HYBRID SOLAR WIND POWER SYSTEM

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***ABSTRACT*: Now a day's electricity is most needed facility for the human being. All the conventional energy resources are depleting day by day. So we have to shift from conventional to non-conventional energy resources. In this combination of two energy resources is takes place i.e. wind and solar energy. This process reviles the sustainable energy resources without damaging the nature. We can give uninterrupted power by using hybrid energy system. Basically this system involves the integration of two energy system that will give continuous power. Solar panels are used for converting solar energy and wind turbines are used for converting wind energy into electricity. This electrical power can utilize for various purpose. Generation of electricity will be takes place at affordable cost. This project deals with the generation of electricity by using two sources combine which leads to generate electricity with affordable cost without damaging the nature balance.**

***Keywords*:-Battery, Non- conventional energy, DC Motor, Gears**

1. INTRODUCTION

1.1 WIND TURBINE INDUSTRY IN INDIA:-

The electricity prices have been rising since last few years. There is also a steadily increasing concern about global warming due to GHG emissions produced by burning of fossil fuels. Renewable energy technology such as Wind Power has begun to emerge as an attractive and
Alternative energy resources to supplement the ever-increasing demands of clean, green and cheap electricity. In the last one decade, wind power has emerged as the biggest renewable energy source in the world. Presently wind power alone is generating almost 26,000 MW capacities globally and the estimated potential of wind power within India itself is 45,000 MW. In May 2005, India surpassed Denmark and attained 4th position in the world after Germany, Spain and US in wind power generation capacity. The Grid-connected wind power generation capacity has now crossed 5,300 MW, more than half of which has been achieved in last two years alone with a capacity addition of 2,850 MW. Large commercial Wind Turbines ranging from 300 KW to 2 MW capacities are being installed all over the country side for supplementing the grid to meet the urban, industrial and commercial power requirement.

Although, the large wind turbine industry has made strong presence in India, the concept of harnessing wind power through small wind turbines is still nascent in our country. The indigenously developed small wind turbine industry in India is still in its infancy and the sporadic market is presently limited to costly foreign products only. Small-scale wind power systems (known as aero generators for powering one or two homes) can change the economic and environmental equations, making clean energy increasingly affordable in the world's poorest regions.

The success of the large wind turbine industry in India shows the impact of sustained, substantial support from government programs and policies. There are several good reasons why it is time to exploit the potential of small wind turbine systems in our country albeit through a combined effort from Public and Pvt Sectors. Firstly, there is the potential for real contribution to our energy supply, however minuscule it may be, towards the ultimate goal of self-reliance for energy needs. Second, an indigenously developed small wind turbines being a simple technology, can become a huge homegrown industry.

Thirdly, the market for small wind turbines also fuels companion industries, including those that market composite products, steel, towers, power electronic equipment, and construction projects. Fourth, while producing energy, small wind turbines produce no environmental emissions. Fifth, small wind turbines will help meet the national need for energy diversification and national security.

1.2 THIN FILM:-

In rigid thin-film modules, the cell and the module are manufactured in the same production line. The cell is created on a glass substrate or superstrate, and the electrical connections are created *in situ*, a so-called "monolithic integration". The substrate or superstrate is laminated with an encapsulate to a front or back sheet, usually another sheet of glass. The main cell technologies in this category are CdTe, or a-Si, or a-Si+uc-Si tandem, or CIGS (or variant). Amorphous silicon has a sunlight conversion rate of 6–12%

Flexible thin film cells and modules are created on the same production line by depositing the photoactive layer and other necessary layers on a flexible substrate. If the substratean insulator (e.g. polyester or polyimide film) then monolithic integration can be used. If it is a conductor then another technique for electrical connection must be used. The cells are assembled into modules by laminating them to a transparent colourless fluoropolymer on the front side (typically ETFE or FEP) and a polymer suitable for bonding to the final substrate on the other side.

2. PROJECT REVIEW

HYBRID ENERGY SYSTEM:

Hybrid energy system is the combination of two energy sources for giving power to the load. In other word it can defined as "Energy system which is fabricated or designed to extract power by using two energy sources is called as the hybrid energy system." Hybrid energy system

has good reliability, efficiency, less emission, and lower cost.

In this proposed system solar and wind power is used for generating power. Solar and wind has good advantages other than any other non-conventional energy sources. Both the energy sources have greater availability in all areas. It needs lower cost. There is no need to find special location to install this system.

2.1 Vertical Axis Wind Turbine:

Vertical axis wind turbines have the main rotor shaft running vertically. The tower construction is simple here because the generator and gear box can be placed at the bottom, near the ground.

Vertical axis wind turbine can be classified into two types

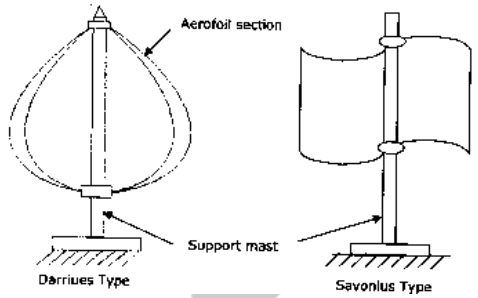
1. Darrieus type
2. Savonius type

Darrieus type rotor

This wind mill needs much less surface area. It is shaped like an egg beater and has two or three blades shaped like aero foils.

Savonius type rotor

Savonius turbine is S-shaped if viewed from top. This turbine turns relatively slow, but yields high torque. It is used for grinding grains and for pumping water.



Vertical-axis wind turbines (or VAWTs) 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, for example when integrated into buildings. The key disadvantages include the low rotational speed with the consequential higher torque and hence higher cost of the drive train, the inherently lower power coefficient, the 360 degree rotation of the aerofoil within the wind flow during each cycle and hence the highly dynamic loading on the blade, the pulsating torque generated by some rotor designs on the drive train, and the difficulty of modelling the wind flow accurately and hence the challenges of analyzing and designing the rotor prior to fabricating a prototype.

2.2SPECIFICATIONS OF THE WIND TURBINE:

BASE DIMENSIONS:-

Height : 48 inches

4. BLOCK DIAGRAM:

Width : 40 inches

BLADE DIMENSIONS:

Height :18 inches

Diameter : 13 inches

Thickness : 0.125 inches

Angle : 45 °

Angle b/w blades : 60°

SHAFT DIMENSIONS :

Diameter : 8 mm

Length :8 inches

Nut and bolts : 5mm / 10mm ms steel bolts

1.3. SELECTION OF MATERIAL

2.3.1 Fig : frame

2.3.2 Fig : gear

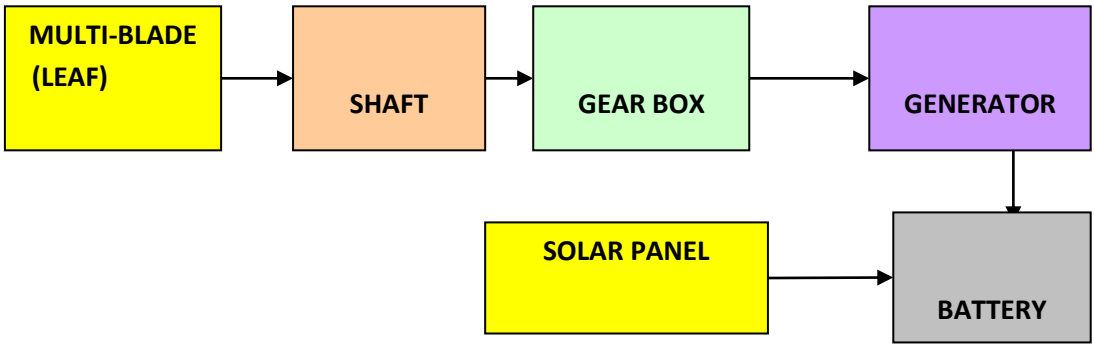
56 teeth gear: ms steel

Size: 3mm thickness

Outer dia : 30 mm

2.3.3 Fig : dc motor

pmdc motor 12v 500 rpm



4.1Power& Sources:

In a macro-meteorological sense, winds are movements of air masses in the atmosphere mainly originated by temperature differences. The temperature gradients are due to uneven solar heating. In fact, the equatorial region is more irradiated than the polar ones. Consequently, the warmer and lighter air of the equatorial region rises to the outer layers of the atmosphere and moves towards the poles, being replaced at the lower layers by a return flow of cooler air coming from the Polar Regions. This air circulation is also affected by the Coriolis forces associated with the rotation of the Earth. In fact, these forces deflect the upper flow towards the east and the lower flow towards the west. Actually, the effects of differential heating dwindle for latitudes greater than 30oN and 30oS, where westerly winds predominate due to
the rotation of the Earth. These large-scale air flows that take place in all the atmosphere constitute the geostrophic winds.

The lower layer of the atmosphere is known as surface layer and extends to a height of 100 m. In this layer, winds are delayed by frictional forces and obstacles altering not only their speed but also their direction. This is the origin of turbulent flows, which cause wind speed variations over a wide range of amplitudes and frequencies. Additionally, the presence of seas and large lakes causes air masses circulation similar in nature to the geostrophic winds. All these air movements are called local winds.

The power in the wind can be computed by using the concepts of kinetics. The wind mill works on the principle of converting kinetic energy of the wind to mechanical energy. The kinetic energy of any particle is equal to one half its mass times the square of its velocity.

Kinetic Energy =½ mv2.

Amount of Air passing is given by

m = ρ AV ……..(1)

Where

m = mass of air Trans versing

A=area swept by the rotating blades of wind mill type generator

ρ = Density of air

V= velocity of air

Substituting this value of the mass in expression of

K.E. = ½ ρ AV.V2 watts= ½ ρ AV3 watts …….. (2)

Second equation tells us that the power available is proportional to air density (1.225 kg/m3) & is proportional to the intercept area. Since the area is normally circular of diameter D in horizontal axis aero turbines, then,

A = πD2 (Sq. m)

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4.2 CHARACTERISTICS & SPECIFICATIONS OF WIND TURBINES

4.2.1Wind Speed:

This is very important to the productivity of a windmill. The wind turbine only generates power with the wind. The wind rotates the axis (horizontal or vertical) and causes the shaft on the generator to sweep past the magnetic coils creating an electric current.

4.2.2 Blade Length:

This is important because the length of the blade is directly proportional to the swept area. Larger blades have a greater swept area and thus catch more wind with each revolution. Because of this, they may also have more torque.

4.2.3 Base Height:

The height of the base affects the windmill immensely. The higher a windmill is, the more productive it will be due to the fact that as the altitude increases so does the winds speed.

4.2.4 Base Design:

Some base is stronger than others. Base is important in the construction of the windmill because not only do they have to support the windmill, but they must also be subject to their own weight and the drag of the wind. If a weak tower is subject to these elements, then it will surely collapse. Therefore, the base must be identical so as to insure a fair comparison.

4.2.5 Requirements For Placing :

Site Selection considers the power available in the wind increases rapidly with the speed; hence wind energy conversion machines should be located preferable in areas where the winds are strong & persistent. The following point should be considered while selecting site for Wind Energy Conversion System
(WECS).

High annual average wind speed

The wind velocity is the critical parameter. The power in the wind Pw, through a given X – section area for a uniform wind Velocity is

Pw = KV3 (K is constant)

It is evident, because of the cubic dependence on wind velocity that small increases in V markedly affect the power in the winde.g. doubling V, increases Pw by a factor of 8. Availability of wind V(t) curve at the proposed site. This important curve determines the maximum energy in the wind and hence is the principle initially controlling factor in predicting the electrical o/p and hence revenue return of the WECS machines, it is desirable to have average wind speed V such that

V≥12-16 km/hr i.e. (3.5 – 4.5 m/sec).

Wind structures at the proposed siteWind especially near the ground is turbulent and gusty, & changes rapidly indirection and in velocity. This departure from homogeneous flow is collectively referred to as "the structure of the wind". Altitude of the proposed site If affects the air density and thus the power in the wind & hence the useful WECS electric power o/p. The wind tends to have higher velocities at higher altitudes.

5. BATTERY

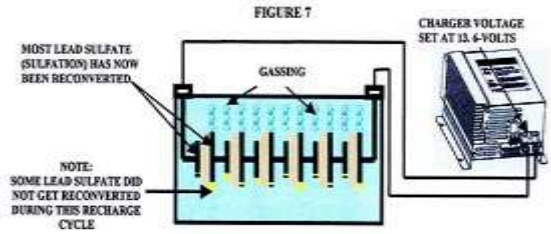
In our prototype, we use 12v battery and they have variety of uses in our daily life. From consumer electronics to robotics, from health care products to industries, almost every second device we use has one battery or the other. Battries have become an indispensible part of our lives. We cannot comprehend living without cellphones, torches, laptop computers, music players like the ipod, but how do we power them up? Answer lies in the battries. Similarly cars are one of the main modern day necessties which use battries to power the head lamps and backlights. In electricity, a battery is a device consisting of one or more electromechanical cells that convert stored chemical energy into electrical energy. Since the invention of the first battery (or "voltaic pile") in 1800 by Alessandro Volta and especially since the technically improved Daniell cell in 1836, batteries have become a common power source for many household and industrial applications. According to a 2005 estimate, the worldwide battery industry generates US$48 billion in sales each year,[2] with 6% annual growth.

There are two types of batteries: primary batteries (disposable batteries), which are designed to be used once and discarded, and secondary batteries (rechargeable batteries), which are designed to be recharged and used multiple times. Batteries come in many sizes; from miniature cells used to power hearing aids and wristwatches to battery banks the size of rooms that provide standby power for telephone exchanges and computer data centers.

Fig 5. Battery

A battery is a device that converts chemical energy directly to electrical energy It consists of a number of voltaic cells; each voltaic cell consists of two half-cells connected in series by a conductive electrolyte containing anions and cations. One half-cell includes electrolyte and the electrode to which anions (negatively charged ions) migrate, i.e., the anode or negative electrode; the other half-cell includes electrolyte and the electrode to which cations (positively charged ions) migrate, i.e., the cathode or positive electrode. In the redox reaction that powers the battery, cations are reduced (electrons are added) at the cathode, while anions are oxidized (electrons are removed) at the anode.[23] The electrodes do not touch each other but are electrically connected by the electrolyte. Some cells use two half-cells with different electrolytes. A separator between half-cells allows ions to flow, but prevents mixing of the electrolytes.

During the recharging process as electricity flows through the water portion of the electrolyte and water, (H2O) is converted into its original elements, hydrogen and oxygen. These gasses are very flammable and the reason your RV or Marine batteries must be vented outside. Gassing causes water loss and therefore lead acid batteries need to have water added periodically. Sealed lead acid batteries contain most of these gasses allowing them to recombine into the electrolyte. If the battery is overcharged pressure from these gasses will cause relief caps to open and vent, resulting in some water loss. Most sealed batteries have extra electrolyte added during the manufacturing process to compensate for some water loss.



5.1ARC WELDING:

Arc welding uses a welding power supply to create an electric arc between an electrode and the Base material to melt the metals at the welding point. They can use either direct (DC) or alternating (AC) current, and consumable or non-consumable electrodes. The welding region is sometimes protected by some type of inert or semi-inert gas, known as a shielding gas, and/or an evaporating filler material. The process of arc welding is widely used because of its low capital and running costs

The following gauge lengths of electrodes are used in this process 8, 10&12mm. The number of electrodes used in this fabrication is around 40-45 electrodes.

Fig.5.2. solar panels

5.2 SOLAR ENERGY:

The surface of the earth receives about 10^{14} kW from sun in the form of solarenergy which is approximately five orders of magnitude greater than that currently being consumed from all resources. It is evident that sun will last for 10^{11} years.

Fig-Solar Plate

There are two obvious obstacles to harnessing solar energy.

Firstly it is not constantly available on earth. Thus some form of storage is needed to sustain solar energy through the night and during rainy season. Secondly the solar energy is diffused. Although the total amount of energy is enormous, the collection and conservation of solar energy into useful forms must be carried out over a large area which entails large capital investments.

By using solar radiation, water or any fluid can be heated by using a solar collector. Such systems can provide hot water for different applications in industries directly or as boiler feed and also in hostels, hotels and canteens.

6. CONCLUSION:

There is a need for the provision of an alternative sustainable electric power supply system for providing electricity to rural and the unreached communities. The vision of hybrid solar -wind energy system to power ICT infrastructures, banking and hospitals in rural and the unreached communities that are not connected to National Grid Power supply system is very important so as to maintain a continuous electricity supply. When considering the cost and overall efficiency, it is advisable for all the stakeholders who have concernfor the rural community development to embrace solar and wind power.

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