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Advanced Technology for Wind Harnessing with Spiral Rotor – Aeroturbines

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Abstract: - Due to the lack of energy resources, we have to search for renewable energy resources to meet our future needs and that to be safe and effective to the environment. Wind power can be used for a clean future. Old wind mill technology has got certain disadvantages like variable frequency and also they are threat to birds. This is a double-helix wind turbine known as aero turbines. Harvesting wind energy from high rise buildings will be possible and production and cost efficiency will be the key factors. The propellers of these aero turbines resemble an electric beater and don't look like a blade. These aeroturbines will not produce noise pollution and can be installed at the rooftops of high rise buildings.
The other plus factors of aeroturbines are that they are safe for birds. They can harness the power of multidirectional and gusting winds. They require low maintenance and are self regulatory as far as over speed protection is concerned. Aeroturbines can work in a heavy snowfall too. They start working in a wind speed of 6mph. Continuous wind supply is not a precondition.

Keywords: - Aeroturbines, Spiral Rotor, TSR, mph, Aerofoil

I. INTRODUCTION

With growing concerns about environmental pollution and a possible energy shortage, great efforts have been taken by the government around the world to implement renewable energy programs, based mainly on wind power, solar energy, small hydro-electric power etc. With improving techniques, reducing cost and low environment impact, wind energy seems certain to play a major part in the world's energy future. Due to its many advantages such as the improved power quality, high energy efficiency and controllability, etc., the variable speed wind turbine is becoming a popular concept. As the wind power penetration continually increases, power utilities concerns are shifting focus from the power quality issue to the stability problem caused by the wind power connection.

Wind is a form of solar energy. Winds are caused by the uneven heating of the atmosphere by the sun, the irregularities of the earth's surface, and rotation of the earth. Wind flow patterns are modified by the earth's terrain, bodies of water, and vegetation. Humans use this wind flow, or motion energy, for many purposes: sailing, flying a kite, and even generating electricity.

The terms wind energy or wind power describes the process by which the wind is used to generate mechanical power or electricity. Wind turbines convert the kinetic energy in the wind into mechanical power. This mechanical power can be used for specific tasks (such as grinding grain or pumping water) or a generator can convert this mechanical power into electricity. Simply stated, a wind turbine works the opposite of a fan. Instead of using electricity to make wind, like a fan, wind turbines use wind to make electricity. The wind turns the blades, which spin a shaft, which connects to a generator and makes electricity.

II. TECHNOLOGY

This is a spiral rotor wind turbine known as aeroturbines. The design of these aeroturbines is simple and eliminates the drawbacks of the existing turbines. Harvesting wind energy from high rise buildings will be possible and production and cost efficiency will be the key factors. The propellers of these aero turbines resemble an electric beater and don't look like a blade. These aeroturbines will not produce noise pollution and can be installed at the rooftops of high rise buildings.

The other plus factors of aeroturbines are that they are safe for birds. They can harness the power of multidirectional and gusting winds. They require low maintenance and are self regulatory as far as over speed protection is concerned. Aeroturbines can work m a heavy snowfall too. They start working in a wind speed of 6mph. Continuous wind supply is not a precondition.

This urban-friendly wind power can be positioned horizontally hence they can be installed on existing high rise buildings. The structural designs of aeroturbines are such that they can be easily integrated and

installed into new as well as existing buildings and their model cages can be mounted in vertical, horizontal and diagonal orientations.

The aeroturbines must be installed 40 feet above the ground in order to operate efficiently and care should be taken that they are not obstructed by surrounding trees and other structures.

Constructional Details

1. Integrated Space Frame Tower: 6' Diameter and 10' high using galvanized steel tubing. Can be mounted vertically or horizontally. Can also be enclosed with wire mesh to keep birds out. Totally visible, safe and versatile.
2. Spiral Rotor: Can accept winds from any direction. Produces high starting torques (but low TSR) and works with low-speed winds. Self-regulates without moving parts - even with no backload.
3. Airfoil Rotor: Two vertical airfoils produce aerodynamic lift. TSR = 3 (blades go 3 times as fast as the wind with spiral in tow). Both produce 1000 watts, total, In 32 mph winds.
4. Boron Neodymium Permanent Magnet Direct Drive, 3 phase Alternator: This alternator has the ability to produce 2 volts per RPM. Ideal for 'battery optional' utility intertie applications.

III. WORKING

As the wind blows the long spiral blade scoops catch wind from nil directions forcing it through the turbine. Can accept wind from any direction. Produces high starting torques (but low TSR) and works with low-speed winds. Functions with wind from any direction and functions in turbulent or gusty winds. This type of rotors arc mainly used for vertical axis turbines as they have the main rotor shaft arranged vertically. Key advantages of this arrangement are that the turbine does not need to be pointed into the wind to be effective. This is an advantage on sites where the wind direction is highly variable. Vertical axis wind turbines can utilize winds from varying directions.

In the original versions of the aerofoil design, the aerofoils are arranged so that they are symmetrical and have zero rigging angle, that is, the angle that the aerofoils are set relative to
the structure on which they are mounted. This arrangement is equally effective no matter which direction the wind is blowing, in contrast to the conventional type, which must be rotated to face into the wind.

When the aerofoil rotor is spinning, the aerofoils are moving forward through the air in a circular path. Relative to the blade, this oncoming airflow is added vectorially to the wind, so that the resultant airflow creates a varying small positive angle of attack (AoA) to the blade. This generates a net force pointing obliquely forwards along a certain 'line-of-action'. This force can be projected inwards past the turbine axis at a certain distance, giving a positive torque to the shaft, thus helping it to rotate in the direction it is already travelling in. The aerodynamic principles which rotate the rotor are equivalent to that in autogiros, and normal helicopters in autorotation.

As the aerofoil moves around the back of the apparatus, the angle of attack changes to the opposite sign, but the generated force is still obliquely in the direction of rotation, because the wings are symmetrical and the rigging angle is zero. The rotor spins at a rate unrelated to the wind speed, and usually many times faster. The energy arising from the torque and speed may be extracted and converted into useful power by using an electrical generator.

The aeronautical terms lift and drag are, strictly speaking, forces across and along the approaching net relative airflow respectively, so they are not useful here. We really want to know the tangential force pulling the blade around, and the radial force acting against the
bearings.

IV. BLOCK DIAGRAM

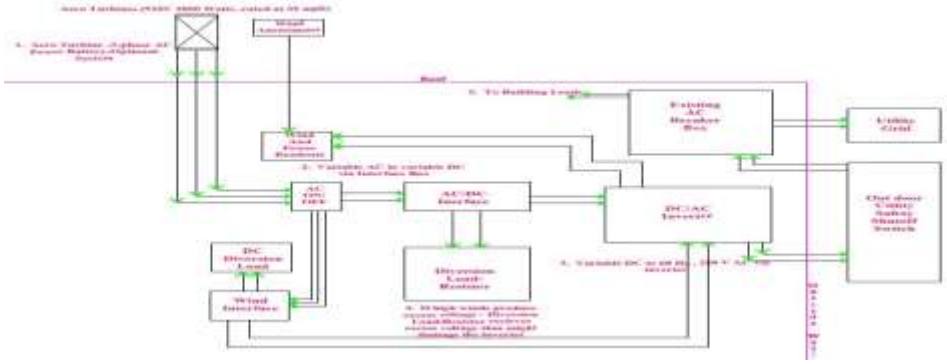

Fig.1: Block diagram of roof mounted equipment

Wind turns the Aeroturbines, which convert wind energy into rotational energy, via the attached Alternators converting rotational energy to 3 phase AC electricity. The Alternators pass 3-phase AC electricity to the Wind Interface Boxes which convert 3-phase AC electricity into DC electricity and regulate the maximum voltage. The Wind Interface Boxes deliver most of the DC electricity produced to the DC to AC inverters and send any excess to the DC Diversion Loads, which use extra electricity to make heat.

The roof top Anemometer sends wind speed information to the main Wind Interface Box connected, through the system, to the main Wind and Power Readout, The Wind and Power Readout, receives wind speed and wind direction data from the Wind Interface Box and power readings from the DC to AC Inverter. The Wind and Power Readout data can be read on site or sent to a collection server and then accessed via a specified URL through the DC to AC inverter. The DC to AC Inverter takes incoming DC power and converts that variable DC power into standard AC building and grid voltage.

The DC to AC Inverter sends standard 240 volt (or 208 volt) 60 cycle, AC voltage to the Outdoor Utility Shutoff first, before going back into to the building s Breaker Box. Alter supplying building loads, the power finally then goes to the Utility Grid, The Outdoor Utility Shutoff is there for the utility lineman as needed.

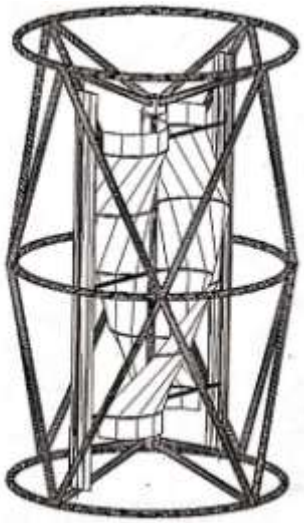

Fig.2: Isometric view of Aeroturbine

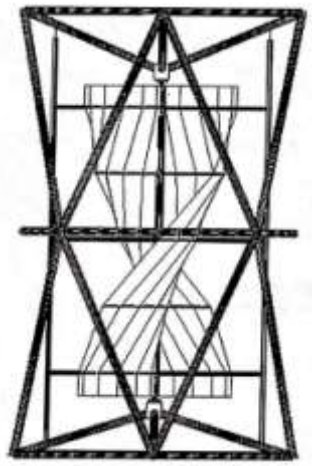

Fig.3: Elevation of Aeroturbine

V. ANALYSIS

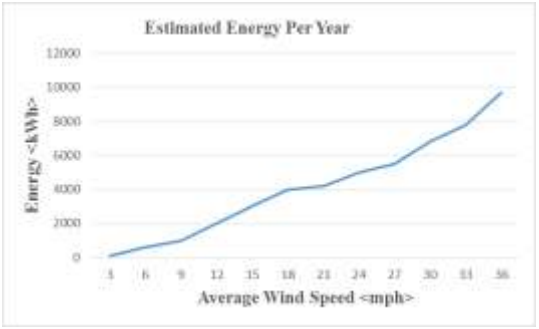

Fig.4: Estimated energy per year graph

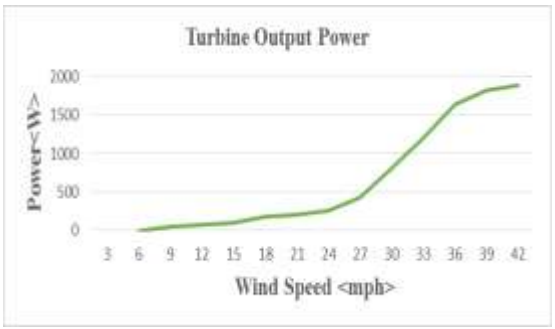

Fig.5: Estimated energy per year graph

VI. ADVANTAGES

These types of aeroturbines are capable of enjoying turbulent winds. They are safe, self-regulating quite and vibration free. They are made of low cost common materials. And also no power line transmission losses like wind farms. There is no need of any giant power line. Aeroturbines are easy to integrate with roof and other sources of roof top power production. They are also portable and architecturally design compatible which are safe to birds and human beings.

VII. CONCLUSIONS

The utilization and harnessing of renewable energy resources must be brought into reality. The government has to take immediate decisions about the renewable energy utilization. This urban-friendly wind

power can be positioned horizontally hence they can be installed on existing high rise buildings. The structural design of aeroturbines are such that they can be easily integrated and installed into new as well as existing buildings and their model cages can be mounted in vertical, horizontal and diagonal orientations.

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