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Review Article

DEVELOPMENT OF MODIFIED WIND TURBINE: A PAST REVIEW

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Wind energy represents a viable alternative, as it is a virtually endless resource. Through the next several decades, renewable energy technologies, thanks to their continually improving performance and cost, and growing recognition of their Environmental, economic and social values, will grow increasingly competitive with Traditional energy technologies, so that by the middle of the 21st century, renewable Energy, in its various forms, should be supplying half of the world's energy needs. In this paper various types of wind turbine are reviewed to understand and the development and modification of horizontal axis wind turbine and how more power can be generated compared to bare turbine of the same rotor blade diameter.

Keywords: Wind jet turbine, Diffuser adjustment wind turbine

INTRODUCTION

In recent years, the growing demand for electric power, environmental issues like global warming, and the rising cost and depletion of fossil fuels have created an urgent need to seek renewable energy sources such as wind energy. At the end of 2009, the worldwide capacity of wind power reached 159 GW, which accounted for 1.5% of the worldwide electricity usage (REN21, Renewables, 2010) the cost of wind-generated electric power has dropped substantially. There are two great classes of wind turbines, horizontal- and vertical-axis wind turbines. Conventional wind turbines, Horizontal-Axis Wind Turbines (HAWT), spin about a horizontal axis. As the name implies, a Vertical-Axis Wind Turbine (VAWT) spins about a vertical axis. Today the most common design of wind turbine and the only kind discussed in this the view of aerodynamic behavior is the horizontal-axis wind turbines. In this paper, detail information about the conventional horizontal-axis wind turbines will be given but before that some unconventional and innovative horizontal-axis wind turbine concepts will be mentioned. A few words are in order to summarize briefly some of these concepts to see the

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evolutionary process that led to modern horizontal axis wind turbine configurations used all over the world.

The Horizontal-Axis Wind Turbines (HAWTs) are dominating the global wind turbine market due to their capacity to produce high power with better efficiency. Since the HAWT industry is emerging, the optimization of this type of wind turbines becomes important. The focus of this work is to optimize the parameters of the turbine such as blade and rotor size, tip speed ratio as well as twist and pitch angles to maximize the wind turbine performance and or minimize the cost. Negm and Maalawi (2000) One of the more promising concepts in the wind energy field is the development of the Diffuser Augmented Wind Turbine (DAWT). These configurations use an additional diffuser to improve performance. Diffuser Augmented Wind Turbine (DAWT) as an improvement to the conventional Horizontal-Axis Wind Turbine (HAWT). DAWTs are simply a HAWT with a trumpet-bell-shaped diffuser surrounding the rotor blades and extending after. A DAWT is claimed to have a greater efficiency than conventional HAWTs, even possibly higher than the Betz limit, because the diffuser allows for a greater pressure drop across the rotor blade. Only DAWT has been commercially produced, the Vortex (Foreman and Gilbert, 1983). The high speed jet flow re energised the boundary layer within the diffuser enabling a short length-to-diameter diffuser with a large outlet-to-inlet area ratio to be developed the vertex (Foreman *et al.*, 1983). The economical benefits derived from this design were not seen until 1997. It was the use of High Tensile Reinforced Fibrous Ferrocement (HT Ferro) that enabled Vortec Energy to secure the rights to the design and the production of the first full-scale DAWT (Nash, 1997). Wind energy conversion systems convert the power in the wind to rotational shaft power and to electricity by coupling a generator to the unit. Wind "turbines" is wind electric power units, and are used throughout the world. Commercial wind turbines range from a few hundred watts to about 20 kilowatts for rural applications. Units designed for grid connection are available in the range of 20 kilowatts to over one megawatt. Where annual average wind speeds exceed about 5 meters per second, residential and village-scale wind turbines can provide electricity at costs competitive with or below those of diesel generators, and can be used in stand-alone applications not requiring a local power distribution system (Prez *et al.*, 2002).

PROBLEM DESCRIPTION

In this project the main aspect is how the wind energy is utilized in effective way for power development by running generator. For this a system is to be made which will convert the wind force in rotational motion of generator.

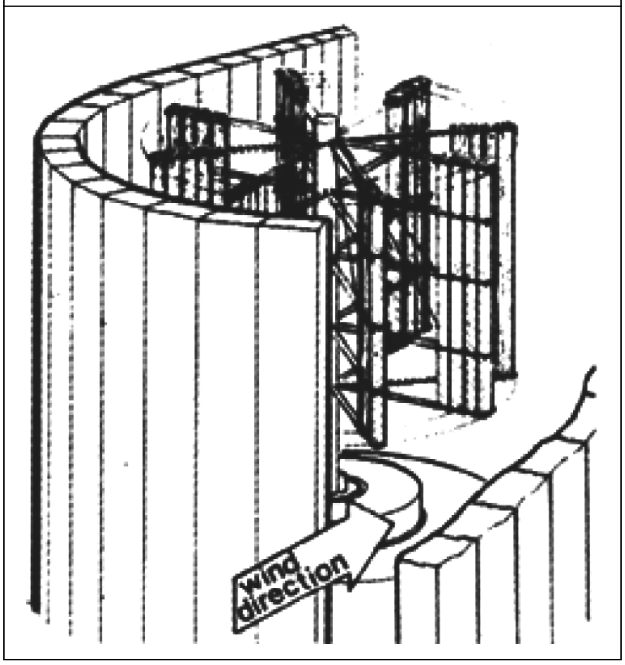
The system usually contains rotor blades on which wind strikes and which converts this force of the wind into rotational motion of the shaft which is connected to the shaft of the generator.

Also for holding this system a rigid structure is to be building which not only hold this system but also save it from damage. For holding this rigid structure a very strong base is to be developed which should be able to hold this complete system under various wind conditions.

HISTORICAL DEVELOPMENT OF WINDMILLS

Even though today's modern technology has firmly and rightly established the definition of wind turbine as the prime mover of a wind machine capable of being harnessed for a number of different applications, none of which are concerned with the milling of grain or other substances (at least industrialized countries), the term windmill was used for the whole system up to recent time, whatever its duty, be it generating electricity, pumping water, sawing wood. Since here the historical development of wind machine is considered it is convenient and has certain logic in it to retain its term, windmill in its historic sense (Spera, 1998) the first record of the use of the windmill is seen in the tenth century in Persia. Inhabitants who lived in Eastern Persia, which bordered on Afghanistan today, utilized the windmill, which were vertical-axis and drag type of windmill as illustrated in Figure 1.

Figure 1: Early Persian Windmill



The invention of the vertical-axis windmills subsequently spread in the 12th century throughout Islam and beyond to the Far East. The basic definition of the primitive vertical-axis windmills were imported in the later centuries such as placing the sails above millstones, elevating the driver to a more open exposure which improved the output by exposing the rotor to higher wind speeds and using of reeds instead of cloth to provide the working surface. The horizontal-axis windmill was a considerably more complex mechanism than the Persian vertical-axis windmill since it presented several engineering problems three major of which were transmission of power from a horizontal rotor shaft to a vertical shaft, on which the grindstones were set, turning the mill into the wind and stopping the rotor when necessary Figures 2 and 3. But the adoption of horizontal-axis windmill is readily explained by the fact that it was so much more efficient (Presz and Werle, 2002).

WORKING OF WIND TURBINE

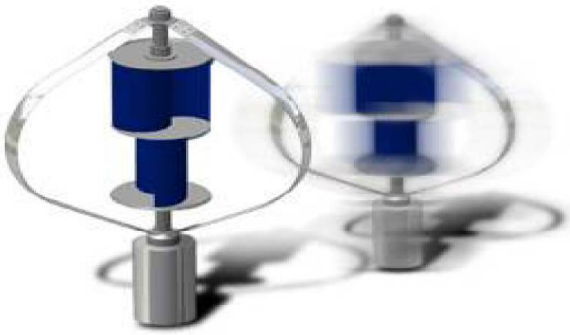
The working of wind mill is very simple as the air comes in the structure the working blades rotates which is connected to main rotor shaft by the supporting arms the main rotor is coupled to a generator from where we can get the output (Figure 4).

DEVELOPMENT IN HORIZONTAL-AXIS WIND TURBINE CONCEPTS

In Figure 5, various concepts for horizontal axis wind turbines are illustrated. A few words are in order to summarize briefly some of these

Figure 2: Horizontal Axis Wind Mill

Figure 3: Vertical Axis Wind Mill



concepts to see the evolutionary process that led to modern horizontal axis wind turbine configurations used all over the world.

WIND JET TURBINE

The jet turbine design, which draws on technology developed for jet engines, circumtents a fundamental limit to conventional wind turbines. Typically, as wind approaches a turbine, almost half of the air is forced around the blades rather than through them, and the energy in that deflected wind is lost. At best, traditional wind turbines capture only 59.3% of the energy in wind, a value called the Betz limit.

Jet turbine surrounds its wind-turbine blades with a shroud that directs air through the blades and speeds it up, which increases power production. The new design generates as much power as a conventional wind turbine with blades twice as big in diameter. The smaller blade size and other factors allow the

Figure 4: Working of Wind Turbine

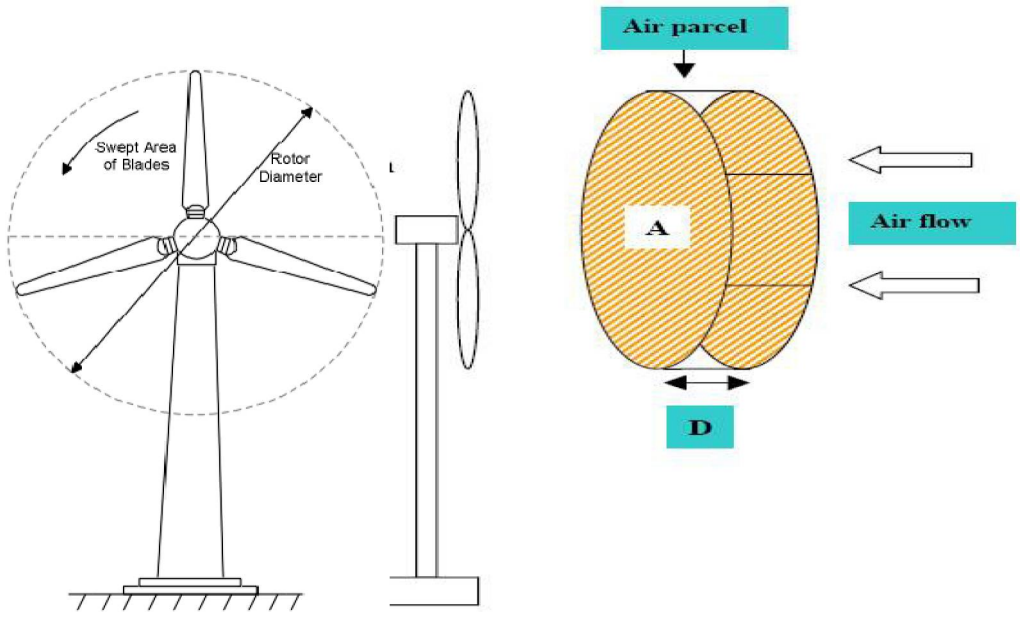
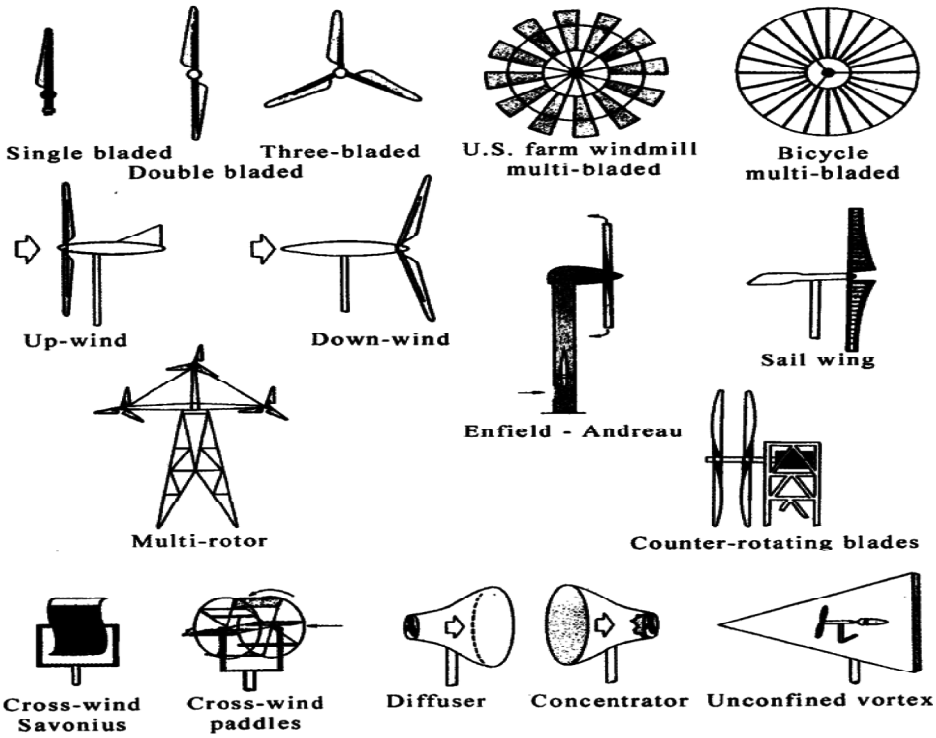


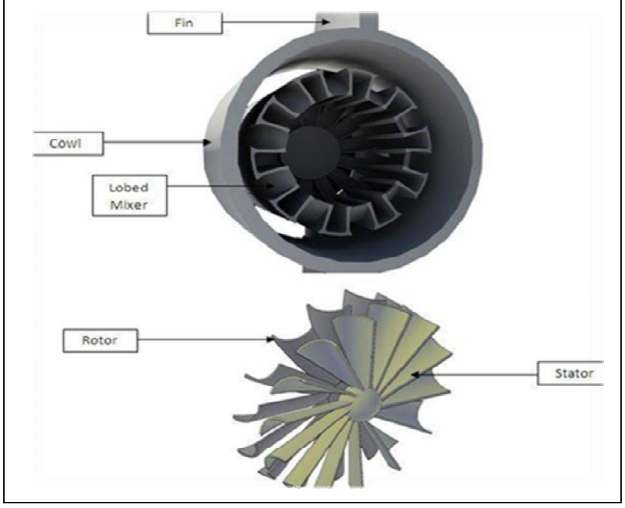
Figure 5: Various Concepts for Horizontal-Axis Wind Turbines



new turbines to be packed closer together than conventional turbines, increasing the amount of power that can be generated per acre of land.

Components of Wind Jet Turbine

Figure 6: Wind Jet Turbine



WORKING OF WIND JET TURBINE

When air approaches the turbine, it first meets a set of fixed blades, called the stator, which then redirects the wind onto a set of movable blades, called the rotor. The air spins the rotor and emerges on the other side, moving more slowly than the air flowing outside the turbine.

The shroud guides the fast-moving air to meet the slow-moving air to create a rapid mixing vortex, extracting more air (Figure 6).

Benefits of Wind Jet Turbine

- Jet wind turbine extracts 3-4 times as much energy from the wind, allowing much smaller and faster blades. Diffusers provide greater efficiency at the expense of weight and length, and they are prone to separation of flow and losses.

- Traditional turbines require placement away from people and buildings. Wind jet turbines are inherently safer, adopting methods from the engineering of jet engines.
- Traditional blades are enormous, and require special infrastructure to manufacture and transport. The wind jet turbine can be disassembled to fit in one truck.
- Wind jet turbine smaller robust rotor spins effectively at lower winds, but can also sustain higher winds in which other turbines would stall or break.
- Wind jet turbine can automatically align to the wind direction like a kite string, and does not need motorized alignment.

CONCLUSION

We know that this project reflect a development of new discovery; but our intention is the build a wind mill in such a way that cost of the wind mill is easily affordable by common people .So that residential societies should install such wind mills on the terrace to tackle with the power cuts and become independent to certain amount. Our main objective So that common people get attracted towards such a clean source of energy.

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