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Hybrid-Solar and Wind Power Water Pumping System

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Abstract: *As we see there is enough wind and solar energy globally to satisfy as much as humanity's energy requirements. vertical axis wind turbines (VAWT) may as efficient as current horizontal axis system, might be practical and significantly cheaper to build and maintain than horizontal axis wind turbine (HAWT). They have other original advantages, like they are always facing the wind, which might make them a significant player in our daily routine for low cost, cleaner renewable sources of lifting water. The growing popularity of solar wind pumps in many rural areas, these areas typically have no access to electricity or shortage of electricity, which creates a problem when it comes to irrigation and watering livestock. VAWT's might even critical in mitigating grid interconnect stability and reliability issue currently facing electricity producers and pump the water from suppliers. Additionally cheap VAWT's may provide an alternative to the rain forest destruction for the growing of bio-fuel crops. In this project we attempt to design and fabricate a Savonius water pumping Vertical Axis Wind Turbine. And also we make our model hybrid- solar and wind mill operated water pump. The solar energy gained by the solar panel and convert that electrical energy into mechanical energy which causes to rotate the shaft which is connected to crank plate. The circular motion of crank plate uses to lift the water as it converted in up and down motion using crank mechanism.*

Keywords: *Solar panel, Wind Mill, Agriculture, Water Pumping.*

I.INTRODUCTION

A pump operates on mutual motion up and down pushing and actuation on a piston which attracts water up out Pumping water was one among the firsts, and vital most essential uses for windmills and mistreatment the energy for turning a millstone to grind grain is additionally essential and also the star plate that's mounted around the wind turbines creates a current within the type of DC current and transfer it to converter.

A converter is a device that changes 'Direct current (DC)' to 'Alternating current (AC)'. Inverter offer this to the battery and also the DC motor via transmission lines.

The DC motor converts the current into the mechanical (rotational) energy and provides it to the foremost shaft that's connected to the crank mechanism. Presently windmills are principally used for the generation of electricity, grinding grain or pumping water.

There's one in a very park simply south of the University of Illinois here that pumps water of the well. Additionally, there is a unidirectional valve to remain the water from flowing back to the well once the pump makes a coming stroke.

A windmill generates motility by turning a shaft. The speed of the turning could also be adjusted by mistreatment gears of varied sizes. To point out the motility of a shaft into mutual motion, a slider-crank mechanism is used. A link is a connected perpendicular to the shaft, and another rod is connected vertically from the sting of the wheel to the pump down below.

As a result of the center of the wheel does, the move, however, the sting goes spherical and spherical, the rod is visiting be a force up. These days, you will be able to generate electricity with a windmill and star plate and connect that to an electrical pump. Now-a-days, solar energy is additionally ordinarily employed in most the fields to urge power.

Starr water pumping system is one among the reliable and also the renewable declares pumping water to the agriculture lands. The value of the water pumped up by physical phenomenon systems is additionally plenty of but that of water pumped up mistreatment standard grid connected.

II.LITERATURE SURVEY

J.Godson et al. (2013)., (1) Renewable energy sources i.e., energy generated from solar, wind, biomass, hydro power, geothermal and ocean resources are considered asa technological option for generating clean energy. But the energy generated from solar and wind is much less than the production by fossil fuels, however, electricity generation by utilizing PV cells and wind turbine increased rapidly in recent years. This paper presents the Solar-Wind hybrid Power system that harnesses the renewable energies in Sun and Wind to generate electricity. System control relies mainly on

micro controller. It ensures the optimum utilization of resources and hence improve the efficiency as compared with their individual mode of generation. Also it increases the reliability and reduces the dependence on one single source. This hybrid solar-wind power generating systemis suitable for industries and also domestic areas.

Ali Diabat (2014)., (2) Among the wide range of problems facing our world today, there is global consensus that greenhouse gas (GHGs) emissions have the largest negative impact on our environment. GHGs include carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, hydro fluorocarbons and perfluorocarbons. These gases help maintain the temperature of the earth at comfortable levels for organisms, and a decrease in their levels would result in a temperature that could be too low for us to survive. However, because GHGs allow sunlight to enter the atmosphere, but trap the heat radiated off the earth's surface, an increase in these emissions would result in an increase of the planet's temperature, or global warming, to levels that could be fatal to living organisms. Many scientists also believe that the increase in natural disasters is fueled by climate.

Chandragupta Mauryan K.S et al. (2014)., (3) Nowadays Renewable Energy plays a great role in power system around the world. It is a demanding task to integrate the renewable energy resources into the power grid .The integration of the renewable resources use the communication systems as the key technology, which play exceedingly important role in monitoring, operating, and protecting both renewable energy generators and power systems. This paper presents about the integration of renewable energy mainly focused on wind and solar to the grid.

Karim Mousa et al. (2014)., (4) Although solar and wind energy are two of the most viable renewable energy sources, little research has been done on operating both energy sources alongside one another in order to take advantage of their complementary characters. In this paper, we develop an optimal design for a hybrid solar-wind energy plant, where the variables that are optimized over include the number of photovoltaic modules, the wind turbine height, the number of wind turbines, and the turbine rotor diameter, and the goal is to minimize costs. Simulation studies and sensitivity analysis reveal that the hybrid plant is able to exploit the complementary nature of the two energy sources, and deliver energy reliably throughout the year.

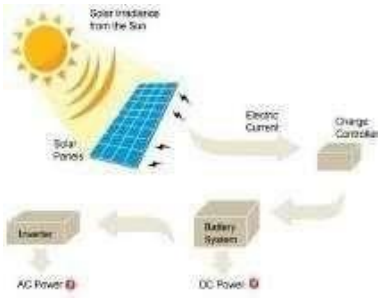
Medugu et al. (2014)., (5) A hybrid power system consisting of PV-arrays and wind turbines with energy storing devices (battery bank) and power electronic device was designed and constructed in this paper. The system is aimed at the production and utilization of the electrical energy coming from more than one source, provided that at least one of them is renewable. The efficiency of the designed power electronic device is about 95% and 73% for capacitive and resistive loads respectively. The integration of the hybrid is to electrifya residential house and its surrounding in order to reduce the need for fossil fuel leading to an increase in the sustainability of the power supply.

Ashish S. Ingole et al. (2015)., (6) 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 the 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 paper deals with the generation of electricity by using two sources combine which leads to generate electricity with affordable cost without damaging the nature balance.

III.COMPONENT USED

1. Solar Panel
2. Wind Turbine
3. Voltage Sensor
4. MPPT
5. Battery
6. LCD
7. Water Pump

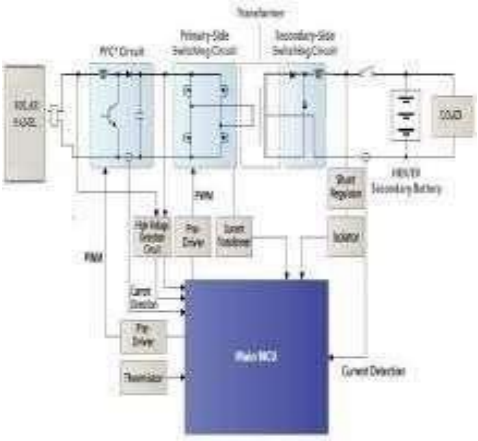
1. Solar Panel: A solar panel is a set of solar photovoltaic modules electrically connected and mounted on a supporting structure. A photovoltaic module is a packaged, connected assembly of solarcell . The solar panel can be used as a component of a larger photovoltaic system to generate and supply electricity in commercial and residential applications.



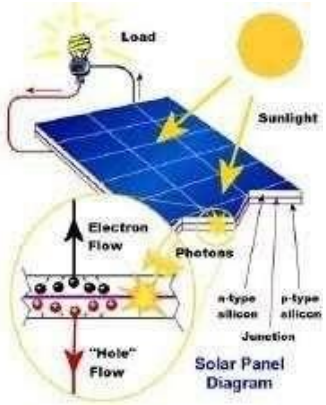
Solar Power Supply

Working Principle

The working principle of all today solar cells is essentially the same. It is based on the photovoltaic effect. In general, the photovoltaic effect means thegeneration of a potential difference at the junction of two different materials in response to visible or other radiation.



Photovoltaic Effect



Solar Working Diagram

The basic processes behind the photovoltaic effect

1. Generation of the charge carriers due to the absorption of photons in the materials that form a junction.
2. Subsequent separation of the photo-generated charge carriers in the junction.
3. Collection of the photo-generated charge carriers at the terminals of the junction.

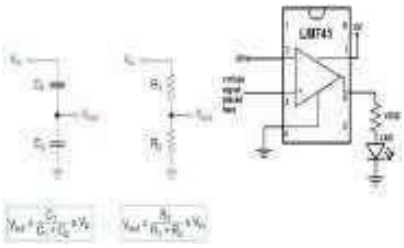
2. Wind Power: Wind energy is known as a renewable source of energy. That Wind energy isobtained with the help of Wind Turbines. Wind turbine is a device that converts the Kinetic Energy from the wind into mechanical energy. If the mechanical energy is used to produce electricity, then that device is called as wind generator.

Wind Turbine Types

Wind turbines can be classified in a first approximation according to its rotor axis orientation and the type of aerodynamic forces used to take energy from wind. There are several other features like power rating, dimensions, number of blades, power control, etc. that are discussed further along the design process and can also be used to classify the turbines in more specific categories**.**

3. Voltage Sensor: A voltage sensor is a sensor used to calculate and monitor the amount of Voltage in an object. Voltage sensors can determine the AC voltage or DC voltage level. The input of this sensor is the voltage, whereas the output is the switches, analog voltage signal,a current signal, or an audible signal.

Sensors are devices that can sense or identify and react to certain types of electrical or optical signals.The implementation of a voltage sensor and current sensor techniques have become an excellent choice for the conventional current and voltage measurement methods.



In this article, we can discuss a voltage sensor in detail. A voltage sensor can determine, monitor, and measure the supply of voltage. It can measure the AClevel and/or DC voltage level. The input to the voltagesensor is the voltage itself, and the output can be analog voltage signals, switches, audible signals, analog currentlevels, frequency, or even frequency-modulated outputs.

That is, some voltage sensors can provide sine or pulse trains as output, and others can produce amplitude modulation, pulse width modulation, or frequency modulation outputs.

In voltage sensors, the measurement is based ona voltage divider . Two main types of voltage sensorsw are available: capacitive type voltage sensor and resistive type voltage sensor.

4. MPPT: The MPPT solar charge controller is a DC-to-DC converter for your solar power system. It receives voltage from the solar panels and converts it to chargeyour battery at a more appropriate level.

MPPT is the process of adjusting the load characteristic as the conditions change. Circuits can be designed to present optimal loads to the photovoltaic cells and then convert the voltage, current, or frequency to suit other devices or systems.

The main benefit of MPPT charge controllers is thatthey can increase the charging efficiency and the power output of the solar system, especially in low-light or cold conditions, where the solar panels produce more voltage than the battery bank can handle.

5. Battery: An electric battery is a collection of one or more electrochemical cells in which stored chemical energy is converted into electrical energy. The principles of operation haven't changed much since the time of Volta. Each cell consists of two half cells connected inseries through an electrolytic solution.

One half cell houses the Anode to which the positive ions migrate from the Electrolyte and the other houses the Cathode to which the negative ones drift. The two cells are may be connected via a semi permeable membranous structure allowing ions to flow but not themixing of electrolytes as in the case of most primary cells or in the same solution as in secondary cells.

This difference of electron concentration causesan electrical potential difference to develop between themetals. This electrical potential difference or emf can be utilized as a source of voltage in any electronics or electrical circuit. This is a general and basic principleof battery.

6. LCD: LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits.A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD hastwo registers, namely, Command and Data.

7. Water Pump: A pump is a device that moves fluids (liquids or gases), or sometimes slurries, by mechanical action. Pumps can be classified into three major groupsaccording to the method they use to move the fluid: direct lift, displacement, and gravity pumps.

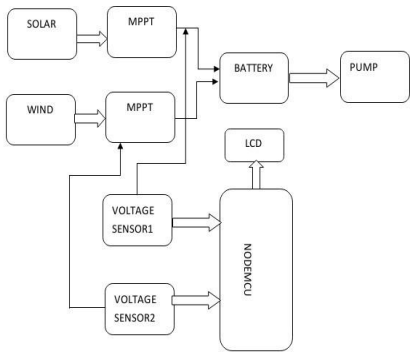
Pumps operate by some mechanism (typically reciprocating or rotary), and consume energy to perform mechanical work by moving the fluid. Pumps operate via many energy sources, including manual operation, electricity, engines, or windpower, come in many sizes, from microscopic for use in medical applications to large industrial pumps.

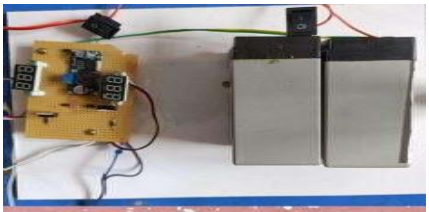
Mechanical pumps serve in a wide range of applications such as pumping water from wells, aquarium filtering, pond filtering and aeration, inthe car industry for water-cooling and fuel injection, in the energy industry for pumping oil and natural gas or for operating cooling towers.

In the medical industry, pumps are used for biochemical processes in developing and manufacturing medicine, and as artificial replacements for body parts, in particular the artificial heart and penile prosthesis.

In biology, many different types of chemical and bio- mechanical pumps have evolved, and bio mimicry is sometimes used in developing new types of mechanical pumps.

IV.WORKING PRINCIPLE





V.WATER PUMP USED

Farming pumps have a wide range of uses, such as:

[1] Running irrigation systems
[2] Watering the plants and pumping water fordomestic, livestock use, and irrigation
[3] Dairy and waste management
[4] Tail-water reuse
[5] Dredging water intakes for aquaculture andirrigation
[6] Cleaning sediment and sludge in lagoons andponds

VI.BENIFITS

1. Water pumps are used to provide high irrigation efficiency by supplying proper amount of water to every area of the field to gain speed in cultivation.
2. Low maintenance is required as it they come with less moving parts which eases the work.
3. Windmills are capable of pumping water from depths of 60 m.
4. Water-pumping windmills have an advantage in that no fuel is required for their operation, and
5. Thus they can be installed in remote windy areas where other conventional means of water pumping are not feasible.
6. Not only is wind an abundant and inexhaustible resource, but it also provides electricity without burning any fuel or polluting the air. Wind continues to be the largest source of renewable power in theUnited States , which helps reduce our reliance on fossil fuels.

VII.RESULT

By using this project we can design a "Water pumping system using solar and wind power" and can be successfully developed. This project proposed the design and architecture of a new concept of electricity available. The advantage of the system lies in the fact that it helps to pump water even when there is availability of electricity.

VIII.CONCLUSION

The wind turbine generates variable output power and hence, it cannot be matched with the PV module in normal cases. But in this hybrid system this problem is overcome by connecting the solar module and the wind turbine to the utility pumping system. It only uses the renewable sources of energy, thus forming a standalone hybrid system. Even after installation of this system, if required additional sensors can also be interfaced with the controller, leading to efficient functioning of the system.

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