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Hybrid Renewable Electricity Generation & Automatic Irrigation System

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Abstract: this paper gives information related automatic supply of water to field & hybrid energy generation technique. Automation of system provided with water level sensor & soil moisture sensor. The source to generate electricity, we prefer sunlight & water pressure. The objective is to generate more electricity using pelton wheel turbine & supply water for the field through solenoid valve and automate the system for better management of resources.

Key words: solar panel, pelton turbine, solenoid valve, dc pump, microcontroller at89c51.

I. INTRODUCTION

Rapidly reducing conventional energy sources and increasing demand for energy in recent years, makes more efficient and positive use of current water resources together with global warming and drought. For hybrid energy generation & irrigation, we need to measure different parameter that is, solar energy in difference session, sunshine and rain fall, moisture in soil, gravitational force etc. The key objective of this project is to develop a Hybrid Energy using two different devices 1. Solar Panel and 2. Turbine. The extra use of water is avoided by using the controlled Irrigation System. Here we use IC AT89C51 to control the solenoid valve & dc motor. Moisture sensor is used to measure the moisture in soil. Water level sensor used to measure the level of water in the tank for energy storage we use 12V battery.

Research focus on smart irrigation water quantity control for increase water use efficiency. System presents the design & development of irrigation control based on AT89C51 & hybrid energy generation using solar panel & turbine.

A. Design of Hybrid Renewable Electricity Generation Technique

Water and electricity is the most important for farming and one of the basic needs of rural area. As in remote area they face power shut down problems many times that's why, there is a need to use renewable energy resources for generation of electricity. The level of underground water is reduces, so there is need to reuse resources and also manage.

II. BLOCK DIAGRAM

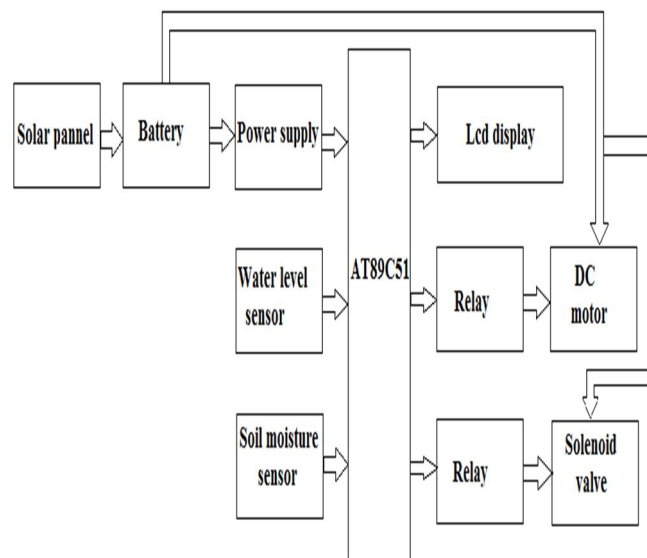


Fig. Block diagram of Hybrid Renewable Electricity Generation & Automatic Irrigation System

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A. Solar Panel

This is the key element of all PV electrical phenomenon system that takes the sun's energy and converts it into the electrical current. The method of changing light-weight (photons) to electricity (voltage) is named the photoelectrical phenomenon (PV) result. Electrical phenomenon PV cells convert daylight directly into alternative energy (electricity). They use skinny layers of semi-conducting material that's charged otherwise between the highest and bottom layers. The semi-conducting material will be placed between a sheet of glass and or a compound organic compound.

When exposed to sunlight, electrons within the semi-conducting material absorb the photons, inflicting them to become extremely energized. These move between the highest and bottom surfaces of the semi-conducting material. This movement of electrons generates a current referred to as an instantaneous current (DC).

B. Solar Charge Controller

A charge controller is a vital part of nearly all power systems that charge battery whether or not the facility supply is PV, wind, hydro, fuel. Its purpose is to stay your batteries properly fed and safe for the future.

C. Battery

A battery converts energy into current by a chemical action typically chemical square measure unbroken within the battery. It's utilized in a circuit to power different elements. Electric battery produces electricity.

D. Microcontroller

The AT89C51 may be a low-power, superior CMOS 8-bit PC with 4Kbytes of Flash programmable and eradicable browse solely memory (PEROM). The device is factory-made victimization Atmel's high-density non volatilizable memory technology and is compatible with the industry-standard MCS-51 instruction set and pin out. The on-chip Flash permits the program memory to be reprogrammed in-system or by a standard non volatilizable memory software engineer. By combining a flexible 8-bit processor with Flash on a monolithic chip, the Atmel AT89C51 may be a powerful PC that provides a highly-flexible and efficient resolution to several embedded management applications.

E. Water Level Sensor

The +5V is provided to water employing a metal contact during this circuit all the transistors are operating as a switch. Once the water touches the metal contact within which base of every semiconductor device is connected, a tiny low current flow and activates the semiconductor device. Once semiconductor device ON at that point it sight the amount of water.

F. Moisture Sensor

Most soil wet sensors square measure designed to estimate soil volumetrically water content supported the nonconductor constant (soil bulk permittivity) of the soil. The nonconductor constant may be thought of because the soil's ability to transmit electricity. The nonconductor constant of soil will increase because the water content of the soil will increase. This response is because of the actual fact that the nonconductor constant of water is far larger than the opposite soil elements, as well as air. Thus, menstruation of the non-conductor constant provides an inevitable estimation of water content.

G. DC Motor (Pump)

The machine that converts energy into hydraulic energy is thought as Pumps. 2 basic classes of machines area unit the rotary sort and reciprocatory sort. Reciprocator motors area unit quite common in power fluid mechanic show ever the rotary principle is universally used for big power devices such on electricity system.

H. Solenoid Valve

There square measure several valve style variations. Standard valves will have several ports and fluid methods. A pair of-way valve has 2 ports; if the valve is open, then the 2 ports square measure connected and fluid might flow between the ports; if the valve is closed, then ports square measure isolated[6]. If the valve is open once the coil isn't energized, then the valve is termed usually open (N.O.). Similarly, if the valve is closed once the coil isn't energized, then the valve is generally closed.

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I. Relay

Relay may be a associate magnetic force switch operated by a comparatively little electrical phenomenon which will activate and off a way larger electrical phenomenon. Once current flows through the coil associate magnetic force field is ready up the sphere attracts associate iron coil, whose alternative finish pulses the contacts along. The most operation of a relay comes in places wherever solely a low-power signal may be wont to management a circuit.

J. Turbine

The device which converts hydraulic energy in to mechanical energy or vice versa is called hydraulic machines .the hydraulic machines which convert hydraulic energy into mechanical energy are known as turbine. In this project we use pelton turbine.

III. SCHEMATIC

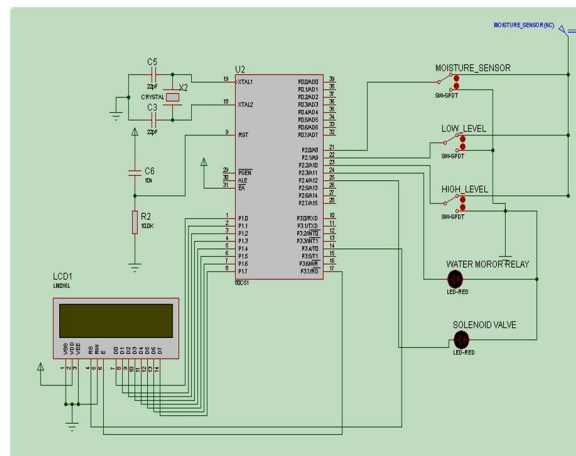


Fig. Schematic of Hybrid Renewable Electricity Generation & Automatic Irrigation System

IV. WORKING PRINCIPLE

- A. Solar panel generates electricity with the help of photovoltaic cells and sun rays and stored in battery.
- B. In between solar panel and battery there is solar charge controller kit.
- C. The basic function of a controller are quite simple charge controllers block reverses current and prevent battery overcharge.

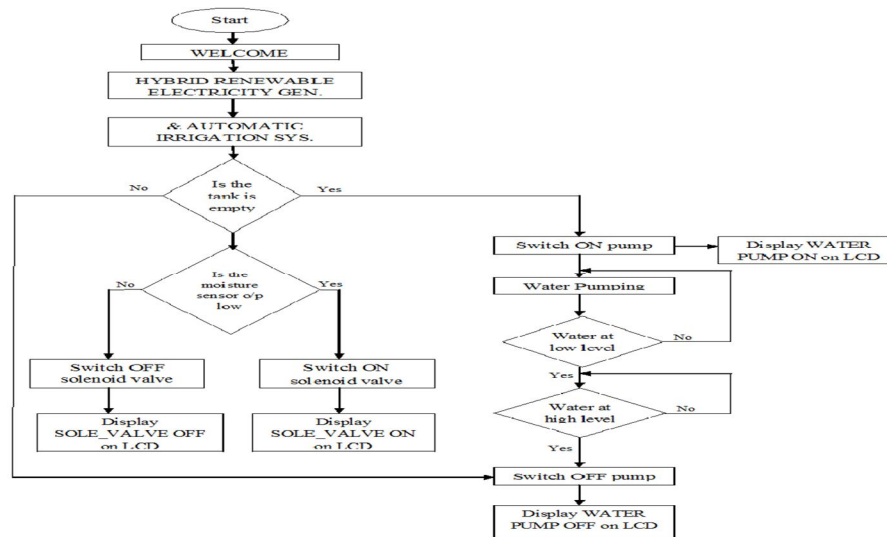


Fig. Flowchart of Hybrid Renewable Electricity Generation & Automatic Irrigation System

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- D. Stored current used by dc pump for pumping water
- E. Pumped water has some pressure and for increasing pressure of pumped water we used convergent type nozzle.
- F. Water with these pressure strikes on turbine which connected to alternator at 1.64 feet height.
- G. Because of water pressure turbine gets rotated and it rotates the alternator.
- H. When alternator get rotates with the turbine it produces electricity.
- I. After that water comes out through turbine casing and enter into cooling tank which have height of 1.14 feet from reservoir and then it get distribute to dripping for farming.
- J. In farm there is a moisture sensor it detect moisture in soil and give output to controller, controller control the solenoid valve on the basis of moisture sensor output using relay.
- K. In cooling tank there is water level sensor it has two levels that is high & low, if this both levels are low then it gives low (0) output to controller and controller turn off the dc pump by using relay. And if this both levels are high then it gives high (1) output to controller and controller turn on the dc pump by using relay.

V. EXPERIMENTAL SETUP



Fig. Experimental setup

- A. *Solar Panel*
 - Voltage = 12V
 - Current rating = 1.25AH
 - Wattage = 15W
- B. *Battery*
 - Voltage = 12V
 - Current rating = 8AH
 - Wattage = 96W
- C. *Water Pump*
 - Voltage = 12V
 - Current rating = 4AH
 - Wattage = 48W
- D. *Solenoid Valve*
 - Voltage = 24V

VI. ADVANTAGES

- A. The energy from the sun is virtually free after the initial cost has been recovered.
- B. Depending on the utilization of energy, pay-backs can be very short when compared to the cost of common energy source used.
- C. The sun provide a virtually unlimited supply of solar energy.
- D. Maintenance is comparatively low.
- E. System is automatic so it reduce the human efforts.

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VII. DISADVANTAGES

- A. Solar cells are costly, requiring a large initial capital investment.
- B. To get enough energy for larger application a large number of photovoltaic cells are needed. This requires a large plot of land.
- C. Limited power density.
- D. Solar cells produced DC which must be converted to AC when use in currently existing distribution grids these incurs an energy loss.

VIII. APPLICATION

- A. This system used in low rainy area.
- B. This is mostly used for farmer who have larger coverage area of farm, because they have that much initial cost.
- C. This system is used for garden that time electricity is generated this is used for home appliances.

IX. FUTURE SCOPE

- A. Main scope of this project is in farming field
- B. For making advance in this we can use solar tracking system in solar panels for continuous electricity generation in whole day up to sunset.
- C. By nearly regular electricity problems in farming this system is useful for farmers with doing one time investment.
- D. Although we have claimed that global warming is harmful never the less it helps to generate solar electricity due to brighter sun rays.
- E. Other scope of this project in garden areas.

X. CONCLUSION

The history of agriculture dates back thousands of years, and also the development has been driven and outlined by greatly totally different climates, cultures and technologies. the most contribution of this paper is to offer a summary of project model which can greatly develop the irrigation system in India. The automation of AN irrigation system can for the most part scale back the gap between demand and consumed energy and any conserves the resources thereby reducing the wastage of resource. Additionally to the present system removes attainment that's required for flooding irrigation. Environmental pollution is prevented with renewable energy and energy production from native resources is inspired. a plus of system is that system desires no maintenance.

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