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Enhancing and Exhausting Conventional Power Module Development using Magnetic Levitation

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Abstract: The main objective of this project is to assemble the vertical axis wind turbine (VAWT) to create power by utilizing wind energy. This kind of vertical axis wind turbine will produce power without utilizing generator or alternator, But by the utilization of attractive levitation idea. This wind turbine is intended to sustain all the services by storm and to keep the wings of the turbine rotating even though there is low wind force. This type of VAWT has three wings that are fond of to the rotating shaft. The wings are intended that recognizes the wind which comes from any directions. This project contains design and prototype of VAWT.

Key words: Wind energy, VAWT, Alternator & Magnetic levitation.

1. Introduction

The Renewable energy is basically a electricity offering from the sources like solar power, hydropower, geothermal energy, wind power & several ways of the biomass. And these sources had coined renewable because of their continuous accessibility and replenishment for utilizing again & again [1-3]. And the familiarity of renewable-energy experienced important upsurge in current period because of generation of conventional power models exhaustion and enhancing the recognition of adverse impacts on nature [4-6]. The wind-turbine generally draws kinetic-energy from wind & converts power in the form of electrical with the assistance of generator.

This project concentrates on usage of energy of wind to be renewable-source. Alone in US, the capacity of wind has increased to 45% -16.7 GW and still it increases through facilitation of novel projects of wind. The objective of the main qualifying project will be planning and applying a VAWT which is levitated magnetically which has capability to perform at both low & high speed of wind circumstances. The option of this method is displaying its effectiveness in several wind circumstances when compared with outdated HAWT and contributing for constant increase in the familiarity for the cause of mass usage in coming future as trustworthy source of generation of power.

2. Types of Wind turbines

Several kinds of turbines present and their plans are generally inclined to one of 2 classifications: HAWTs-horizontal-axis &VAWTs. As name denotes, every turbine is differentiated by orientation of the shafts of rotor. And the earlier is more predictable and general kind everyone has known whereas, the latter because of its seldom exploitation & utilization has become quite unfamiliar.

2.1 HAWT

The HAWTs generally contains 2 or3 propellers such as blades which are attached to horizontal end on top of bearings of assisted tower as shown. When wind blows the turbine blades will set in the movement and activates the generator which generates AC [7]. And for efficiency which is optimal, these turbines which are horizontal are generally created to point the wind through the sensor aid & wind vane or servo motor for the implementations of wind turbine which is smaller.

2.2 VAWT

VAWT are latter sub-grouped into 2 main kinds called Savonius & Darrieus model. Through VAWT the notion behind performance is same to the designs of horizontal. The most variation is orientation of generator and rotor that are all arranged vertically and generally on shaft aimed at assistance and the stability [8-10]. And this leads in diverse turbine blades response towards wind in association to configurations which are horizontal.

3. Proposed Design

The objective of this project is to manufacture the wind factory of vertical hub to create power by utilizing wind vitality. This kind of vertical pivot wind plant will produce power without utilizing generator and alternator. By the use of magnetic levitation power will be created.

Magnetic levitation diminished wind plant weight acting by the gravitational power. This wind plant will be intended to support all the powers by wind. The primary bit of leeway of this wind factory is cost is low when contrasted with other. This sort of vertical pivot wind plant has three vanes or cutting edges, which are connected to the pole. The vanes or cutting edges are will be planned like they ought to acknowledge wind originating from all the directions [11-13].

Design and Manufacture of components

3.1 STATOR

Stator is a part which consists of enameled copper coils. Illustration by magnitude and 3D plan of a stator revealed in fig

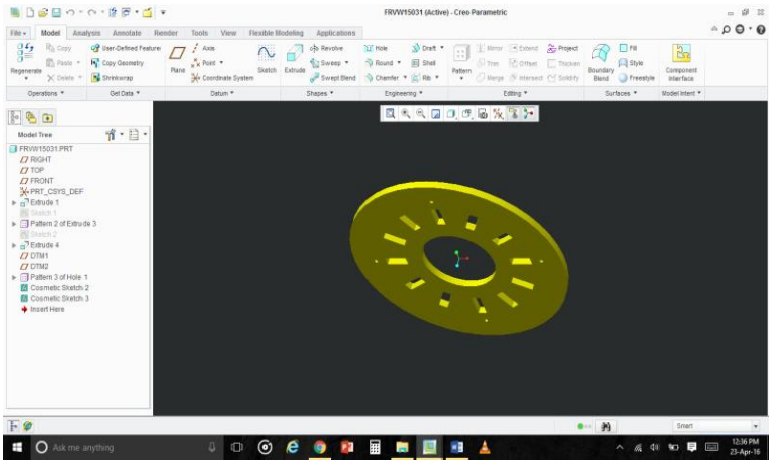

Figure 1 Stator 3D Image

4. Manufacturing Process

4.1 Coil Design

The coils should be exactly planned for the pre-requisite output-voltage and exact current. And the voltage impacted the count of wire turns, the current impact the wire thickness utilized.

Figure 2 Coil winding.

Recur to generate 12 coils entire in same way as possible

Check whether entire coils have similar count of the turns to weigh every coil in return.

Weight variations which are more than 5% propose that coils were not similar.

4.2 Joining the coils

As the coils are created, they might be united together ready aimed at placing in resin. Initially, enamel should be scratched off from 1cm end of 2 wires from every coil. And the coils will then be laid out in the following way inside circle. And it is better for utilizing huge paper sheet through the circle drawn to make sure that coils are placed at the exact distance. Make sure that entire coils are located the similar from around, through outer and inner wire from every coil in similar location as others.

4.3 Cast the stator

When the coils are linked, they might cast in the mixture of resin through glass of fiber for adding robustness. This might offer waterproofing and mechanical strength aimed at stator coils.

Figure 3 Mold

5. Procedure

The procedure for the casting of stator is in the following way. It will be the finest to have run-dry with no resin to make sure that everything is going smoothly.

a. Check mould & make sure that entire pieces are alright.

b. Keep ring of silicon-sealant across base for sealing base towards outer segment and base towards middle piece. Make sure that these were in exact location by utilizing bolts to make them line. And the sealant of silicon stops any resin from escaping from mould.

c. Close the region where stator is generated through newspaper scrap.

d. The mould will then needs waxing for making sure that stator released simply and is not fixed to mould. For this cause, the wax is utilized. This might be implemented liberally by smooth cloth. Make sure that whole surfaces which might be exposed towards resin will be covered. This might then be dried buff utilizing electric bugger or clean cloth. Recur this procedure for at least 5 times such that the wax having thick layer is formed. And mould will then be utilized.

5.1 Rotor Disks Design and Manufacturing

A rotor is turning part of a mechanical gadget, for instance in an electric engine, generator, alternator or pump. It operates with a stationary element so called stator.

5.2 CREO 3D PIC

The apparatus we utilize to plan this rotor disks in CREO 2.0 are PART MODELING and ASSEMBLING.

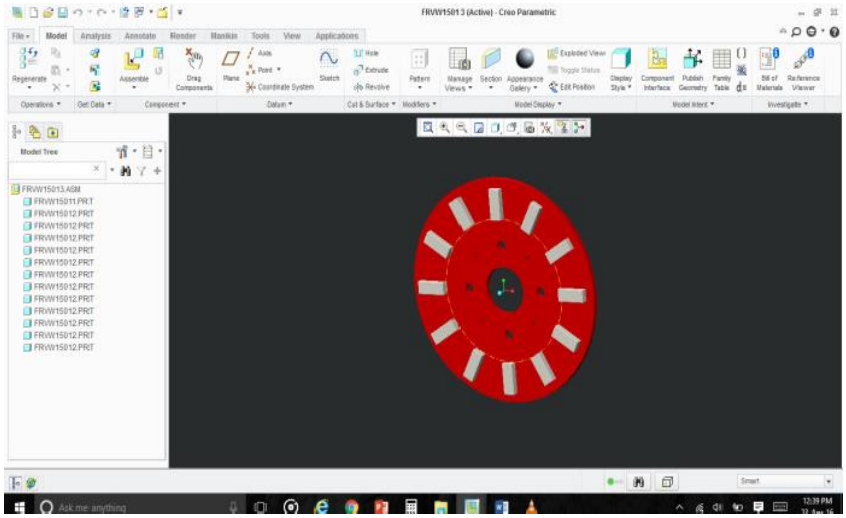

Figure .4. Rotor 3D model

5.3 Manufacturing Process

The material utilized for the manufacturing of ROTOR is mild steel, according to the design dimensions

the rotor has been produced with the laser cutting technology**.**

5.4 Laser cutting Technology

Laser cutting is an innovation that utilizes a laser to cut materials, and is normally utilized for modern assembling applications, but on the other hand is beginning to be utilized by schools, independent companies, and specialists.

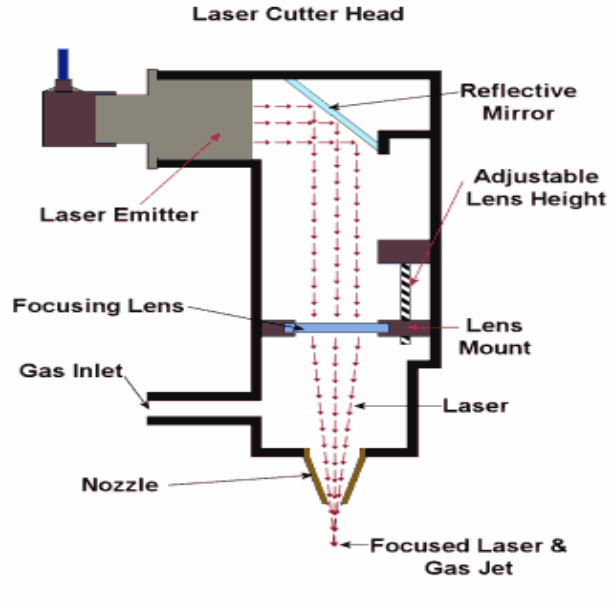

Figure .5. Laser cutting technology

Figure .6. Rotor Assembly

5.5 Blades and Wings Design and Analysis

The blades are deliberated on the foundation of Air foils**.**

3D Figures the below figures are of two different design blades use in this project.

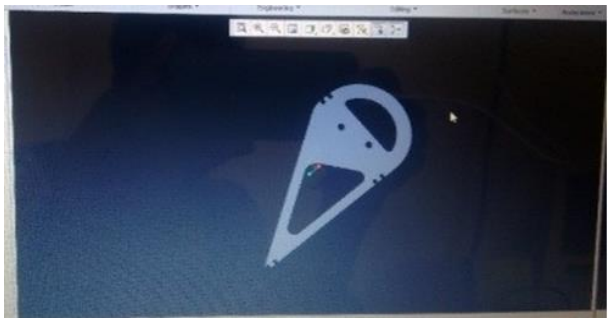

Figure .7. 3D figures of Blades

Manufacturing: The material used to manufacture the blades is mild steel. The blade cutting with given dimensions is done by the laser cutting process.

Airfoils analysis: Structure Analysis

Parameters	Values	Units
Force	3072.16	N
Velocity	6	m/s
Attack angle of Blade	31º	
Surface area of the blade	715310 * 10^{-6}	m^2
Density of air	1.125	Kg/m^2

Table.1. Parameters of Structural analysis

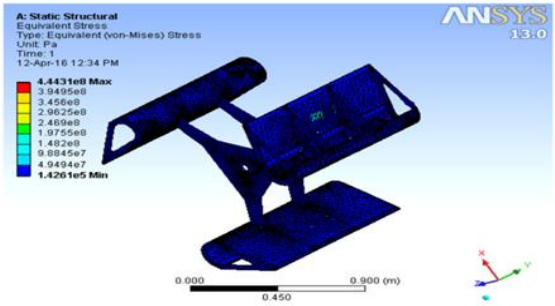

Figure.8. Equivalent Stress

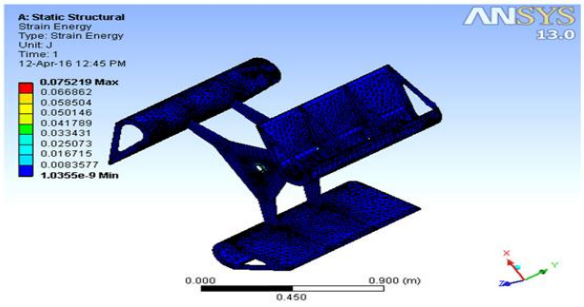

Figure.9. Equivalent Strain

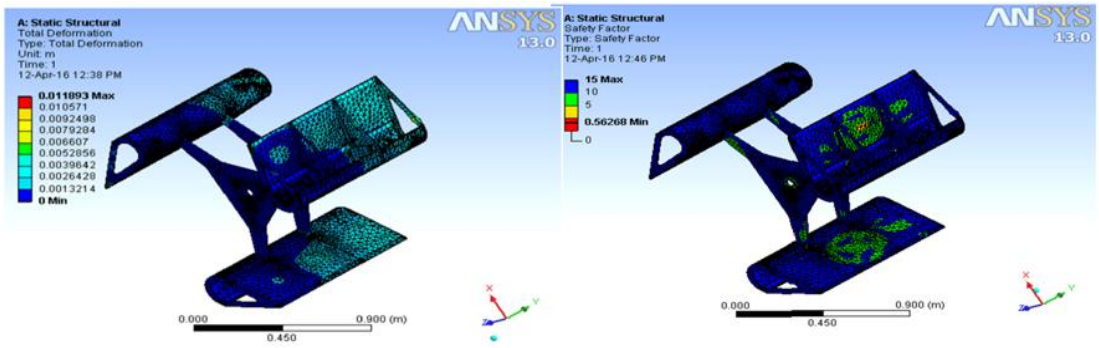

Figure.10. Total deformation Safety Factor

6. Assembly of VAWT

There are five subassemblies included in this VAWT assembly, they are

a. Base assembly
b. Wing assembly
c. Magnet assembly
d. Rotor and Stator assembly
e. Support blade assembly

6.1 Base Assembly

In the first step of this assembly the base pole is mounted and welded on the foundation plate with the arc welding. Next the base plate is welded on the top of base pole.

Ribs are welded to the foundation plate and base plate at right angle to the base pole with arc welding to increase the strength of base assembly.

Bush and a shaft are assembled on the top of the base plate and welded together with arc assembled on the top of the base plate and welded together with arc welding. Bush supports the shaft and holds it in its position [14].

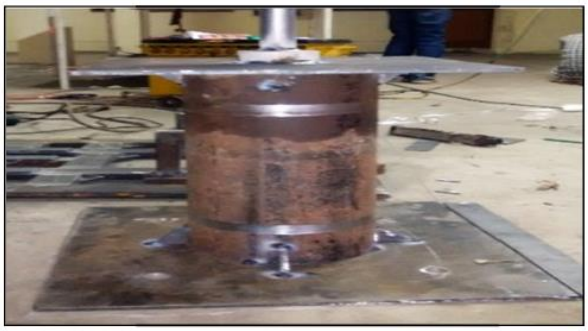

Figure.11. Base assembly of VAWT

6.2 Wing Assembly

Two different types of blades of thickness 4mm are assembled to the vertical bars of 10mm thickness which has slots; through press fit blades are fixed and are welded together with arc welding. M.S sheet of

1mm thickness is bent in required shape and is welded to the bars with arc welding.

Figure 12 VAWT Wing assemblies

6.3 Magnet Assembly

12 Neodymium magnets are placed on one side of the rotor disk at regular angles with alternate poles facing the rotor disk. Another 12 Neodymium magnets are placed on one side rotor which faces the rotor at regular angels with alternate poles facing the rotor.

The north pole of the magnet on the first rotor has to face the south pole of the magnet on the rotor.
These magnets on the rotor disks are placed at regular angels with the help of thermo-coal sheet so that the placement of the magnets doesn't differ on both the rotor disks.

6.3 Rotor and Stator Assembly

Stator is place in between the two rotors as below shown in the figure. Rotor should be assembled in such a way that rotor and stator should have some distance in between them. The North facing of magnet on upper rotor disk has to face the south facing of magnet on the lower rotor disk.

6.4 Main Assembly

a. Main assembly will be done in following steps.
b. The rotor and stator assembly fixed to the base assembly with the help of bolts, nuts, spacers and washers.
c. Next all support blades are attached to the rotor assembly with the help of bolts and nuts.
d. Wings are attached to the support blades.

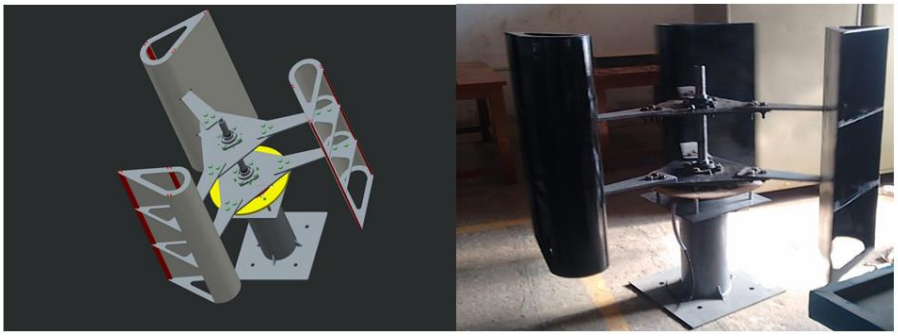

Figure 13 VAWT Final Assemblies

7. Conclusion

At the conclusion of project, VAWT which is levitated vertically is fruitful. And the rotors which are planned enough harness air for rotating at greater speeds of wind while placing the center of mass near to base output stability. And the levitated wind turbine rotor suitably utilizing permanent magnets of neodymium that enabled aimed at soft rotation through friction which is negligible for generating electro motive forces that are cut by winding of stator producing electric energy.

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