GOVERNMENT ENGINEERING COLLEGE BHAVNAGAR

A PROJECT REPORT ON

"BLADE LESS WIND TURBINE"

PROJECT TYPE:-USER DEFINED PROJECT

In fulfilment for the award of the degree
Of
BACHELOR OF ENGINEERING
In
MECHANICAL ENGINEERING DEPARTMENT

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GOVERNMENT ENGINEERING COLLEGE BHAVNAGAR

CERTIFICATE

This is certify that the project entitled **"BLADE LESS WIND TURBINE"** Submitted by following students to the **GUJARAT TECHNOLOGICAL UNIVERSITY** in the partial fulfillment for the award of degree of bachelor of engineering in **MECHANICAL ENGINEERING** in a bonafide record of project work carried out by them under my supervision during the year 2018.

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ABSTRACT

- In today's world, energy generate is the most important things in the world. Wind turbines are energy conversion devices, which convert kinetic energy of the wind into mechanical energy. In bladeless wind turbine System, we can generate electricity using vortex shedding effect. It works on a phenomenon called Karman Vortex Street, which is a "repeating pattern of swirling vortices".

- The primary objective of this project to develop is to deals with a new development of blade less wind turbine. Generally problem with the normal wind turbine it's consist long and bulky rigid structure, which offers many failures and many accidents. Its required constant wind velocity for power generation after studying research papers of wind turbine. It clarify the some problem regarding the normal wind turbine, hence we decide to develop a "BLADE LESS WIND TURBINE". Which is such type of device OR structure which haven't blades in it. Blade less wind turbine is work on same principle normal wind turbine which converts Kinetic energy of wind into the mechanical energy and then it's finally converted into the Electricity.

- Bladeless wind turbine is Consist supporting base, power generating mechanism and hollow section for resist more wind for displacement of power generating mechanism. Bladeless wind turbine will mainly develop for low power generation and commercial use. Based on efficiency and cost it's cheap with compared to HAWT and VAWT based on commercial use it's more efficient then the HAWT and VAWT.

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CHAPTER 1.INTRODUCTION

❖ 1.1 INTRODUCTION ABOUT WIND TURBINE TECHNOLOGY :-

- Rapid demand of electricity and power source, it is crucial thing to develop that one type of prime mover which generate energy with the help of natural source of energy. Wind is available in more than enough amount of a clean region of energy source in the planet earth core. Wind is produce specific electronic energy by using the power of wind to run a special power generator. primarily there are two types of wind turbine based on the rotation axis of rotation to the ground, horizontal axis wind turbine (HAWT) and vertical axis wind turbine (VAWT) according to the Cartesian co-ordinate system.
- In 21th century's, we will ultimately need to search for renewable or virtually infinite energy for the human improvement to continue. Renewable energy is generally electricity supplied from power head, like as wind power, solar power, geothermal energy, hydropower and various forms of bio-mass (bio- gas). These sources have been coined renewable due to their incremental variation and accessibility for use over and over again.
- The rapid demand of renewable energy has believed a significant upsurge in modern times due to the exhaustion of old power producing methodology and increasing actualization of its adverse effects on the climate. The exploration of renewable energy is the only opinion to reduce our livingness on fossil fuels.
- Among the renewable energy power sources Wind Energy is oldest of the

very highest growing energy sources which are growing at the rate of 30% annually.

- Wind energy results mainly by un-sufficient heating of the earth's ground layer by the sun. About 2% of the total solar flux that reaches the earth's surface is changed into wind energy. Solar energy strike on clouds, uneven surfaces, and mountains while reaching the earth. This uneven heating causes temperature, density and pressure difference on the planet earth's surface that is responsible for local wind mill construction

❖ 1.2 CONCEPT OF BWT :-

- Bladeless wind turbine is a device which is used to convert the kinetic energy of wind into mechanical energy. It is use for generating electricity. It works on vortex shedding effect. It works on a phenomenon called Karman Vortex Street, which is a "repeating pattern of swirling vortices".

Bladeless wind turbine

CHAPTER 2. LITERATURE SURVEY

❖ 2.1 WIND ENERGY:-

- Wind is known as one form of solar energy because it comes about as a result of uneven heating of the atmosphere by the sun coupled with the abstract topography of the earth's surface.
- According to application, there are two types of wind like local wind and planetary winds. Proper site selection is must require for getting more effective wind turbine output.
- There are some reasons to support in using the electricity generated by wind turbine. Wind power source available in the atmosphere is so much larger than present world energy application. The ability of wind power source is only limited by the economic and environmental factors, since the resource available is far larger than any practical means to develop it.
- Renewable energy produced type the wind has addict a much of attention and support in present years. However, this green energy is often criticized for its small scale output and lack of trustiness.

❖ 2.2 BRIEF HISTORY OF WIND TURBINE :-

- Wind energy was developed first harvested centuries ago, when early windmills were used to power millstones, pumps, and forges etc. Now days, the harvesting of wind is done by special device called wind turbine which produces safe and efficient source of electricity.
- There are so many new designs proposed which creates high efficient electric power output. They may vary either in the design of shape of the turbine blades, the axis of rotation, and other useful modification.
- The speed of wind is so much lower in Asian continent is less than 7 m/s. It can't works when the wind velocity is as per our requirement. This project introduces structure and principle of the proposed low speed wind velocity.
- The project aim is to modify, design and integrates a new techniques. The power output of wind turbine is increased hence it decreases the need for costly power generators that deteriorates the environment. Noiseless operation and less weightare the main advantages of this bladeless less wind turbine.

❖ 2.3 GENERATOR :-

- The basic understanding of generator is that it converts mechanical energy to electrical form of energy. Generators are applicable for extensively indifferent different applications and for the most part have similarities that exist between these applications.
- Over the years, alternating current (AC) has been the common to choice of power supply. AC is popular because the generated voltage can be easily stepped up or down using a transformer. Due to the inherent properties of a transformer, DC voltage can't be altered using this type of equipment.
- Transformers operate due to a changing magnetic field in which the change in magnetic flux induces a current. With the AC flux generator design, its operability is based on permanent magnet alternators where the concept of magnets and magnetic fields are the dominant factors in this form of generator functioning.
- These generators have air cavity surface parallel to the rotating axis and the air cavity generates magnetic fluxes (90degree) perpendicular to the axis.

❖ 2.3 CLASSIFICATION OF WIND TURBINE :-

- Mainly there are two types of wind turbine based on the rotation axis of rotation to the ground, horizontal axis wind turbine (HAWT) and vertical axis wind turbine (VAWT).

1. Horizontal Axis Wind Turbine (HAWT):-

2. Vertical Axis Wind Turbine (VAWT) :-

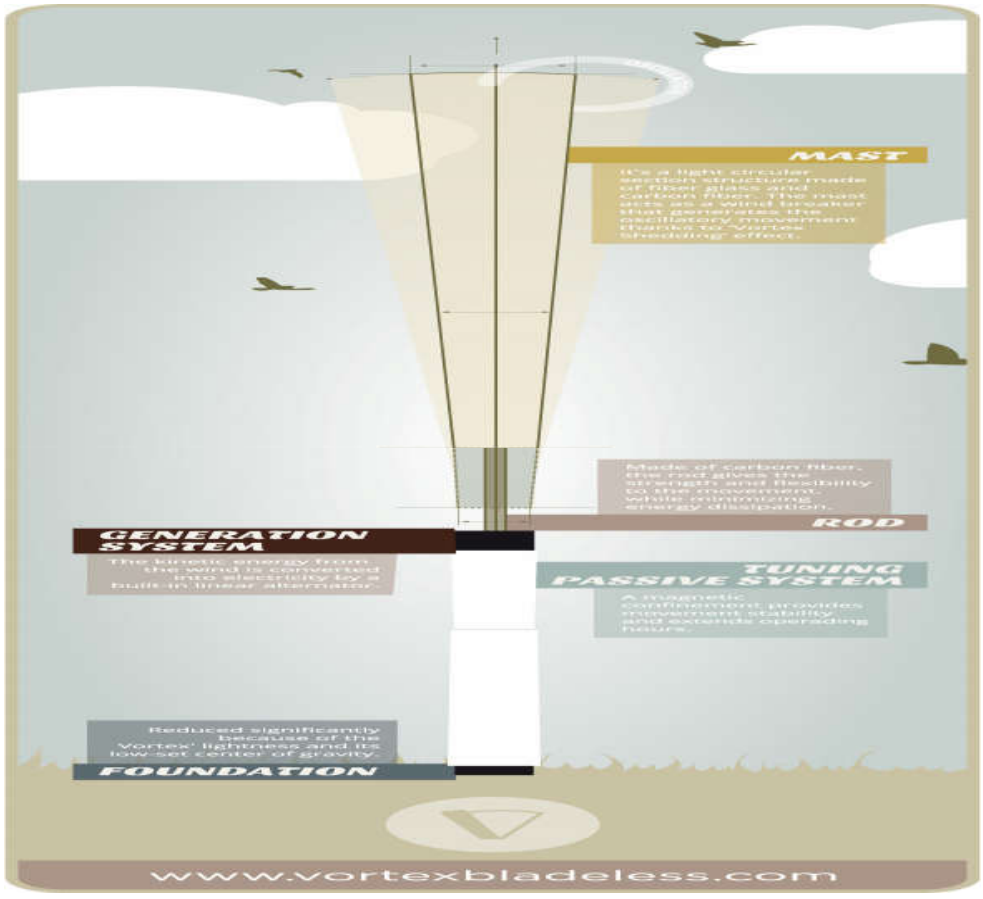
CHAPTER 3. INTRODUCTION ABOUT BWT

❖ DESCRIPTION OF BWT :-

- It consists of the components like a firm base and it is having a supporting rod, upper structure and its middle part it is having a mechanism for transmitting the wind energy into electrical energy.
- The material which can be used for bladeless wind turbine can be composite material, aluminum, carbon fiber material etc. As the bladeless wind turbine is for low power generation its cost is low and affordable.

❖ 3.1 BASIC COMPONENTS OF BWT :-

1. **Mast :-**
   - It is a light circular section structure made of fiber glass and carbon fiber. The oscillatory movement thanks to vortex shedding effect.
2. **Spring :-**
   - Made of Mild Steel, the Spring gives the strength and flexibility to the movement, while minimizing energy dissipation.
3. **Generation system :-**
   - The kinetic energy from the wind is converted by a built-in linear alternator.
4. **Foundation :-** It provides the strength.



❖ 3.2 ADVANTAGES :-

- Environment friendly
- Reduces 30 % to 50 % of operating cost
- Very less in weight
- Very easy transportation
- Noiseless
- Lower cost

❖ 3.3 LIMITATIONS :-

- It has less efficiency compared to conventional wind turbine
- Material of mast is very costly

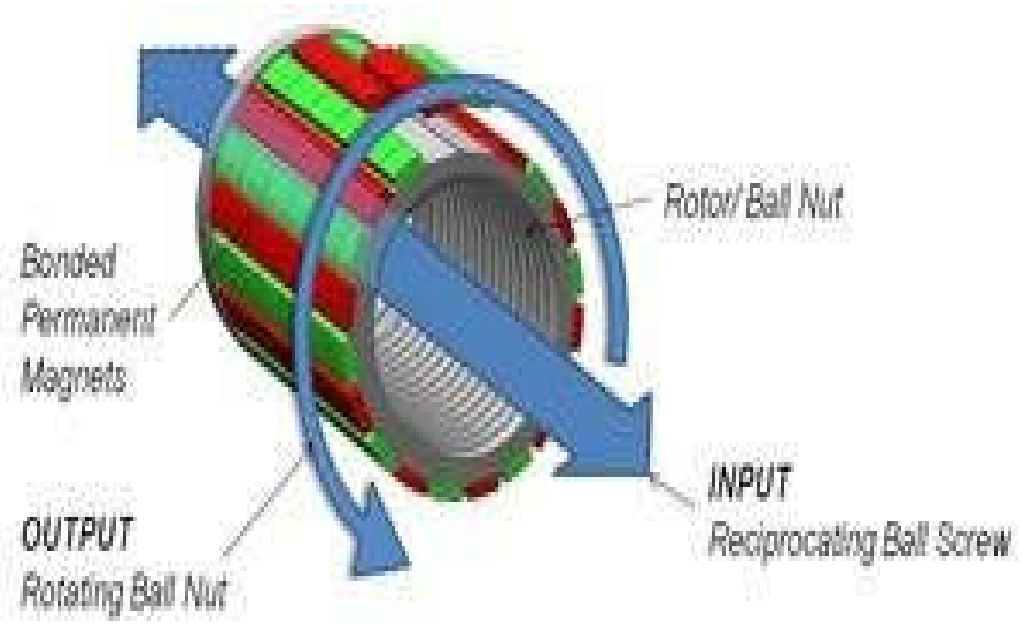
❖ 3.4 APPLICATIONS :-

- It Converts kinetic energy into electrical energy
- It is Efficient for commercial use
- It is also use for small scale power generation
- It can be use for agriculture purpose
- For use in telecom purpose

CHAPTER 4. METHODOLOGY

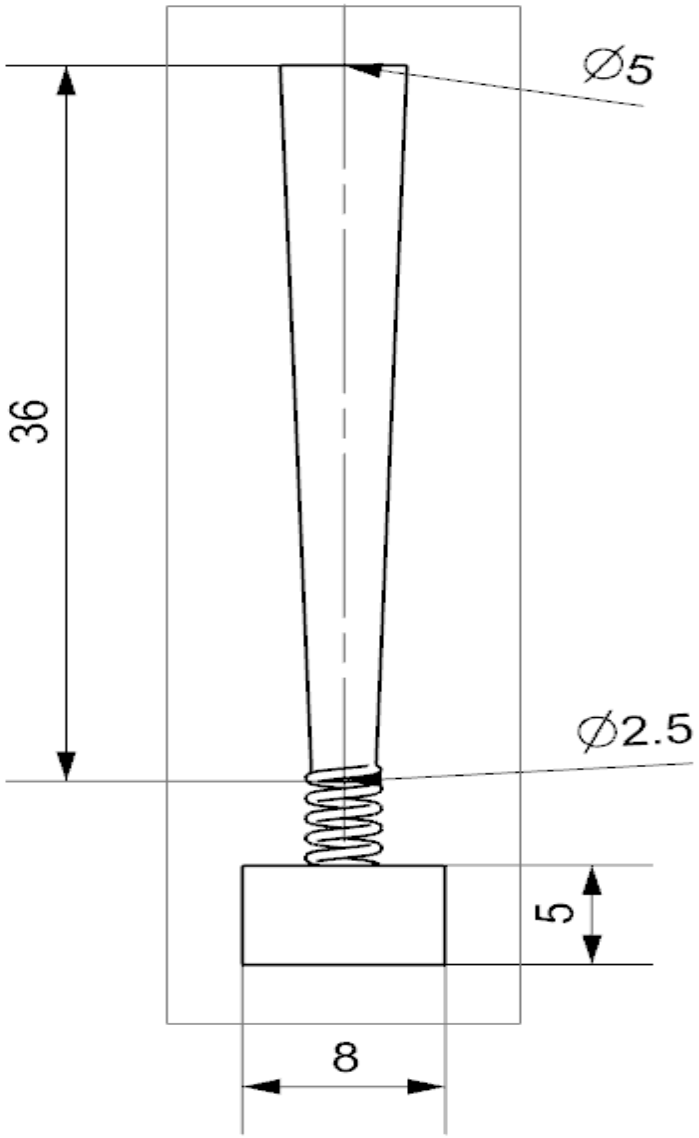
❖ 4.1 BY LINEAR ALTERNATOR :-

- A linear alternator is essentially a linear motor used as an electrical generator. An alternator is a type of alternating current electrical generator.
- The devices are often physically equivalent. The principal difference is in how they are used and which direction the energy flows.
- Difference between alternator and simple motor is in an alternator converts mechanical energy to electrical energy, whereas a motor converts electrical energy to mechanical energy. Like most electric generators and electric motors, the linear alternator works by the principle of electromagnetic induction.
- However, most alternators work with rotary motion, whereas linear alternators work with "linear" motion.



CHAPTER 5. MEASUREMENT

- Upper diameter= 5”
- Lower diameter= 2.5”
- Height of Mast= 36’
- Height of Foundation= 5”
- Thickness of mast= .25”
- Distance between foundation to the lower diameter of mast= 1”



CHAPTER 6. MATERIAL INFORMATION

Here, Plastic material is very beneficial for the mast.

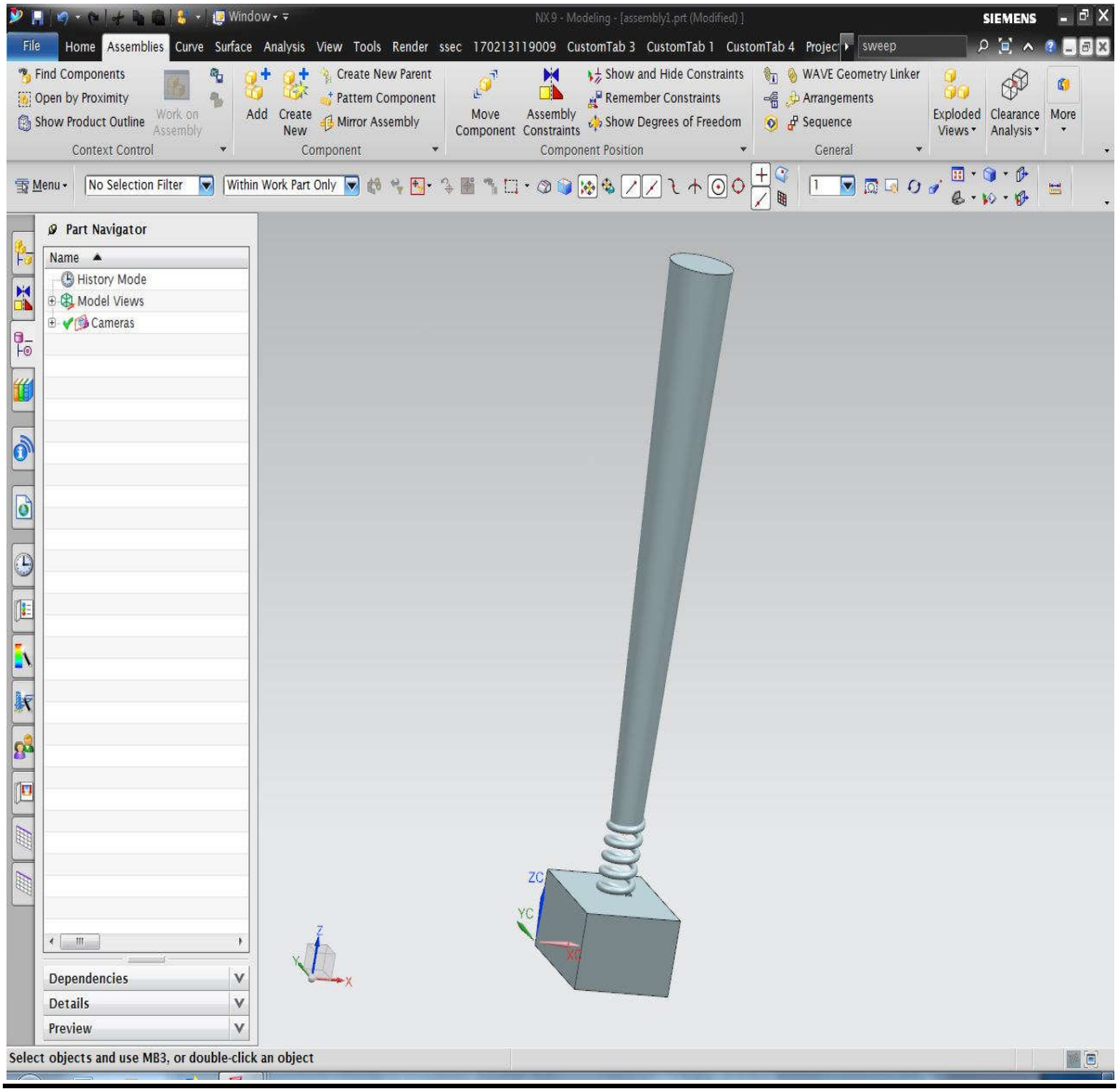
PLASTIC:-

- Thermoplastics are in the application range of hard or tough elasticity and can be melted by energy input (mechanical, thermal or radiation energy).
- Elastomers are of soft elasticity and usually cannot be melted. Thermo sets are in the application range of hard elasticity and also cannot be melted.

Properties of plastic:

- The properties of plastics are defined chiefly by the organic chemistry of the polymer such as hardness, density, and resistance to heat, organic solvents, oxidation, and ionizing radiation. In particular, most plastics will melt upon heating to a few hundred degrees Celsius.

CHAPTER 7. DESIGN OF MODEL



CHAPTER 8. MAKING OF MODEL

- Up till now we have study about theoretical concept and calculations. The process of making of practical model is given below;

  1) Preparation of Mast

  2) Spring and mast connection

  3) Preparation of foundation

  4) Setup of generate voltage by using dynamometer

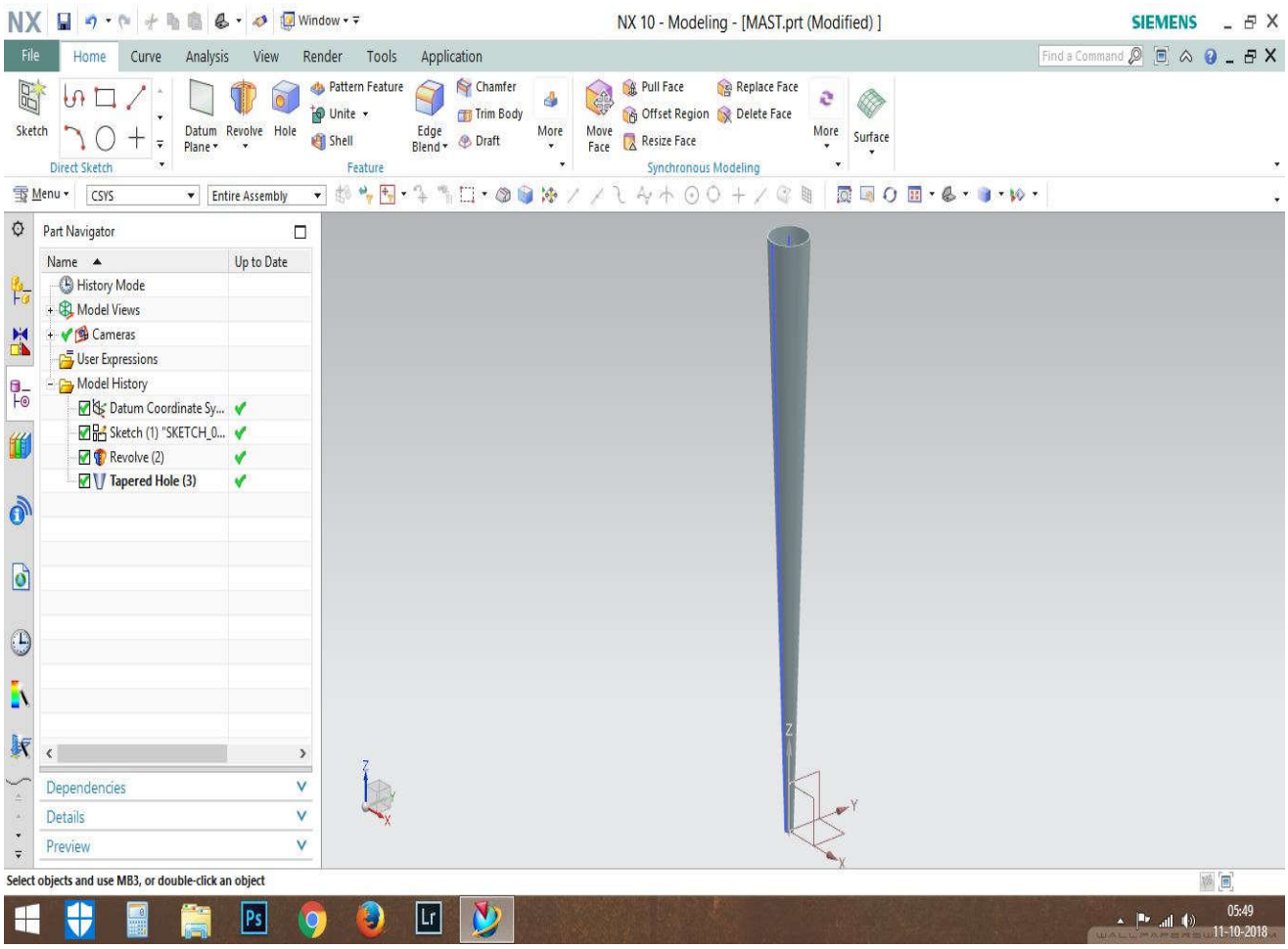
1. PREPARATION OF MAST :

Material for mast: - Plastic

- We have use the Plastic Sheet which is light in weight and thin. We have round it as shown in figure and cover with papers.
- Due to wind, mast will move.
- We have round a Plastic Sheet in taper and then after covering with tap and for decoration purpose we used silver wrapping paper as shown below

Drawing of mast:

- We have a prepare a 3D drawing of mast in NX software as below;



2. SPRING AND MAST CONNECTION:-

- Here, we have attached a Spring and mast with the help of welding. The Spring diameter is 2.5 inches.
- For providing strength, we attach the spring at lower diameter of mast so that spring and mast can move with each other.
- The spring diameter is 2.5 inches and in 5 turns.

3. PREPARATION OF FOUNDATION:-

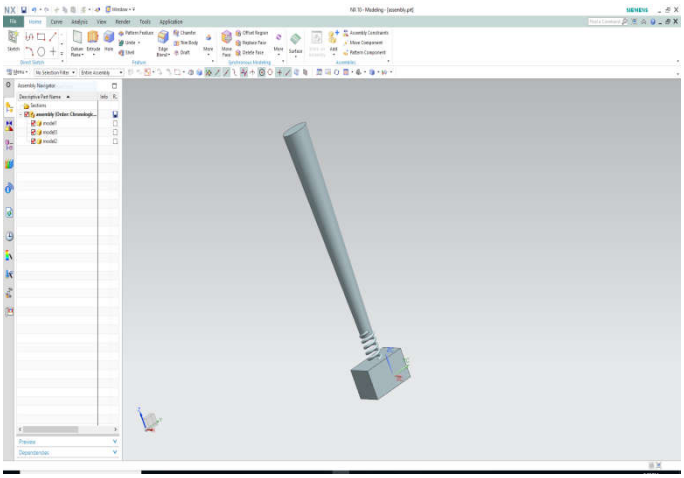
- It is the main part of this project on which all parts are carried on the foundation.
- We have made a box of iron plates by welding and it is poured by cement for the gaining the weight.

4. SETUP OF GENERATE ELECTRICITY BY VIBRATING MECHANISM:-

- The vibrating mechanism is used for generating electricity.
- It consist a PVC pipe, copper wire of 36 gages and the neodymium magnets.
- The copper wire is winding on the PVC pipe about 1500 to 2000 turns and the neodymium magnets are put inside the PVC pipe.

WORKING MODEL OF BLADE LESS WIND TURBINE:-

- The Blade less wind turbine works on simple mechanism. There is a top section of tapered conical shape made of polymer sheet, which have very narrow diameter at bottom and large at top. The model is supported on the table. This conical section makes to-and-fro movement like pendulum when Air of specific velocity strikes on this. There is a shaft connected at the bottom of the conical section which is pivoted perpendicularly to the horizontal shaft.
- There is an arrangement of pillow blocks which gives the support to the ends of horizontal shaft .The horizontal shaft get freely movement between the bearings of pillow blocks. To restrict the extra movement of vertical shaft there is an arrangement of two springs which are attached at the ends of the shaft.
- When shaft moves towards right side the left side springs get stretched due to that energy of spring the shaft try to moves towards left after that a right side spring gets stretched. Due to this arrangement of springs the shafts get free to and fro movement. There is cycle pedal wheel used which is attached with its one end with horizontal shaft. It is connected with freewheel through chain.
- Due to the movement of vertical shaft the pedal wheel at the end of horizontal shaft gets movement and rotates the freewheel. The shaft of dynamo gets movement which generates power and the LEDs are glowed.



❖ **COST ANALYSIS FOR ALL COMPONENTS:-**

Sr. No.	Components	Quantity	Material	Price (Rs.)
1	Mast	1	Plastic Sheet	350
2	Spring	4	Mild Steel	90
3	LED	5	-	10
4	Iron Plates	6	Mild Steel	500

CHAPTER 9. CONCLUSION

- The objective of this innovative concept consists of generating device belonging to the renewable energy industry, transforming wind energy into usable electric potential.
- Normally aerofoil shape of wind turbine blade is quite difficult to produce, its leads to bulky construction, difficult process of transportation, it is more costly. hence based on this project we can say that will lead to cheap electricity production device, which is blade less mechanism, eco-friendly and application for house hold purpose and specially affordable common public, based on test we had obtained such result which gave movement to our experimental setup, hence it can help to small scale power generation.
- Hence, based on this project electricity generation for low scale requirement it can be satisfied at far area, where transmission of electricity is costly and difficult. It consist low cost of installation and maintenance so it is helpful for local people.

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