

HYBRID AUTOMATIC DUAL AXIS SOLAR TRACKING SYSTEM ALONG WITH WIND POWER

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Abstract: Our main objective of this project is to develop a very precise solar tracker. This project is classified into two portions; hardware and software. The solar panel, LDR sensor module, two DC stepper motors attached with gearbox and controlled by electronic circuit are the hardware parts. The understanding capability of our system was represented by the software part; by this several weather conditions of our system is acting. The sun position is sensed at two stages that are primary stage and secondary stage. The position controlling system uses the first stage or sun and earth's geometrical characteristics only helps to identify the presence of the sun if the climate is cloudy or dusty; so, the position where the sun is tracked by the system which does not based upon on the climatic condition. Based upon the solar irradiance from any solar collectors or photovoltaic the energy can be extracted. The alignment of the solar collector keeps changing to get maximum power from the sun; here the solar collector changes the position by using the solar trackers. It should be always maintained at the minimum tilt angle. The energy efficiency of the PV panel is improved by the solar position controlling system. Light Dependent Resistor (LDR) and with the gear arrangement mechanical structure of a DC stepper motor is employed for developing and designing the solar position controlling system in automatic dual axis. The automatic solar position controlling system was one of the most efficient and more reliable methods than the fixed method.

Keywords: Renewable source, wind energy, solar energy, photovoltaic cell, Hybrid power production are certain keywords of this paper.

1. Introduction

A certain photovoltaic module were electrically fabricated and placed for main purpose that is supporting the main structure.

The electricity is generated and supplied to the residential and commercial applications. A bigger photovoltaic system is used for generation purpose. Each module of the photovoltaic system is rated under the Standard test conditions (STC), and mainly the range is from 110 to 300 watts. Solar panels are collectively used for the photovoltaic system. Based upon the area the efficiency of the plant can be determined.

Usual efficiency of the plant is 8% for 220-watt module. If the area is correctly chosen then the efficiency is increased up to 16%. Certain of the solar pv has the efficiency up to 19%. Comparing with single module, more produce more amount of energy. Installation process is mainly based upon the efficiency of the area.

A Photo Voltaic system consists of an array of solar cells or panel, an inverter circuit, and a battery and or solar panel position changer and wiring system. For the past wind turbines are ranged in their rated powers from 25 to 50kW, with rotor radius from 10 to 15 meters. Commercial wind turbine was now having ratings over 2 MW and turbines for the application based and offshore usages have rated power outputs having 5 and even 7-8 MW of rated power for off-shore wind loads. Bigger sizes are preferred for two reasons. They are cheap in cost and they produce more power.

The rotor position is located in higher position from the ground, hence the energy developed is improved and therefore it produces the high force winds and they are partially more efficient.



The production about 500 kW electrical turbines is around 40 percent more than that of the 50 kW electrical machines. The reliability of the system is developed constantly with wind turbine and the manufacturers gives guaranty that is the availabilities of the 95 percent Wind energy process consists of the major components, they are the rotor and their blades, the hub assembly chamber, main shaft, yaw mechanism, the gear box, main frame, transmission, over speed protection chamber, nacelle, yaw driver, power conditioning circuit, and tower electric generator.

2. Solar Panel Construction

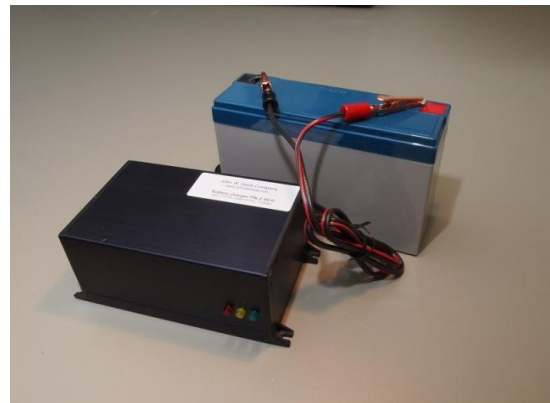
The electric power could be produced from the photovoltaic effect by using the solar modules. That the light radiations from the sun are used as the input for the solar modules. The majority of array use wafer-based crystalline silicon cells and thin-film cells based on cadmium telluride gel or silicon crystal.

The top or the black layer is the load carrying member of the module. Solar cells must be protected from the mechanical damage and also from the moisture. Solar arrays are especially rigid in structure, but semi-flexible which is available depends on thin-film solar cells. The old year's solar modules were used in space in 1958. The circuit are made in both series and parallel.

In series to get a required output and in as parallel to produce a required current capability. The current conducting wires of the array may have many things, which are consisting of silver and copper or other non-magnetic transition metals. In external the PV use MC3 in older days or use MC4 for the weather proof connection for the remaining system. The electrical system is connected to each other.

To maximize the final output of the PV array bypass diodes is incorporated at externally with connection to the partial shading. There are more methods available for improving the system efficiency. In now-a-days the light is concentrated on to the lenses or modules by using the concentrators on the solar photovoltaic modules, in which the cells have more paisa per unit area such as gallium arsenide in a very efficient manner.

More number of solar cells was coordinated in a group and is integrated in a plane to manufacture a solar photovoltaic panel. More number of solar arrays was coordinates to make a solar power plant. The PV module, which consists of a sheet of glass on the sun light falling side, which allows the sunlight to pass hrough the solar panels while it protects the semiconductor wafers. Since the solar cells are connected in the series manner it creates the additive voltage.



While if we connect the cell in parallel then it yields high current. Here some problems were arrived in the parallel strings because of shadow effect, which causes the power loss and also gives damages to the system. It is because of reverse bias effect applied to the cells by their illumination. Parallel string means number of series connected cells.

The series cells are always independently handled and are not connected in parallel manner, though separate power box supply is available for separate module, and are connected in parallel. All the modules are interconnected to make the array of the system with the required voltage and current. The maximum power point tracking is preferable for the independent array of the system. By employing this method, the power loss is reduced.

Otherwise, the series or parallel connected cells can reduce the power loss using the shunt diodes.

2.1. Battery Chargers:

We provide more related chargers that are very friendly to use. The battery chargers are always automated and fully regulated; continuous shorting will not affect the charger.

The voltage will be regulated by having voltage regulator as 12V and it will have controlled during discharge also as 12V.

2.2. Power Supply:

The source of electrical power is power supply. The system which supplies the electrical power or other source of energy to particular system is called power supply unit.

There are more types of energy which is available in the world to control the load system. Power supply unit (PSU) is the acronym is most usually employed to

electrical power supplies, less often to mechanical ones, and very frequently to others.

3. Wind Construction

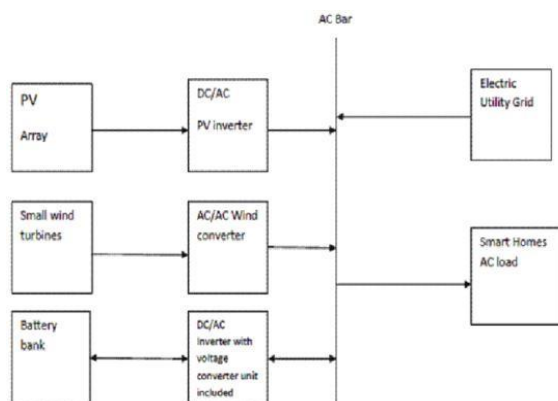
Nowadays in the energy industry wind energy project is most advanced one in the utility scale. Wind energy is one of the very efficient recognition powers while comparing other source of energy in our country, which eliminates the energy need in our country. White construction is the base of the planning in the budget planning and scheduling to construction management in the every part of the system. In every part, the stage white construction takes responsible for the maximum cost reduction that means saving in every design work for the client.

This leads to increase the production of the system for the customers. And also, it reduces the environmental effects at every stage.

3.1. MEMS Sensor:

MEMES (microelectromechanical system), Which will analyses faults that happens in the wind turbine. Faults such as high rotor speed due heavy winds or due to control failure of rotor chamber and pitch angle faults can be also measured using this type of sensor. Generator speed also can be sensed using this sensor and Signal will be sent to the person in charge and fault will be displayed in LCD display.

3.1. Block Diagram:



3.2. Working Principle:

In this system energy is generated by combination of solar photo voltaic and wind turbine known as hybrid system. In this system battery plays an very important

role because energy produced from both solar and wind will be stored in battery.

Because of hybrid system either of energy can be generated, if wind energy is available wind turbine will generate power and if solar energy is available solar energy will generate power and if both energy are available, then energy produced will be stored in batteries for uninterrupted power supply to load. The electrical energy produced from wind turbine is AC and so it is passed through AC - DC rectifier.

The energy produced from wind mill will be passed through boost converters. For solar system also boost converter have been used for the correction. Microcontrollers are employed in this system for control purposes. PIC is used in this system, where signals from LDR will be received by PIC and according to the program written in controller those signals will be processed and according to that panel will rotated and solar energy will be tracked by tracking system.

RTC unit also incorporated in this system and it will send time signal according to that generated power and values will be sent to customer via Bluetooth.

3.3. Implementation:

Hybrid energy system and its energy resource unbalance plays a vital role in installing a hybrid energy supply system. The Hybrid Solar Photo voltaic and wind system is capable for conditions where both sunlight and wind will be available seasonally.

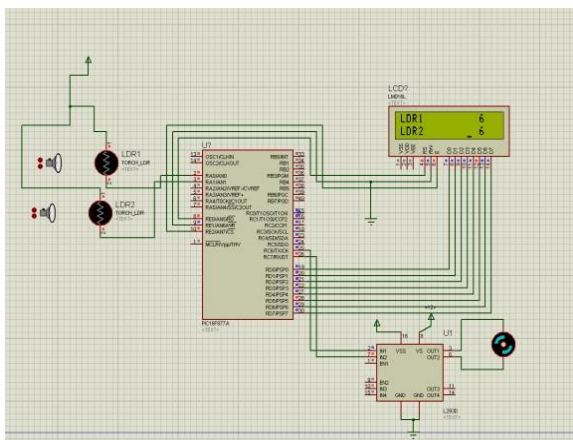
As throughout the day wind will not be available at same time sun light also will not be available for entire day, so it is best to opt for both sunlight and wind. Harvesting electrical power with combination of wind and solar and produced energy will be stored in battery which is a realistic power source. Even if there is no availability of wind and solar energy load can be run by using power saved in battery.

In order to provide customers with low cost of energy and also with maximum efficiency is done using hybrid solar wind system. Because of high cost of solar panels, it is less competent to design larger capacity plants. So only we have introduced wind turbine along with solar power in order to reduce the cost of production of electrical power.

Energy produced by solar and wind will have stored in battery for use during unavailability of power. Wind energy will be available during day as well as night times, which will only increase the reliability of the system and power plant. During the monsoon seasons, availability of sun light during day time will be less. So, hybrid system will be suitable.

4. Simulation

We have done simulation with proteus software. PIC 16f877a has been used for control purposes. Components used in simulation are two LDR sensors, PIC micro controller, motor control IC, Switch, LCD display and DC motor are used. According to the coding dumped in PIC, when light intensity in a LDR increases, actuator in opposite direction will rotate and same will happen for another LDR. Light intensity will be displayed in LCD display. And a switch has been used to either on or off the load in practical.



4.1 Experimental Setup:



The current readings and voltage readings from the wind turbine, solar panels, battery and load are measured in the proposed system. Production and consumption of electrical energy for each are calculated.

5. Conclusion

In the present work a Hybrid solar photo voltaic and wind system was implemented. A part of the energy requirement for a private house, farm house, a small company, an educational institution or an apartment depending based on their need at their location can be obtained. People need not depend on single resource. So, it will improve the reliability of resource.

So, it will increase the efficiency of the entire system having hybrid mode of generation and revolution in energy production.

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