Energy Efficient Solar Powered Smart Crop Watering with Water System using Arduino Controller

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Abstract

This paper mickle with the various automated crop watering with water skill available to the farmer. The key goal of this paper is to provide energy efficient solar powered Arduino based automated crop watering with water system. Minimisation of human treatment in farm land crop watering with water can be done by using this automated technology. The bypass connector of the solar mastery board will reduce the shading effect of the solar panel. This technology will improve the solar panel efficiency and this improved efficiency will be used in the automated smart crop watering with water unconscious process. The use of moisture sensor, DHT 22 sensor and all together sends the signals to Arduino which further sends the different status as read by the sensing element to drug exploiter mobile through GSM. The farmer (user) can watch and control all crop watering with water operations through his android mobile device. The farm land will be off printed as a zone which has a separate moisture sensor and it has a separate valve connection too. These valve connections are controlled by the Arduino which receives signal from moisture sensors of a particular zone.

Keywords: Automated crop watering with water, Solar panel, Bypass Diode, GSM module, DHT 22 sensor, Arduino processor and Moisture sensor

I. INTRODUCTION

Farming part is a major source of income in a country like republic India. Till today, most of the crop watering big plan are operated manually resulting in over crop watering and water wastage most of the times. These no longer used ways of doing things can be replaced by automated ways of doing things of farm crop watering with water. The decreasing cost of solar board encourages its use in different areas, including crop watering with water system of rules for farming. The solar boards are affected by the shading effect. It can be reduced by the using the diode connection. Potential drop produced by a single solar prison cell is about 0.58 volts DC, with the current flow (amps) being fair in amount to the light energy (photons). In most photovoltaic cells, the voltage is nearly constant, and the current is fair in amount to the size of the cell and the intensity of the light. Bypass diodes in solar panels are connected in “parallel” with a photovoltaic cell or panel to shunt the current around it, whereas blocking diodes are connected in “series” with the PV panels to prevent current flowing back into them.

An automated crop watering with water system uses solar panel which effort water tickers to pump water from water source bore well to the farm land using the outlet of the solenoid valve which is set to the particular node of the farm land is controlled automatically by using GSM, controller and sensors. For that use the land will be separated as a node. Every node has a wireless sensor connection which bill the soil condition which is controlled the valve. This way of doing things improves the use of water for crop watering with water intent. This way the problems related to higher agricultural productivity, poor performance and decreased. The availability of water for farming can be solved by using the proposed solar powered automated crop watering with water system.
II. RENEWABLE ENERGY UTILIZED

A. Solar Energy:
Availability of the solar energy resource are supercilious and it has used for vanquish of the application. Stillness flip the solar energy are exceedingly worn in different applications it has quite a distance satisfactory of power generation to use in an application seemly for to the efficiency. The paramount routine issues in the solar panel are shading effect. The shading effect will be reduced by using the bypass connected solar panel. The bypass diode is used to force the current in the shaded solar cell. The effects of the shaded cells are shown in above fig.

Fig. 1: Solar panel with bypass diode
Fig. 2: Shade effect in solar panel

B. Voltage controller:
Regulators are used to control the voltage level of the solar panel. The solar panel has some effect and it has losses also. The solar panel has a changeable DC voltage. The output of the solar panel must be needed to control the voltage due to that purpose the regulators are used.

Fig. 3: Block diagram of renewable energy utilized

C. Battery:
The battery which the electrical storage device connection will store the energy which is got from the solar panel. 12 V, 10 amp hour, and Nickel Metal Hydride batteries to power the pump instead of powering directly from the 40W solar panels they have gotten. This allows for more crops watering during times of low solar irradiance. The dc current is generated by using solar panel. This dc power is stored in a battery so as to operate the pump even during the night time.

III. MOTOR CONTROL

Basically the weather condition of the farm land will be considered due to the bad rainstorm rainfall. The rainfall will improve the soil moisture level. So it should be must to measure the humidity level of the surrounding conditions before start the process.

A. DHT 22:
This lesson covers the low cost DHT temperature & humidity sensors. The DHT sensors are made of two parts, a capacitive humidity sensor and a thermistor. The DHT 22 sensors are used to measure the humidity of the surrounding conditions and temperature level of the soil. The received equivalent voltage is given to processor circuit which In Solar Panel Based Automatic
Plant crop watering with water has a reference voltage that can be changed to make better by farmer as per System proposed. The output of the DHT 22 sensor is fed to the relay through the Arduino processor. The Relay will be used to start the motor driver circuit and this motor driver circuit will be operated automatically and manually (android). The motor drive circuit is used to drive the motor.

**B. Special Electrical Machine:**

The control signal which is received from the processor is given to Brushless DC motor having a less maintenance and the high ability. The overall benefits are high and system is money saving in long run. As brushes are not present, the mechanical energy loss due to friction is less which improved efficiency. A BLDC motor can operate at high-speed under any condition. The motor ON/OFF control is depends upon the valve condition and the DHT 22 sensor.

**IV. SOLENOID VALVE CONTROL**

The automatic crop watering with water system is used to gathering the water amount of the water supplies. In this closed loop system, the farm land will be separated as a zones based on the area of the farm land and coverage area of the wireless sensor network. Every zone has a separate solenoid valve and moisture sensor. The zone has a base station which has the processor unit.

**A. Wireless Sensor:**

We use the moisture sensor which can be inserted the soil in order to measure the moisture content of the soil. Soil electrical conductivity is measured using two metal conductors spaced apart in the soil except that mixed with and became part of liquid salts greatly change the water conductivity and can confuse the measurement. This measured value will sends to the processor which is used to control the valve of the zone.

**B. Wireless communication:**

The solenoid valves are connected to the crop watering with water valves that are in the field, that is, they are not at close quarters with the computer. Because of this, it is not able to be done to take electric wires from the valves and motor bomb to the local serv. Because of this, we use the GSM wireless kit, which is responsible to take the signal the Arduino board received from the software to the solenoid relays. Since Arduino is not able to transmit a wireless signal, GSM is a module that can be added to the platform and complete this job.

**C. Solenoid valve:**

The processor will monitor the sensed values of the moisture sensor and sends which further used to control the particular valve of the zone. The farmland will be separated as a zone based on the coverage area of the sensor. The GSM and the processor are used to watch the valve of a zone. When all the solenoid valves are OFF then the motor is also OFF.

**Table – 1**

<table>
<thead>
<tr>
<th>RH (%)</th>
<th>V_{out} (mV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1325</td>
</tr>
<tr>
<td>20</td>
<td>1600</td>
</tr>
<tr>
<td>30</td>
<td>1860</td>
</tr>
<tr>
<td>40</td>
<td>2110</td>
</tr>
<tr>
<td>50</td>
<td>2360</td>
</tr>
<tr>
<td>60</td>
<td>2605</td>
</tr>
<tr>
<td>70</td>
<td>3125</td>
</tr>
</tbody>
</table>
V. RESULT AND DISCUSSION

This system has more efficiency compared to the existing method. This somehow the result is received the difference in the measured moisture values at different times from the set moisture values to trigger water. In almost same way, the valve control method was depended mostly on the soil moisture values, small deviations in the measured values affect the control set of computer instruction leading to the auto-stop not to respond when the tolerable moisture level was successfully reached. The plant’s water needed thing is 600-800mm a day and temperature needed thing of the soil ranges from 50°C- 100°C. In the Arduino code, the moisture and temperature range were set as 300-700 and 450-800 respectively. More than that, this system reduces the cost effective and skilled in preserving water and reducing its consumption. The output result is shown below,
VI. CONCLUSION

In the present system, the farmers are manually control the crop watering with water process which result the use of more water. More than that, in dry areas where there is not enough rainfall, crop watering with water becomes very hard. Because of this, we require an automatic system that will surely monitor and control the water needed things in the field which will be saves time and secures well thought-out usage of water.

REFERENCES