerful source of light available is the Sun, called Sol by astronomers. Some scientists call them photovoltaic which means, basically, "light-electricity."

2. Principle

The basic working principle of a wind turbine is when air moves quickly, in the form of wind, the 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. The high speed shaft drives the generator to produce electricity. The low speed shaft of wind turbine is connected to shaft of high speed drives through gears to increase their rotational speed during operation. Using the effects of magnetic repulsion, spiral shaped wind turbine blades will be fitted on a rod for stability during rotation and suspended on magnets as a replacement for ball bearings which are normally used on conventional wind turbines.

The wind power increases as a function of the cube of the velocity of the wind and this power is calculable with respect to the area in which the wind is present as well as the wind velocity.

Kinetic energy (K.E) = ½ mv^2

Amount of Air passing is given by

m = ρ AV …….. (1) Substituting this value of the mass in expression of K.E.

K.E = watts …… (2)

To convert power to kilo watt a non-dimensional proportionality constant k is introduced

where, k = 2.14 X 10-3.

Therefore Power in KW (P) = $2.143\rho Av^3 \times 10^{-3}$…. (3)

Where

m = mass of air traversing

Air Density (ρ) = 1.2 kg/m3

Area (A) = area swept by the blades of the turbine

Velocity (V) = wind speed

3. Magnetic Levitation Wind Turbine

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.

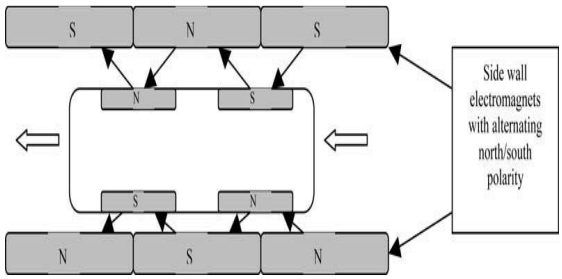

Fig.1. Magnetic Levation

4. Solar Panel

Solar panels are devices that convert light into electricity. They are called "solar" panels because most of the time, the most powerful source of light available is the Sun, called Sol by astronomers. Some scientists call them photovoltaicwhich means, basically, "light-electricity."

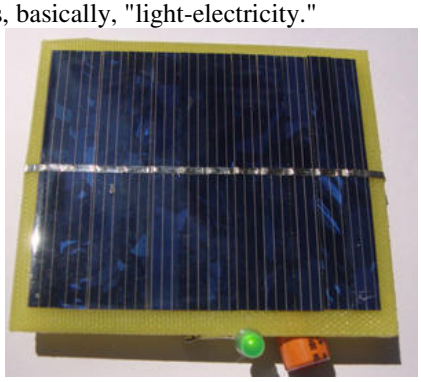

Fig.2. Solar Panel

A solar panel is a collection of solar cells. Lots of small solar cells spread over a large area can work together to provide enough power to be useful. The more the light hits a cell, the more electricity it produces, so spacecraft are usually designed with solar panels that can always be pointed at the Sun even as the rest of the body of the spacecraft moves around, much as a tank turret can be aimed independently of where the tank is going.

5. 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.3. Neomagnet

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 "fullpermanent" magnets, electromagnets eliminating the need for electricity to run the machine. Magnetic bearings have been around for a while, and SKF bearings use a noncontact 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.

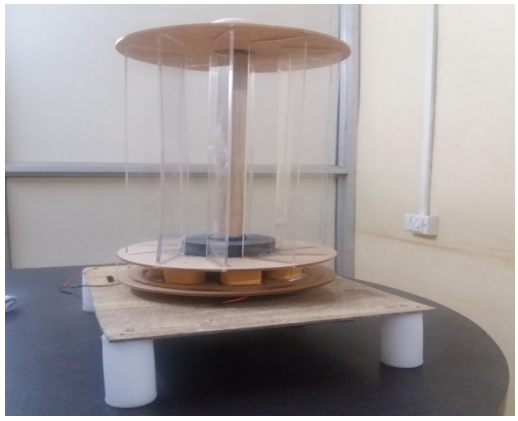

Fig.4. Maglev Turbine

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.

6. Working

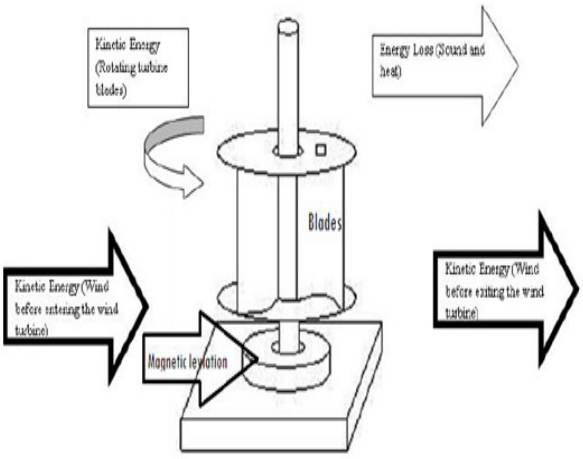

Fig.4. Working

Above figure gives an idea of MAGLEVE WIND TURBINE. This phenomenon operates on the repulsion characteristics of permanent magnets. This technology has been predominantly utilized in the rail industry in the Far East 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.

Power will then be generated with an axial flux generator, which incorporates the use of permanent magnets and a set of coils. The generated power is in form of DC, stored in battery, this can be used to directly supply the DC loads and can also be converted to AC using inverter to supply AC loads.

It can be used as OFF grid and ON grid as shown in above figures. Wind power is a proven and highly effective way to generate electricity. Maglev technology is the most efficient means of transferring kinetic energy to generate electricity. The vertical axis wind turbine platform floats on a magnetic cushion with the aid of permanent-magnet suspension and a companion linear synchronous motor. This technology eliminates nearly all friction and delivers maximum wind energy to the downstream linear generator.

7. Result

Sr: no	Speed of Turbine (in rpm)	o/p voltage (in volt)
1	100	9.9
2	150	12
3	200	16
4	250	22
5	300	24

Table no. 1.RPM v/s voltage generated.

The output power depends on the load and the maximum capacity of generator used is 20W. Hence it should be loaded below 20W for smooth and continuous operation.

8. 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.

The efficiency of turbine is increased by replacing the bearings by magnets; the magnetic levitation helps the turbine to spin at much faster rate as it will eliminate the stress on the shaft of the turbine. The major components are placed at ground level. We can say the maglev turbine can power more output with high efficiency conversion compared to traditional wind turbine.

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