

WIND POWER TECHNOLOGY



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ABSTRACT

The use of “wind energy” has developed significantly world wide wind power is strongest growing form of renewable energy, ideal for a future with pollution free electric power. But the integration of wind farms in power networks has become an important problem for the unit commitment and control of power plants in electric power systems. The intermittent nature of wind makes it difficult to forecast wind produced electric energy in wind farm even in the next hours. Raising energy demands along with pollution and climatic change issue or among the most fundamental issue of our time the great challenge is to tackle the growing demands and ensure energy security while still caring for our environment. In this global context wind energy is by far the most advanced, efficient and environment friendly energy technology available for global deployment. Wind energy is fuelled by the wind so it's a clean fuel source. Wind is a renewable source of energy; it can not be used up. Wind is one of the lowest priced renewable sources today

In this technology we have two primary design they are horizontal axes vertical axis. Vertical axis wind turbines are pretty rare. In this technology all equipments are at ground level, for easy installation, controlling and servicing. Horizontally axis wind turbines are self starting without using any booster. These turbines use more sophisticated aerodynamic principles to capture the wind energy most effectively.

Key words:- wind energy, power plant, renewable, stream, met mass, anemometer, generator, electricity, kinetic energy, yaw, Gear, pitch, Tower.

INTRODUCTION

Wind is the quasi – horizontal movement of air caused by a horizontal pressure gradient force. It occurs at all scales, from local breezes generated by heating of land surfaces and lasting tens of minutes to global winds resulting from solar heating of the earth. (Wind is a stream of moving air molecules circulated by the sun's unequal heating of the earth's surface). The two major influences on the atmospheric circulation are the differential heating between the equator and the poles, and rotation of the planet.

In the 1970's many people began to desire a self-sufficient life style. Solar cells were too expensive for small scale electric generation, so some turned to wind mills. Later in the 1980's California provided rebates for ecologically harmless power. These rebates funded the first major use of wind power for utility electricity.

In the 1990's aesthetics and durability became more important, turbines were placed on top of steel reinforced concrete towers. Small generators are connected to the tower on the ground, then the tower is raised into position.

The wind speeds in India or in the low wind regime with average wind speed between 17 and 24 Km/hr. India has established a good manufacturing base with about 12 manufacturers of wind turbines and allied is being tested in India to increase the generation of wind power and invite greater participation from the private sector.

What is renewable energy?

Renewable energy sources include solar energy which comes from the sun and can be turned into electricity and heat. Wind, geothermal energy from inside the earth, bio-mass from plants and hydro power and ocean energy from water are also renewable energy sources.

Alternative sources of energy have become very important and relevant to today's world. These sources, such as sun and wind can never be exhausted and therefore are called **RENEWABLE**. They cause less emission and are available locally. Their use can, to a large extent, reduce chemically, radio, active and thermal pollution. They stand out as an available source of clean and limitless energy. This is known as **“NON - CONVENTION”** source of energy.

HOW WIND IS PRODUCED?

The sun heats the land mass and the heat from the land is absorbed by the surrounding air. When the air reaches a certain temperature, it begins to rise quickly upwards. This results in a low pressure area at ground level and a higher pressure area above the land. Air naturally moves from higher pressure zones to lower pressure zones; this air movement creates wind.

Due to elevation, topography, surface roughness and locations, some areas experience more wind than others. The faster the wind, the more energy can be produced. For this reason, it is important to place wind turbines at sites with high wind speeds.

HOW WIND ENERGY CONVERTED IN TO ELECTRICAL ENERGY?

Wind turbine capture the kinetic energy in surface winds and convert in to electrically energy in the form of electricity. To do this there are three basic parts. They are blades of turbines, shaft and a generator. As wind moves, the wind turbine blades convert the kinetic energy in the wind in to mechanical power. The mechanical power can be converted in to electricity by a generator.

ABOUT WIND POWER PLANT

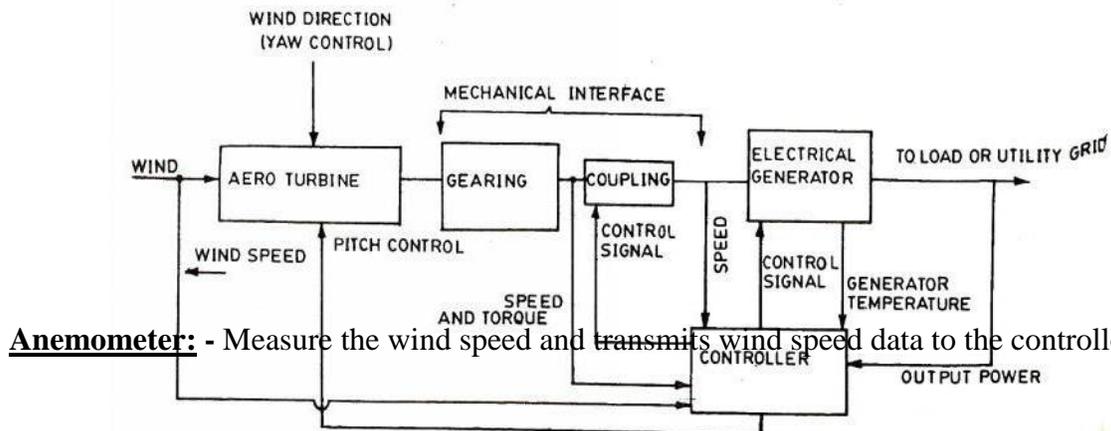
Wind power plants or wind farms as they are some times called clusters of wind machines used to produce electricity. Wind plants are not owned by the public utility companies. These are belongs to private companies. And also known as INDEPENDENT POWER producers. Operating a wind power plant is not simple as plucking down machines on a grassy field. To construct a wind plant the following factors are considered. Wind availability. Proximity to electrical transmission lines. Local weather conditions and Local zoning codes. Wind plants also need a lot of land .one wind machine needs about two acres of land. a wind machine needs about two acres of land. A wind power plant takes of 100s of acres.

Before installing a wind machine **METMASS** is installed. In which Anemometer and wind vane are placed. They note the speed of wind and the direction of the wind flow

SELECTION OF SITE FOR WIND POWER PLANT

The power available in the wind increases rapidly with the speed, hence wind energy conversion machine should locate preferably in areas where the winds are strong & persistent. The technical, economic, environmental, social and other factors are examined before a decision is made to erect a generating plant on a specific site. Some of the main considerations are. High annual average wind speed. Availability of anemometry data Availability of wind curve at proposed site. Wind structure at the proposed site Altitude of the proposed site. Terrain & its aerodynamics Local ecology Distance to roads or railways Nearness of site to local centers or users Nature of ground Favorable land cost

BLOCK DIAGRAM



Blades:- Most turbines have either two or three blades wind blowing over the blades causes the blades to “lift” and rotate.

Brake:- A disc brake, which can be applied mechanically, electrically, or hydraulically to stop the rotor in emergencies. **Controller:** The Controller starts up the machine at wind speeds of about 8 to 16 miles per hour and shuts off the machine at about 65mph. turbines can not operator at wind speeds above 65mph because their generator could over heat

Gear Box:- gears connected the low speed shaft to the high speed shaft and increase the rotational speeds from about 30 to 60 rotations per minute to about 1200 to 1500 rpm, the rotational speed required by most gene rators to produce electricity. The gear box is costly part of the wind turbine and engineers are exploring “**direct – drive**” generators that operate at lower rotational speed and do not need gear boxes

Generators:- Usually an off – the – self induction generated that produces 60cycle AC electricity

High - Speed shaft:- Drive the generator

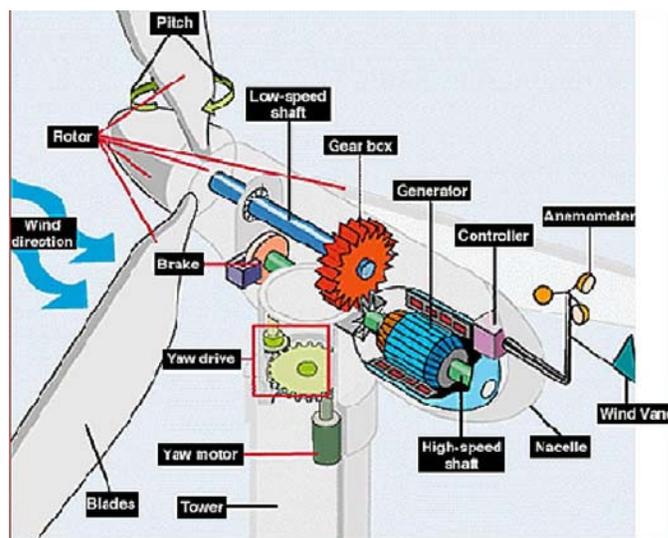
Low-Speed Shaft:- the rotor turns the low speed shaft at about 30to60rpm.

Nacelle:- The rotor attaches to the nacelle, which sits a top the tower and includes the gear box, low and high speeds shafts, generator, controller and brake. A cover protects the components insert the nacelle. Some nacelle is large enough for a technician to stand inside while working.

Pitch:- Blades are turned, or pitched, out of the wind to keep the rotor from turning in winds that are too high too low to produce electricity

Rotor:- the blades and the hub together are called the rotor.

Tower:- towers are made from tubular steel or steel lattice. Because wind speed increases with height, taller towers enable turbines to capture more energy and generate more electricity



Wind direction: - This is an “**Up wind**” turbine, so called because its operators face in to the wind other turbines are designed to run “**Down wind**”, facing away from the wind

Wind Vane: - measures wind direction and communicate with the yaw drive to orient the turbine properly with respect to the wind.

Yaw Drive: - Up wind turbines face in to the wind, the yaw drive is used to keep the rotor facing in to the wind as the wind direction changes down wind turbine do not require a yaw drive, the wind blows the rotor down wind.

Yaw Motor: - Powers the yaw drive.

ADVANTAGES:

Wind energy is fueled by the wind so it is a fuel a source. Wind energy does not pollute the air like power plants that release on combustion of fossil fuels, such as coal or nature gas. Wind turbines don't produce atmospheric emissions that cause acid rain or green house gases.

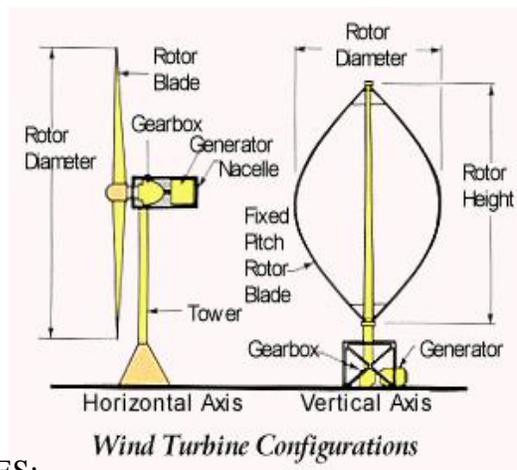
Wind energy is a domestic source of energy, produced in the United States the nation's wind supply is abundant.

Wind energy relies on the renewable power of the wind, which can't be used up. Wind is actually a form of solar energy; and the earth's surface irregularities cause winds.

Wind energy relies on the renewable power of the wind, which can not be used up. Wind is actually a form of solar energy; the heating of the atmosphere by the sun, the rotation of the earth, and the earth's surface irregularities causes winds.

Wind energy of one of the lowest priced renewable energy technologies available today. Costing between 4&6 cents per kwh , depending up on the wind resources and project financing of the particular project

Wind turbines can built on farms or reaches thus benefiting the economy in rural areas where most of the best wind sites are found formers and ranchers can continue to work the land because the wind turbines use only a fraction of land. wind power plant owners make rent payments to the farmer or rancher for the use of the land



DISADVANTAGES:

Wind power must compete with conventional generation sources on a cost basis .depending on how energetic a wind site is, the wind farm may or may not be cost competative. Even though the cost of the wind power has decrease dramatically in the past ten years, the technology requires a higher initial investment than fossil fueled generators The major challenges to use in wind as a source of a power is that the wind is intermitted and it does not it always blow when electricity is needed. Wind energy (unless batteries are used) and not all winds can be harnessed to meet the timing of electricity demand.

Good wind sides are often located in remort locations, far from cities where the electricity is needed. Wind resources development may comp ete with other uses for the land and those alternative uses may be more highly valued than electricity generation

Is the liable to be effected by natural conditions such as weather and has large out put variations The noise created by the wind mills as well as their influence land scape may become problematic

APPLICATIONS:

Applications of wind power range from small stand alone systems to utility scale wind power plants with improved technology and lower cost, wind is growing in popularity – both for utilities and their for a costumers many U.S utilities non o ffer wind power

CONCLUSION:-

It has been suggested that wind power technology is better because of more efficient wind power is eco friendly to atmosphere wind is available at free of cost Wind turbines used more sophisticated aerodynamic principles to capture the wind energy most effectively. Most robust construction

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