AN ALTERNATE DESIGN FOR WIND TURBINE

R. Mohamed Afrideen, M.A. Nanthakumar, R.Ananth

Dept. of Mechanical Engineering, Sri Sri Ram Engineering College, Chennai - 44

Abstract-Wind as a source of energy is being used for a long period of time. It has gained more significance in the current age of energy crisis. The Horizontal Axis Wind Turbine and the Vertical Axis Wind Turbine is developed and implemented commercially. In order to have combined advantage a new way of Wind Turbine is to be developed in the project. In this, design of the component plays the vital role. The foils in which the blades of different sizes are packed in to it. The design was optimized to attain structural strength in which the E - Glass Fibre is used to design the blades and foils without compromising the weight and strength. The analysis is done using the ANSYS Fluent to determine flow parameters.

This is a different design in which Wind takes advantage other household power generation techniques. So Apartment dwellers could efficiently/effectively/sustainably generate electricity and independently make use of feed-in tariffs. This Wind turbine is well suited to urban environments hence widening the range of suitable locations for the harnessing of sustainable energy. Further prototyping and test will be made in order to optimize its performance. Beyond this solution, the technology can be used for developing on-grid and off-grid alternatives for the urban market as well as for motor homes, boats and other stand-alone applications at different sizes. One particularly interesting possible application is wave energy generation, as under the waves it is also a chaotic situation with water flowing in every direction. In order for this technology to be used in that scenario, a greater R&D effort should be made.

I - INTRODUCTION

Over Centuries overall world has been depend on non-renewable energy resources like fuel, wood, natural gas, coal, uranium etc. All these energy resources are limited and create pollution.

Due to above stated problem the world has lid to focus on renewable energy resources like solar energy, hydropower, wind energy, tidal energy. These energies provide optimized use of energy eco-friendly and minimizing the pollution. Out of these energies wind energy plays a vital role in day to day life.

The wind energy is utilized by using wind turbine. The most developed types today are wind energy and biomass because they are short time stored energy resources. A converter is required to turn kinetic wind energy into operational energy ex. Electricity.

This chapter describes the history of wind turbine technology development and

its potential applications. Wind turbine technology offers cost-effective solutions to eliminate the dependence on costly foreign oil and gas now used to generate electricity. Additionally, this technology provides electrical energy without greenhouse effects or deadly pollution releases. Furthermore, wind turbine installation and electricity generating costs are lower compared to other electrical energy generation schemes involving coal fired steam turbo-alternators, tidal wave turbines,

geothermal-, hydrothermal-, biofuel-, and biodiesel-based electrical energy sources and nuclear reactor-based generators.

Wind turbine technology offers a cost-effective alternate renewal energy source.

It is important to mention that a wind turbine is capable of generating greater amount of electrical energy with zero greenhouse effects compared to other energygenerating schemes including solar cell, tidal wave, biofuel, hydrogen, biodiesel,and biomass technologies. A wind turbine is the reverse of an electrical fan. A wind turbine uses wind energy to generate the electricity; a fan uses electricity to generate wind. In more sophisticated terminology, a wind turbine converts the kinetic energy of the wind into electrical energy.

Scope of the Project

The turbines are located in the centre median of the highways where the continuous motion of vehicles in high speed to produce more power.

By installing the turbines in tall buildings the power is generated.

The turbines can be used in the hill region to achieve more efficiency.

The project will become an example for future works

Objective of the Project

The primary objective is to develop a wind power generation which is simple and cost effective

The reduction of coal for the power generation

II - CURRENT RESEARCH

Wind power generation capacity in India has significantly increased in recent years. As of 31 December 2018 the total installed wind power capacity was 35.288 GW, the fourth largest installed wind power capacity in the world.[2][3] Wind power capacity is mainly spread across the South, West and North regions.

R.A. Msuya et al stated that Most small scale level wind turbine generators are directly driven system, variable speed, and partially connected power electronic converter system. Choice of such system is to avoid costs associated with gearbox. However, due to low wind speed in most of the tropical countries, synchronous generators with smaller or medium speed Permanent Magnet (PM) generator design found to be important and given high performance efficiency. In order to be able to harvest wind energy in off-grid population efficiently, there was a need to design a synchronous generator that can be able to operate under low wind speed, directly connected to the end user. Hence, the study designed a six pole pair wind turbine generator using permanent magnet (PM) model, using Maxwell two dimensions (2D) and Rotational Machine Expert (RMxrpt) software. The designed PM AC wind turbine generator worked with efficiency of 93% at rotational speed (rpm) range from 50 to 350 with maximum power output of 980 watts.

III - DESIGN

The design is done in the solidworks software.

The features used for the design are

Boss-Extrude:

Extruding the selected sketch or contour in one or two direction based on the dimension.

Cut-Extrude:

This is used to cut the solid by extruding the profile in one or two direction based on the dimension.

Cut-Loft:

This is used to cut the solid by selecting the two or more different or similar profiles.

Mirror: This is used to recreate/mirrors the edges faces based on the axis of the body.

Surface sweep:

This is used to create the surface feature based on the profile (open or close) following the open or closed path.

Thicken:

This is used to create the solid feature by applying the thickness to the surface. It is mostly used for converting the complicated surfaces to the solid.

Fillet:

It is used to create the rounded edge from the straight edge to reduce the stress factor and provides smooth contact at joints.

FIGURE 1:Isometric View (Wireframe)

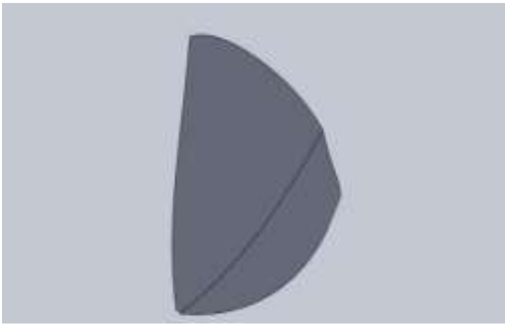
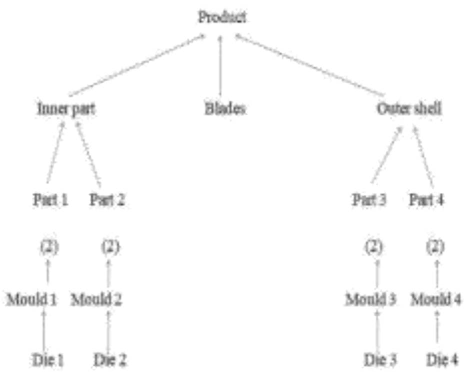


FIGURE 2: INNER PART

IV - FABRICATION

Process flow:

The process flow consists of the flow of assembly of parts to form the product.



DIE PREPARATION

Die is the major component in the manufacturing. Die can be prepared from various materials and for our design parameters and from economic analysis we concluded that to make the die from the wood rather than the ferrous materials. In the wood there are many types of wood which having its own significance and performance.

After the study of properties of all commercial wood we chose MDF (Medium Density Fibreboard) for the die production.

Process

The Standard MDF board of size (1200*600) is divided into two pieces. The maximum dimension of the product is nearer to 600mm. So based on size it is divided into two pieces. The MDF pieces are merged to form a solid block. The binding resin is used to join the MDF pieces and then dwell time is given for proper setting.

FIGURE 3: APPLICATION OF BINDER

Mould Design

The mould design is obtained main design of the product. There are four moulds to be prepared for the fabrication of the product.

In these moulds the inner part is produced from the part1 and part2. We need to fabricate the two pieces in each part.

The exterior parts are made from the part3 and part4. In this moulds also we need to fabricate the two pieces.

Part 1:

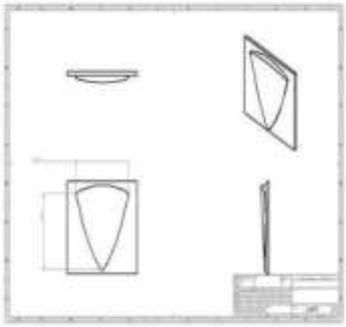


FIGURE 11: INNER PART 1

Part 2:

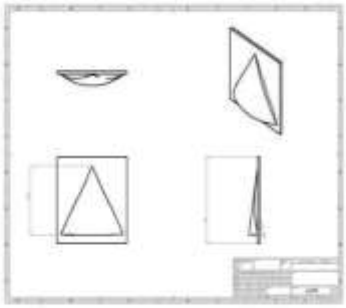


FIGURE 4: INNER PART2

Part 3:

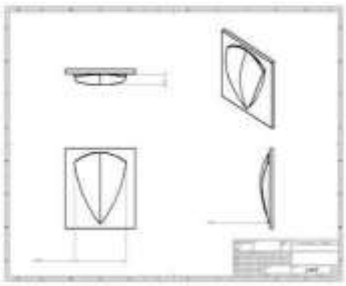


FIGURE 5: OUTER PART 1

Part 4:

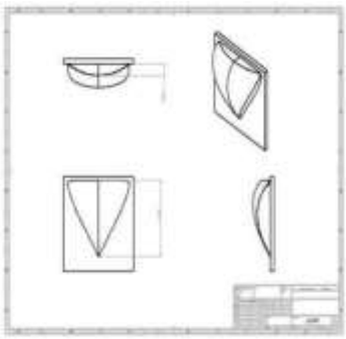


FIGURE 6: OUTER PART 2

FIGURE 7: STAND

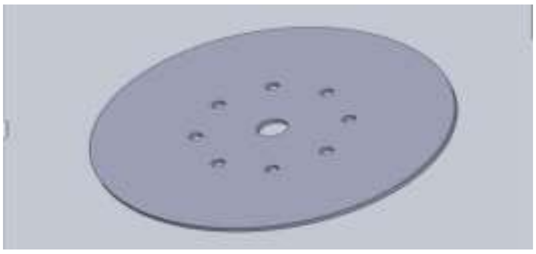


FIGURE 8: DISC FOR SHAFT HOUSING

Shaft attachment:

The shaft is connected with the completed part by means of attachment in which the rectangular block consists of four holes for fasteners and the bush is provided at the centre.

The bush is welded to the block. The hole is drilled in the bush and tapped in it. The dead screw is used as fasteners.

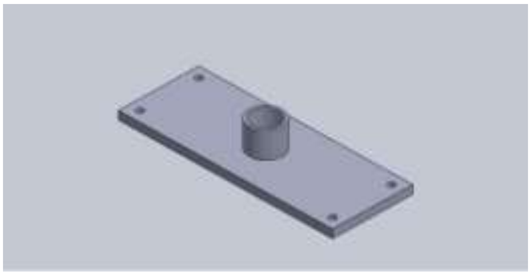


FIGURE 9: SHAFT ATTACHMENT

Bearings:

FIGURE 10: Bearing F204

Two pieces of F204 bearing is used for the assembly of shaft.

Self-aligning ball bearings have two rows of balls, a common sphered raceway in the outer ring and two deep uninterrupted raceway grooves in the inner ring. They are available open or sealed. The bearings are insensitive to angular mis alignment of the shaft relative to the housing which can be caused, for example, by shaft deflection.

ELECTRICAL SYSTEM

DC To DC Converter:

A DC-to-DC converter is an electronic circuit or electromechanical device that converts a source of direct current (DC) from one voltage level to another. It is a type of electric power converter. Power levels range from very low (small batteries) to very high (high-voltage power transmission).

DC-to-DC converter is used as step up converter in which the low volt power is converted to the high volt.

FIGURE 11: DC-DC CONVERTER

Permanent Magnet Generator:

A permanent magnet generator is a device that converts mechanical energy to electrical energy. In this device the rotor windings have been replaced with permanent magnets. These devices do not require a separate DC supply for the excitation circuit or do they have slip rings and contact brushes. These machines are superior alternatives to traditional induction motors that can be coupled with turbines, diesel generators and used for hybrid vehicles. Another major advantage is that these machines does not require any specific work environment and hence can be used in wind and water machines.

FIGURE 12: Permanent Magnet Generator

TABLE 2: BILL OF MATERIALS

S. No.	**Particulars**	**Cos**
1	L section 2x2x60deg (9feet)	125
2	Disc 300mm(1 piece), 100 mm (3 pieces)	750
3	Mdf board 2 sheet	3850
4	Resin apply labor and materials	1000
5	VMC	8850
6	Turbine labor	9000
7	Base bush	600
8	Shaft	350
9	PMG	2000
10	Battery	400
11	DC –DC Converter	200
12	Multimeter	200
	Total	28450

V - CONCLUSION

FIGURE 13: Complete Model

This wind turbine is fabricated as per the design and the turbine is tested to attain the voltage output from the generator in the range of (1.5-5.0V) by using the step up converter it is converted up to the 20 to 30V.

VI - APPLICATION:

- The turbines are located in the centre median of the highways where the continuous motion of vehicles in high speed to produce more power.
- By Installing the turbines in tall buildings to achieve the power generation.
- The turbines can be used in the hill region to achieve more efficiency.

VII - FUTURE SCOPE

Further prototyping and test will be made in order to optimize its performance. Specialized facilities have been made available at National Institute of Wind Energy for this purpose. Beyond this solution, the technology can be used for developing on-grid and off-grid alternatives for the urban market as well as for motor homes, boats and other stand-alone applications at different sizes. One particularly interesting possible application is wave energy generation, as under the waves it is also a chaotic situation with water flowing in every direction. In order for this technology to be used in that scenario, a greater R&D effort should be made.

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