



# Effective Utilization of Wind and Solar Energy by Hybrid Power Generating System

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## Abstract:

Power is one of the most critical components for the economic growth and welfare of nation. Due to the shortage of conventional resource the power generation range will changes to nonconventional resource like solar and wind...In this machinery life necessity of electricity must be equalized according to our demand. In order to meet the increasing demand for electricity in the country massive addition to the installed generating capacity is required. In this research vertical wind mill along with photovoltaic panel is proposed for hybrid power generation. In wind mill vertical type blades are used to produce electricity. Vertical wind mill is placed on the top the building roof then it can sense and capture more wind energy and save more work space. There are many blade types are to be used like wood, PVC, aluminum, and fiber. Here PVC which will be give more efficient output and long last able. Considering of different shaped blades were 'C' shaped wind blade will be used. For further increase the electricity photovoltaic panel is placed along with vertical axis wind mill. This wind mill along with photo voltaic panel is used in hydro power plant to increase electricity wind turbine, photo voltaic panel, wind mill are used to increase the production of electricity.

**Keywords:** DC Generator, Solar panel, Coupling pipes, Blades, Bearing

## 1. INTRODUCTION

India is one of the nations in the world with fastest growing economy. Today the technology is increased day by day. The technology will be increased on the basis of energy. The energy can be developed in two ways like renewable and non renewable. Energy demand is increased with usage of fossil fuel which increase global warming, air pollution and climate changing will be occur. Depending technology based on energy production energy is produced by renewable or non renewable energy sources(solar, wind...).due to the shortage of the non renewable energy resource we want to find some other way to produce energy.in 21th centaury the energy will be developed on the basis of renewable energy resource. This paper based on change renewable energy resource like wind and solar which plays an important role to produce energy. Wind will be the clean energy in the fastest growing source in the world wide. To utilizing the wind energy horizontal type wind mills are used .The horizontal type wind mill arranged with three air foil shaped blades are arranged and the wind comes in to the face and generator will start to rotate due to the movement of the blades and produce electricity. The major issue with this technology is fluctuation and the intensity price of installing wind farm is very high. The generated energy from wind farm is less than the capital investment. To rectify this problem this paper implements the changing of horizontal base blade into vertical type blade. Using vertical axis wind turbine (VAWT) can achieve wind from all direction. To increase the energy production additional photo voltaic panel this is placed on the top of the wind mill. Using this hybrid arrangement energy production is increased. PVC which will be used for the construction of the rotor blades. The paper explains to set of dual generators are placed on the single shaft. Due to this forced air which will hits on the turbine and starts to rotate at high speed. To achieve the required torque with short duration wind turbine is placed on the top of the building.by this we achieve maximum amount of wind without any disturbances like trees, buildings

and other disturbing objects. Here we implement three set vertical axis wind turbine which is arranged on triangular shape and photo voltaic panel will placed on the top of the wind turbine to achieve maximum output.

## 2. LITERATURE SURVEY

1)Design and fabrication of vertical axis high way wind mill,S V Saravanan,M Varatharaj.L,Ayyadurai,S.palani,ISSN:2278-8948,volume-2.issue-2,2013 says that day to day life the demand of electricity increased and he introduced vertical axis high way wind mill to produce electricity by using force of air created by the moving vehicle in high ways with effective and efficient output.

2) A low order model for offshore floating vertical axis wind turbine, Brain Hand, Andrew Cash man, Ger Kelly ,aero dynamics IEEE Transaction on industrial applications vol:53issue 1 jan26-01-2017 Here cascaded low order vertical axis wind turbine is placed on the deep sea to account for unsteady aerodynamic effects and also steady about the numerical efficiency and, stability, an iterative time advancement scheme with an adaptive under relaxation has been integrated in the developed model. And also tell it will produce average normalized root mean square for the vertical axis wind turbine normal and tangential co efficient

3)Comparison of power electronics life time between vertical and horizontal axis wind turbine; Max Alexander Parker, Conalil Soraghan; alex Giles; IET renewable power generation vol 10,issue 5, 2016, Here the comparison will be made up for the power electronics life time for 5MW for two types of wind turbine. Here considering both two and three blade stall regulated to rotor vertical axis wind turbine was modelled with several different parameters and found vertical axis wind turbine has not only low life time but also power consumption is low

4) Design and implementation of straight bladed vertical axis wind turbine with collective of pitch control, mechatronics and automation (ICMA), 2015 IEEE, 2015, in order to improve self starting capacity of straight blade VAWT a prototype with collective pitch control as developed. The pitch angle of each blade was adjusted by a blade pitch control mechanism consisting wheel attached to the blade and servo motor and motion of each blade was half of the rotor. The results indicate that it is effective to improve self starting capacity in two bladed configuration is a little larger than four bladed rotor under the condition of same rotor solidity

### 3. BLOCK DIAGRAM

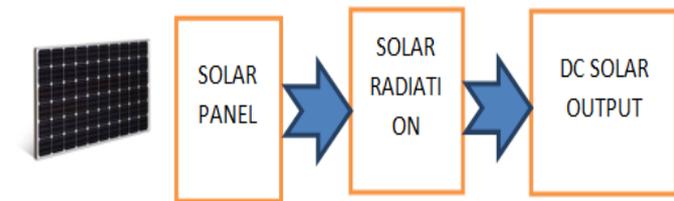
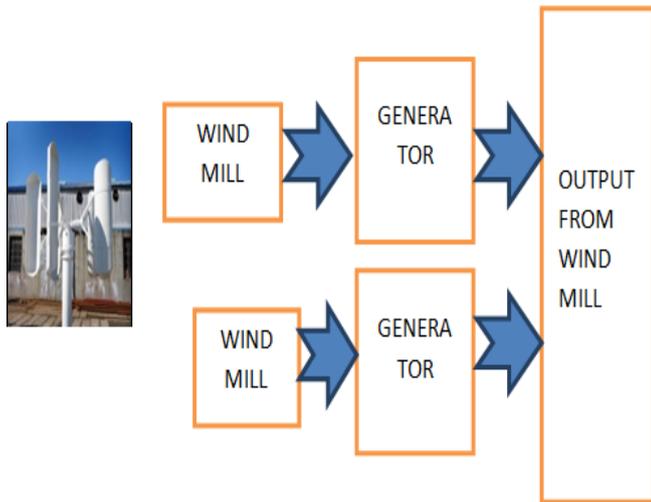
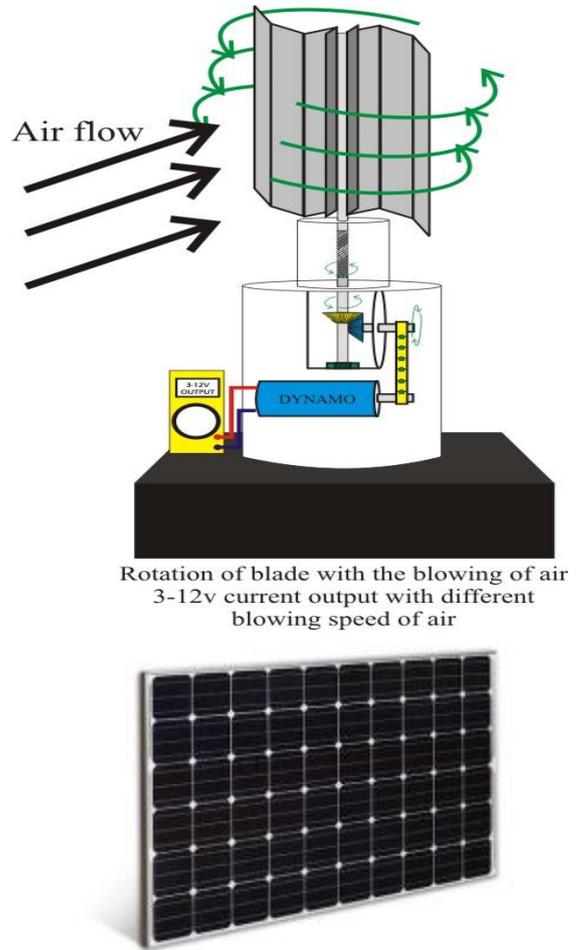


Figure.1. Block diagram of proposed method

### 4. WORKING

Generally at present only one generator is placed in the wind turbine. Which gives us only limited power output. As because the type of wind turbine preferred is horizontal type. Here in order to get the continuous high unlimited power output, The vertical axis wind turbine with three generators is preferred and is fixed on to the top of the buildings. From power output is obtained since three generators are used in a single wind generator setup. With this setup a hybridizing technique is added that contain photo voltaic generation along with wind generation. Since the power output from wind turbine generation is AC and we get DC output from the solar panel



Rotation of blade with the blowing of air  
3-12v current output with different blowing speed of air

Figurer.2. solar and wind generator

By implementing hybridized technique we can get more power from these two renewable resources

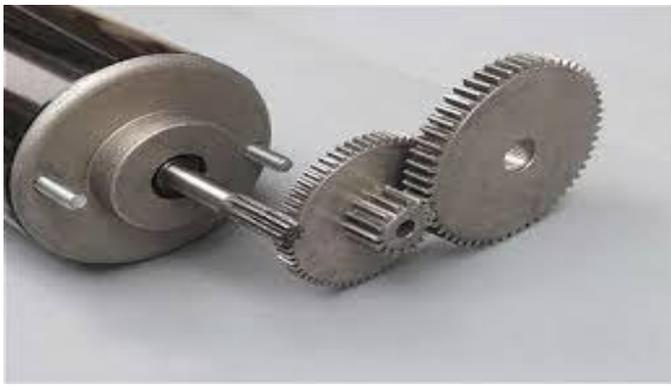
### 5. OPERATION

Here the vertical axis winds mill and solar panel which will be placed on the top of the building. When we place the whole setup at the lower places it can't access full amount of wind and solar energy for the production of electricity. To rectify this problem the whole set up which will be placed on the top of the building to access more wind and solar radiations without any disturbances. Here the developed wind and which will hits on the vertical axis wind blade and it will start to rotate .Here the shaft which will be connected with the generator to produce electricity and the power can be stored in the battery for future use. Here the three motors which will be connected as serially to get more voltage. And also the project which analysis that the generation amount on different blade materials.

### 6. COPONENTS

#### A. DC Generator:

The alternators or DC generators are the heart of the windmill and it must be properly sized to match your swept area and to produce right type of power to match your application. The unit needs to make higher voltages at lower rpms, otherwise it is not Suited for wind power use, even motors can also be used a generators. In this vertical



**Figure.3. DC generator**

axis windmill we are using three dc generators coupled with the wind blade Turbine

**Table.1. Blade Turbine**

TYPE	RPM	WATTS	VOLTAGE	AMPS
DC GEAR MOTOR	1000 rpm	1.2 watts	12 volts	100 mA

**B. Angular Bevel Gears:**

These are bevel gears whose shafts are set at an angle other than 90 degrees. They are useful when the direction of a shaft's rotation needs to be changed. Using gears of differing numbers of teeth can change the speed of rotation. These gears permit minor adjustment of gears during assembly and allow for some displacement due to deflection under operating loads without concentrating the load on the end of the tooth.

**Table.2. Spur gear dimensions**

COMPONENTS	OUTER DIAMENSIONS	INNER DIAMENSIONS	NUMBER OF TEETH	THICKNESS
SPUR GEAR ATTACHED WITH SHAFT	3 inch	16mm	72	12mm
SPURGEAR ATTACHED WITH MOTOR	1 inch	16mm	28	12mm

**C. Ball bearing**

A ball bearing is a type of rolling-element bearing that uses balls to maintain the smoothness to the rotation of blades. The purpose of a ball bearing is to reduce friction and support radial and axial loads. It achieves this by using at least two races to contain the balls and transmit the loads through the balls. In most applications, one race is stationary and the other is attached to the rotating where the wind blades are connected.

**Table.3. Ball bearing dimensions**

TYPE	OUTER DIAMENSION	INNER DIAMENSION	WIDTH
Ball bearing(6202)	35mm	16mm	12mm



**Figure.4. ball bearing**

If the bearing races rotate it causes the balls to rotate as well. Because the balls are rolling they have a much lower coefficient of friction

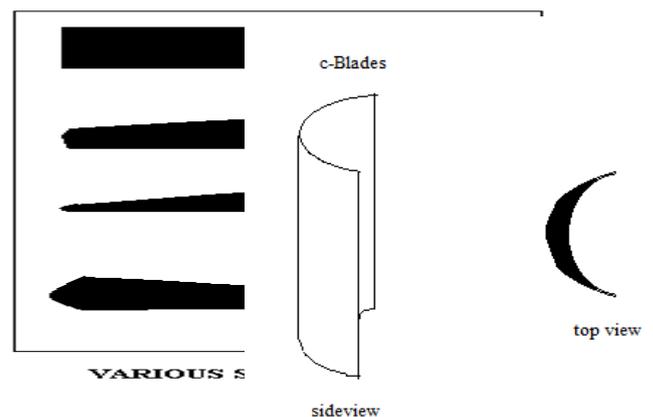
**D. BLADE SELECTION**

The blades are available in plastic, non-metallic, brass, steel and cast iron and are manufactured in a variety of styles. The material that we are selecting should be more weight less and it should be able to withstand at high air pressure. They are made with many different properties. Factors like design life, power transmission requirements.

**E. TYPES OF BLADES**

- a) Flat, unmodified blade surface.
- b) Wing shape with one leading edge
- c) Both edges tapered to a thin line.
- D) Both edge leading type
- f, Design of blades:

The design of blades the selection material is very much important because of that material should be weight less and it should be able to withstand at high air pressure. For that a special type of PVC can be used it has light weight and it can be able to withstand at high air pressure. Here we also compare different blades with different sizes and compare the generated output from each shape and size of the blade and analyse the blade which gives more wind output. The next important thing is to choose a blade shape. The c-type blade is suitable for vertical axis windmill...Because its shape can be able to collect maximum air pressure and it can be able to give maximum energy transformation from forced wind energy to



**Figure.5. blade shape**

Rotational mechanical energy. In vertical axis wind turbine which normally placed on the top of the building to catch full amount of wind. Here we analyse the generation with different shapes of the blade.

**G. PHOTOVOLTAIC CELLS:**

The photo voltaic devices generate a voltage in proportion to the glittering light from the sun at day time and the received energy are analogous in impact to electrical conduction. The Light energy consists of two semiconductor sandwiched materials along with making a voltage of roughly 0.5 V. The most common kind of electrical phenomenon light sensor or cell.



**Figure.6. solar panel model**

Then the light energy is converted into the DC power with the help of Solar cell within the sort of a voltage or current to an influence a resistive load like a light, battery or motor. Photo voltaic cells are used in many varieties of applications to supply another power supply from typical batteries, like in calculators, satellites and currently in homes providing a sort of renewable power. Photovoltaic cells 12\_ 13 square measure made of single crystal element PN junctions, a similar as photodiodes with a really massive light sensitive region however square measure used while not the reverse bias. The unique cell generates the circuit voltage of 0.58 V or 580 M v by lighting the sunshine which causes the electrons for flowing to the PN junction. These solar cells also having the positive and negative aspects which are same as the battery. The Solar panel is measured by Watts which is calculated by multiplying the output voltage and current value.

**7. ADVANTAGE**

- Vertical axis wind turbine can produce electricity in any wind direction.
- The generator, gear box and other components are placed on the bottom and by this we can reduce strong supporting towers.
- Production cost is low compared with horizontal axis wind turbine.
- There is no need of pointing turbine in wind direction to be efficient and pitch mechanism is not needed.
- Easy installation compared with other wind turbine.
- Easy to transport from one place to other place.
- Maintenance cost is low.
- Vertical axis wind turbine can be install urban areas and can place on top of the buildings.
- Low risk for human and birds because blades moves at relatively low speed.
- They can be particularly suitable for areas with extreme weather condition like in the mountains where they can supply electricity to mountain hub.

**8. DISADVANTAGE**

- They need initial push to start this action use few of its own produce electricity.
- When compared to horizontal axis wind turbine efficiency is very less this is because they have an additional drag when their blades drag.
- As only one blade of wind turbine work at a time so efficiency is low.

- They have relative high vibration because the air flow near the ground creates turbulent flow.
- Vibration bearing wear increases which results in the increase of maintenance cost.

**9. RESULT**

The output from the single generator will be 12 volt and we serially connect three set of generator in a single set up and approximately 62 volts will be produced on there. Here we combine three set of vertical axis wind turbine to increase the output voltage. Solar panel which will be effectively hybridized with vertical axis wind turbine to increase output voltage. By this net output will be effectively increase up to 78 volts without change in ampere rating

**Table.4. Single dc generator set up output**

S.No	Volts	Current	Speed in rpm	Power
1	7	0.352	608	2.569
2	5.4	0.260	449.8	1.404
3	4.8	0.231	399.8	1.108
4	2.9	0.140	241.5	0.406
5	1.7	0.821	141.6	1.395
6	0.4	0.193	33.3	0.0772

**Table.5. Three dc generator set up output**

	OUTPUT POWER	MAX.OUTPUT CURRENT	MAX.OUTPUT VOLTAGE
SINGLE PANEL	20 W	1.15 A	17.20 Volt

**Table.6. Serially connected three generator output**

S. No	Volts	Current	Speed in rpm	Power
1	7	0.352	608	2.569
2	5.4	0.260	449.8	1.404
3	4.8	0.231	399.8	1.108
4	2.9	0.140	241.5	0.406
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**10. CONCLUSION**

In the near future, wind energy will be the most cost effective source of electrical power. In fact, a good case can be made for saying that it already has achieved this status. The actual life cycle cost of fossil fuels is not really known, but it is certainly far more than the current wholesale rates. The eventual depletion of these energy sources will entail rapid escalations in price which averaged over the brief period of their use will result in postponed actual costs that would be unacceptable by present standards. And this doesn't even consider the environmental and political costs of fossil fuels use that are silently and not-so-silently mounting every day. Thus utilizing the wind and solar energy by hybrid power generating technique it can generate more energy with efficient output continuously. By implementing three generators with three setup and placed at the bottom of the proposed system can increase in the output power obtained by placing the wind turbine in top most building. Main advantage is that each and every person can buy this type of small wind mill with lowest price

## 11. FUTURE SCOPE

- To increase electricity wind turbine, photo voltaic panel along with the water turbine is used in hydro power plant to increase power production and easy to connect the supply to grid
- Heat from the sun light captured by the solar thermal system. Using that heat normal water converted to steam. This steam can be used as a rotation initiator of the wind turbine .so it become more efficient than the conventional system

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