



DESIGN PIEZO SOLAR PANEL GENERATOR

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Abstract: The objective of this project is to generate power continuously from the renewable energy resources. Here the renewable energy resources used in this project are solar power and rain water. Now-a-days using solar energy for the generation of electricity has become very popular. Particularly in the agricultural fields the usage of solar panels for electricity increasing day by day. The flaw in this concept is whenever there is sun, there will be solar energy production. But if there is no sun light i.e., during rainfall sufficient power will not be generated. For overcoming this problem this project is needed. This project is based on the principle of using hybrid mechanism of combining solar power technology with piezo electric power technology In this project, we will have hybrid panel i.e., one side it will have solar panel and other side it will have piezo electric plate. Based on the weather conditions, the plate will be rotated automatically using dc motors. So whenever the day is sunny, solar panel will be faced up and whenever there is rainfall, the piezo electric plate will be faced up. For sensing the sun, we are using an LDR and for detecting the rainfall we are using moisture sensor.

Keywords: hybrid energy harvester, photovoltaics, piezoelectricity, electromagnetism.

I. INTRODUCTION

Increasing work in automation and development in the E&TC sector ,more and more electricity is demanded. But, the conventional sources like fuel are decreasing day by day. Therefore, any alternatives that use nonconventional energy resources are being tested. The need for research to exploit the piezoelectric effect and improve their performance is being felt nowadays. The use of piezos for large scale power generation is restricted due to their high impedance and low power output. This energy can be stored in the battery. By making this energy on a large scale, we can build a power station somewhere, piezoelectric energy can be made from vibration in some way. It works on a kind of vibration. We can generate energy from water droplets falling in the rain.

II. PROPOSED METHODOLOGY

Methodologies or approaches that will be done is the initial modeling of the design that will be used for the membrane piezoelectric and solar cells as a media producer of electrical energy that comes from the influence of compressive force or impact that comes from rain water droplets and also sunshine by region in Indonesia. Step-by-step methodology, as follows:

- a) Conducting literature study and analysis was based on initial data from the study of membrane manufacture piezoelectric and also about changes in the electrical energy derived from the compressive force that have been done and the study of literature regarding the solar cells to be used.
- b) Creating models and simulation design tools Hybrid models of the solar cell power system and rain water power.
- c) Perform data analysis and the final calculation, in order to obtain the output of the design or model is made in order to obtain estimates of the electrical power obtained from the model.

III. HARWARE IMPLEMENTATION AND WORKING

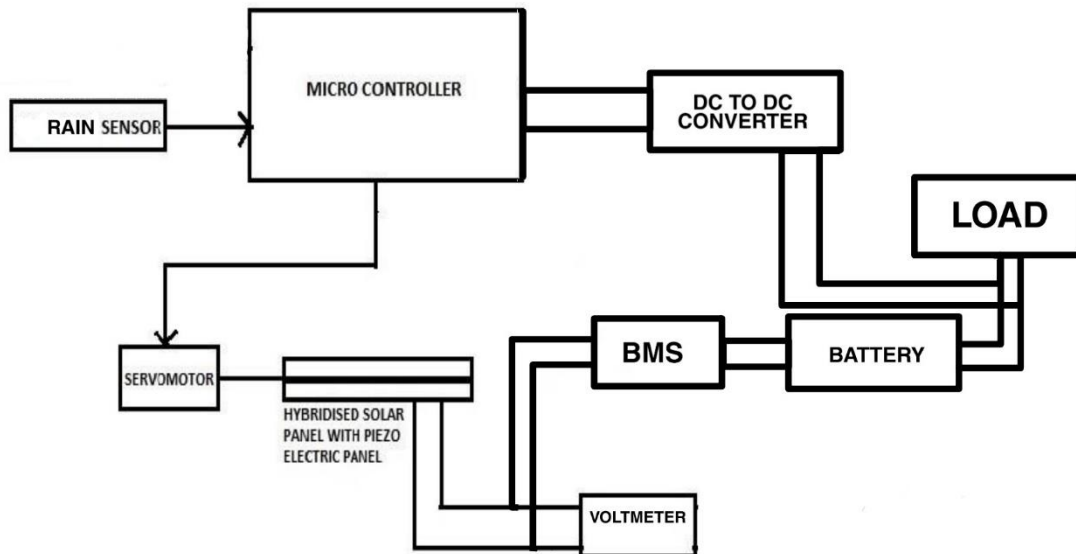


Fig. 1 BLOCK DIAGRAM OF PRPOSED SYSTEM.

The microcontroller is connected to the rain sensor and Rain sensor detects water droplets From rainwater, it provides input for the microcontroller and the microcontroller drives the servomotor so that Hybridized panels and piezo electric panels face up Rain water hits the piezo electric panel and causes the piezo Electric effect, electricity is generated and the battery is charged. Similarly when the water goes and the rain sensor gets dry, it gives a signal to the microcontroller and the microcontroller rotates the servo motor, then the solar panel is towards the sun and charges the battery with sunlight. Similarly, we can get electricity from both the sources, which can be increased by installing dc boosters

IV. COMPONENT USED

1. Diode 1N4007

Diode, an electrical component that allows the flow of current in only one direction. In circuit diagrams, a diode is represented by a triangle with a line across one vertex.

2. Arduino UNO

The Arduino Uno can be powered via the USB connection or with an external power supply. The power source is selected automatically. External (non-USB) power can come either from an AC-to-DC adapter (wall-wart) or battery. The adapter can be connected by plugging 2.1mm centre-positive plug into the board's power jack. Leads from a battery can be inserted in the Gnd and Vin pin headers of the POWER connector. The board can operate on an external supply of 6 to 20 volts. If supplied with less than 7V, however, the 5V pin may supply less than five volts and the board may be unstable. If using more than 12V, the voltage regulator may overheat and damage the board. The recommended range is 7 to 12 volts.

3. Lithium-ion batteries

A lithium-ion battery or Li-ion battery is a type of rechargeable battery. Lithium-ion batteries are commonly used for portable electronics and electric vehicles and are growing in popularity for military and aerospace applications.

4. Servomotor

A servomotor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity and acceleration. It consists of a suitable motor coupled to a sensor for position feedback.

**5. Rain sensor**

Raindrop Sensor is a tool used for sensing rain. It consists of two modules, a rain board that detects the rain and a control module, which compares the analog value, and converts it to a digital value. The raindrop sensors can be used in the automobile sector to control the windshield wipers automatically, in the agriculture sector to sense rain and it is also used in home automation systems.

6. piezoelectricity

Piezoelectricity is a phenomenon which means that there is a coupling between the electrical and the mechanical state of the material. When a piece of piezoelectric material is mechanically deformed, e.g. compressed, a current will flow and charge its faces.

7. Solar panel

A solar panel, or photo-voltaic (PV) module, is an assembly of photo-voltaic cells mounted in a framework for installation. Solar panels use sunlight as a source of energy to generate direct current electricity. A collection of PV modules is called a PV panel, and a system of panels is an array. Arrays of a photovoltaic system supply solar electricity to electrical equipment.

8. DC Submersible Pump

The DC submersible pumps as well as other types of submersible pumps look like a metal tube and their goal is to push the water to the surface. This type of pipe-look water pumps conceals the motor within the tube so that the liquid outside the pump does not get access to the electrical parts inside the pump.

9. digital voltmeter

Digital Voltmeter abbreviated as DVM is an instrument used to measure the electrical potential difference between two points in a circuit. The voltage could be an alternating current (AC) or direct current (DC). It measures the input voltage after converting the analog voltage to digital voltage and displays it in number format using a convertor. The usage of digital voltmeter has increased the speed and accuracy with which the readings are noted. A typical DVM is shown below.

10. Dc Booster

A boost converter (step-up converter) is a DC-to-DC power converter that steps up voltage (while stepping down current) from its input (supply) to its output (load). It is a class of switched-mode power supply (SMPS) containing at least two semiconductors (a diode and a transistor) and at least one energy storage element: a capacitor, inductor, or the two in combination. To reduce voltage ripple, filters made of capacitors (sometimes in combination with inductors) are normally added to such a converter's output (load-side filter) and input (supply-side filter).

11. Capacitor

A capacitor (originally known as a condenser) is a passive two-terminal electrical component used to store energy electrostatically in an electric field. ... Unlike a resistor, a capacitor does not dissipate energy. Instead, a capacitor stores energy in the form of an electrostatic field between its plates.

12. SPST Switch

A Single Pole Single Throw (SPST) switch is a switch that only has a single input and can connect only to one output. This means it only has one input terminal and only one output terminal. A Single Pole Single Throw switch serves in circuits as on-off switches. ... When the switch is open, the circuit is off.

**V. HARDWARE IMPLEMENTATION**

Fig. 2 Hardware Implementation.

VI. ADVANTAGES

- Conservation and Utilization of Natural Resources.
- This present model ensures the reduction in the use of coal and other sources of energy.
- This will save a huge amount of money which the government spends for purchasing power for street.
- No fuel transportation problem.
- Energy available all the year round light.
- Life time expected system is around 15 years.
- Require led cost in maintaining the system.
- Various government scheme are available for developing such system

VII. CONCLUSION

Energy harvesting is a promising technique that can help solve global energy challenge without depleting natural resources. Federal, state, and local governments have enacted renewable energy policy to mitigate potential impacts of climate change and invest in long-term economic savings associated with renewable energy. which will be quite beneficial for smart infrastructure. The challenge of using piezoelectric technology for energy harvesting is to integrate the piezoelectric transducer with the structure of roadway and bridges.

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