

# Power Generation using Magnets in Windmill System

C.Vengatesha Rajaperumal, Servai Rakesh Ramanathan

**Abstract:** *The depletion of non-renewable resources and higher energy requirement has led to a severe power crisis though there are many renewable sources and they are being harnessed to generate power wind energy is considered one among the least expensive renewable sources. Generation of energy from non renewable sources creates various complications such as a noise pollution, water pollution and air pollution. This serves as a major reason to choose wind energy to generate electricity. Wind energy is considered as green energy and it can be used to harness energy in environmentally benign manner. The efficiency of the windmill is much lower than other sources of energy. This project is aimed at improving the efficiency and to simplify the mechanism of normal windmill to produce large amount of current with the help of magnets. The magnetic lines of force generated by the nature of magnets by North and South Pole of a bar magnet creates a magnetic field. To generate electricity double rotation of wind mill blades in alternate direction is used to produce more displacement for coil windings and magnets. The power generated by this process is alternative current (AC) can be directly connected to the house main supply for the further use and it needed to be stored in batteries for emergency cases. The energy generated can be used to supply power for the seashore villages or individual houses.*

**Index Terms:** *Renewable energy, Slip ring,*

## I. INTRODUCTION

The reason for development is renewable sources of energy is due to the growing population in the world and to meet their demands in various sectors. The contribution of fossil fuels in power generation has created adverse effects in climate change resulting in global warming. The most common renewable sources of energy are solar energy, wind energy, hydro energy and bio fuels. In these, solar energy sector has attained tremendous development, although the generation of energy using solar power doesn't sustain that much for use of household near the seashore areas. The economic cost of this power generation is high which creates an unavailability of this power generation technique among the common people. Solar energy has proven to be the most promising owing to its unparalleled potential for power generation. The large-scale conversion of these resources into usable form has been the challenge. Home users and small companies have started exploiting alternative energy to meet their energy needs. Solar energy seems to be receiving more patronage but its output performance is subject to unpredictable weather condition and limitations of geographical locations. The durability of photovoltaic panels

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is not satisfactory enough for sustainability. The economic cost of this power generation is very high for low energy consumption and storage of this energy is being a major problem for this sector.

Power generation using magnets in windmill is more reliable than any other power generating sector for normal small business and household purposes. In this paper,

Power generation is being produced with the help of the Neodymium magnets and wind force to drive the blades in alternate direction. The existing windmill system has generator which is being replaced by the neodymium magnets for the purpose of simplifying the system as well as to produce the necessary power with the help of flux created by the magnets. With advancement in this system our project signifies in rotation of blades in alternate direction of two blades which result in maximum displacement between coil windings and magnets. By introducing double rotating system of windmill causes more electricity production at very low wind speed. The rotating shaft of this system makes the circuit complex for the wiring to carry electricity from a rotating medium to a stationary medium. The slip ring simplifies the system and introduction of this device, ease the difficulty of driving the electricity from the rotating medium to stationary medium.

The rest of the paper summarizes the importance of the components individually and discusses the future development for the household small companies to be independent in production of required energy for their own. Section II Summarizes the importance of the components and uses and purpose specific material selection in this project.

## II. COMPONENTS

The power generation system comprises of useful components which are essential for the generation of power more effectively. The neodymium magnets, coil windings and slip ring are the most essential components in this system. The further details are been discussed below paragraphs.

### A. Neodymium Magnets

Neodymium magnets are the most widely used type of rare-earth magnets. They are permanent magnets made from alloy of neodymium, iron and boron to form the Nd<sub>2</sub>Fe<sub>14</sub>B tetragonal crystalline structure. The most important factor for their strong nature is the tetragonal structure. They are the strongest type of permanent magnet commercially available and have replaced other types of magnet in the many application areas such as motors, hard disk drives and magnetic fasteners.



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The purpose of using this magnet type is to produce strong magnetic flux produced by the rotation the blades. The half life of the magnet is basically more than other magnet types been found till date. The stator which is being used for the placement of magnets over them in such a way that they can produce sufficient amount of power while rotation of blades. The placement of magnets in the system is the most important factor, because the facing of the poles creates more effective flux then simply placing the magnets without perfect series. The North Pole and South Pole alternate position of the magnets creates sufficient amount of flux between the magnets and coil windings been arranged. There are 13 poles been created over the stator to place neodymium magnets on the stator plate facing North Pole towards the coil windings and South Pole of the magnet is being made to face over the coil windings. These series is being arranged over all the poles on the stator.



Figure 1: Neodymium Magnets

### B. Coil Windings

Coils are used as components of circuits, and to provide the magnetic field of electrical machines such as motors and generators, and in the manufacture of loudspeakers and microphones. The shape and dimensions of a winding are designed to fulfill the particular purpose. Parameters such as inductance, Q factor, insulation strength, and strength of the desired magnetic field greatly influence the design of coil windings. The basic arrangement of the coil windings over the stator which is been mentioned in the upper paragraph it contains 13 poles, and the number of turnings on the stator is the most important part in this project. The number of windings is 300 turns over the stator gaps, as the number of turns are turned over the stator will produce the amount of electricity more efficiently. The efficiency is increased by the reducing the turns and increasing the diameter of the copper wire, because the copper wire carries the current produce from the magnet levitation process. The copper wire diameter is been increased to 0.23mm for increasing the effectiveness of the power produced in this system. The coil windings are been rotated on the stator to the inner side of the stator such that the magnets are been placed for flux creation. The stator which is been used for the coil windings is being placed on a separate stator and the magnets are being placed on the separate stator.



Figure 2: Coil Windings

### C. Slip Ring

The system which carries electricity through wires is been drawn with the help of the slip ring. This helps to draw the current from a rotating mechanism to a stationary mechanism because of the rotating system makes the system complex to connect the load with other system for further use. All the windmill system uses this slip ring as a main component for drawing current from the windmill system. The slip ring used over in this project has two wire specification which is connected to the coil windings directly. Due to no other brush or chain drives present the power which is being collected from the circuit have so amount of power loss, but in our project the power loss which is being actual to zero level to compare to other windmill systems. Two-wire slip ring is used in this system.



Figure 3: Slip Rings

## III. EXPERIMENTAL SETUP

The windmill system is purely based on the magnets which is being present in the system which creates flux between two different poles of magnets is been drawn into the coil windings and been used for the further cause, for that the current produced is Alternating current (AC) can been directly connected to the main supply for household purposes. The current produced is very high to limit the high current step down transformer is used to regulate the amount of high current and to stabilize the current at a constant flow of current for avoiding the damage to the appliance. But since the flow of wind is natural and to control the nature is purely impossible for human beings, to tackle this problem battery is being used to store the energy which is being produced by the



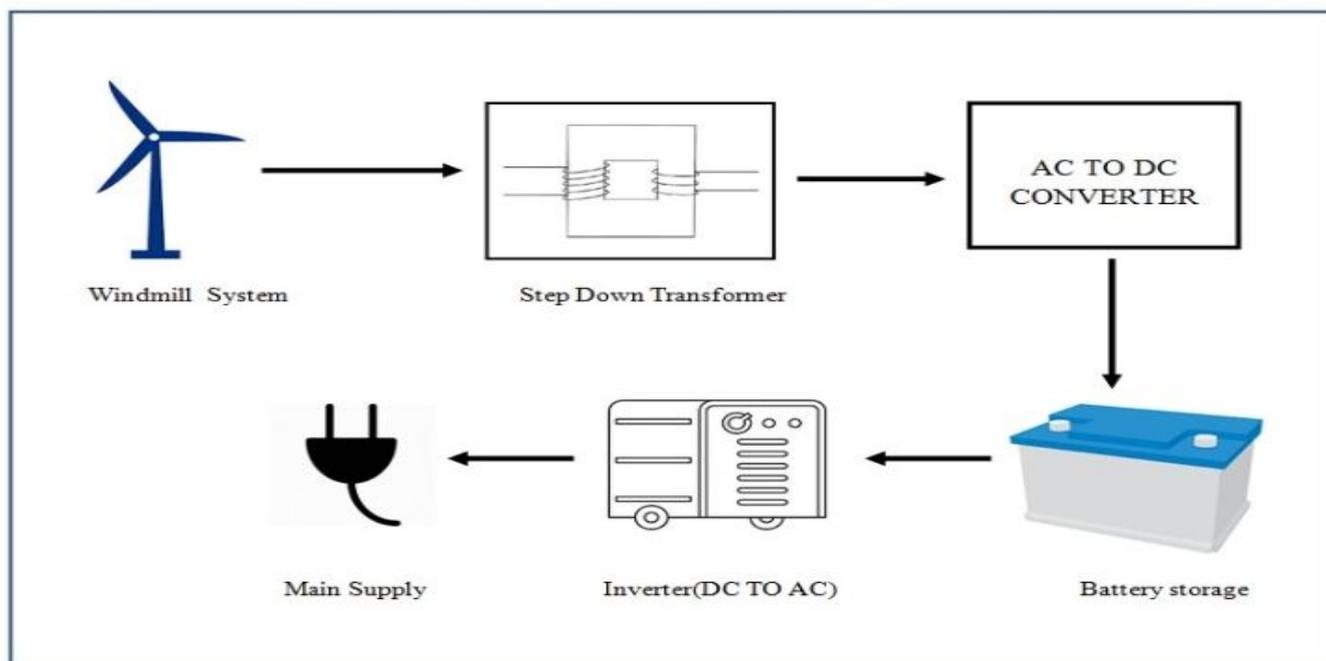


Figure.4: The semantic diagram of the procedure

Windmill system while the flow of wind is high or low and to avoid any power failures for the household or small companies work. As the windmill system produces (AC) voltage it is necessary to convert into Direct Current (DC) voltage for the purpose of storage in battery. Then the Inverter is used to convert the battery current into Ac supply to the main supply for the further use of the household and small companies. Each and every individual household or companies can setup their own small windmill system for generation of electricity instead of relying on private individuals.

The voltage production is high compared to other windmill systems and the cost of the windmill system is three times lower than the normal windmill system with gears and generators. The windmill system can be operated at very high speed without causing any harm to the system because for the rotation of blades only bearings.

The rotation of windmill can be handled at very high wind speed without having threat of getting damage or breakage of the system. In future the household appliance can be operated using dc current so the cost of the system and circuit complexity can be reduced . This project is mainly useful for the seashore places where the wind force is available for almost all the time.

#### IV. RESULT AND DISCUSSION

##### I. COMPARISON OF NORMAL WINDMILL AND MAGNET USED WINDMILL SYSTEM

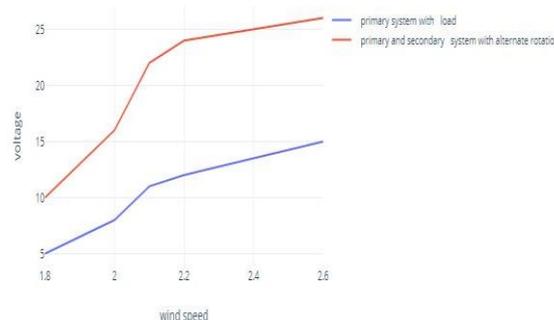
SI. NO.	WIND SPEED (m/s)	VOLTAGE (volt)
1	1.8	5
2	2	8
3	2.1	11
4	2.2	12
5	2.6	15

Table 1: Observation of Windmill System having gears

SI. NO.	WIND SPEED (m/s)	VOLTAGE (volt)
1	1.8	10
2	2	16
3	2.1	22
4	2.2	24
5	2.6	25

Table 2: Observation of Magnets used Windmill System

The Graph clearly states that the X axis represents the wind speed and Y axis represents the voltage. The curves line indicates the difference of the voltage produced by the two different windmill systems. The red curve signifies about the windmill system with magnets and the blue curve line signifies the windmill system with gears.



It also signifies the level of difference of the windmill system using magnets and windmill system using gears. The cost difference is also so low compared to gear system windmill system. The observation table is been calculated on the basis of the meter used for the separate system.



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The wind speed is been measured using the anemometer and the voltage is been measured using millimeter. The windmill system with gears at 2.6 m/s wind speed produces only 15 voltages whereas the windmill system with magnets produces 25 voltages.

## V. CONCLUSION

The use of double turbine system clearly states that the efficiency of this turbine system produces more alternating current compared to direct current generated by other systems. This system can run at very low rpm can produce efficient amount of electricity. And this project is totally new to other systems. We can emerge to the never ending and cost reducing project for the society and as it is new to the wind mill generating power field would be a boon to the power seekers for household and can reduce the living cost for the humans at respective areas. Especially the seashores are more beneficial with the project and it totally replaces the old wind mill system which has the gears and generator and brushes.

## VI. ADVANTAGES

1. The biggest advantage of using this type of turbine system is to rotate the stator at very low rpm can produce sufficient amount of electricity.
2. There are no gears or belts been used instead of that bearings are used for the ease rotation purpose.
3. The wind turbine can be placed at local seashores to generate sufficient amount of electricity to run the household works.
4. The weight of the turbine is low compared as to the other turbine.
5. Efficiency is more than any other turbine and can produce more electricity without any loss compared to others.
6. The turbine can rotate at very high speed without damaging the system.
7. The system is more simple and easy to understand.
8. The cost of the system is very low compared to others.
9. The sound produced is very low will result in no noise pollution.

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