

Arduino Based Water Conservation System for Different Types of Soil in Agriculture Sector

¹Kajal Lavhate, ²Sudarshan Aghav, ³Manjusha Bhosale, ⁴Prof. Pradnya Maske

¹BE Student, Department of Electrical Engineering, University of Pune, JSPM's BSIOTR, Wagholi, Pune, Maharashtra, India;

²BE Student, Department of Electrical Engineering, University of Pune, JSPM's BSIOTR, Wagholi, Pune, Maharashtra, India;

³BE Student, Department of Electrical Engineering, University of Pune, JSPM's BSIOTR, Wagholi, Pune, Maharashtra, India;

⁴Assistant Professor, Department of Electrical Engineering, University of Pune, JSPM's BSIOTR, Wagholi, Pune, Maharashtra, India;

Abstract :

As there is exhausting of non renewable energy sources. We should be depends on the renewable energy sources like solar, wind etc. In this paper the energy required for the operating motor is totally generated from solar energy sources. Solar energy is converted into electrical energy by using photo-voltaic cells. During the day time, the energy stored in the batteries can be utilized to run water pump for agriculture. The paper aims at developing a controlled charging mechanism providing protections for over charge condition, deep discharge condition and under voltage state of the battery. Proposed system is an innovative solution to operate a liquid pumps for a small duration. If a machine is to be operated for ten minutes, and should be switched off after the duration, it is too difficult and many times we forget to switch it off the system after the prescribed time. Proposed system provides the facility of automatic switch off after the requited time duration. Soil moisture Measurement is important in agricultural to help farmers for manage their irrigation systems more efficiently. Knowing soil moisture conditions on their fields, farmers able to generally use less water to grow a crop, they are also able to increase the quality of the crop by improved management of soil moisture during plant growth stages. ESP8266 is Wi-Fi enabled system on chip module. It is mostly used for development of Internet of Things embedded applications.

Keywords- Renewable energy, Water Pump, Moisture sensor, ESP8266 Wi-Fi

I. INTRODUCTION:

A star hopped-up pumping system technique must take correct account of the actual fact that demand for irrigation system water varies throughout the year. Solar-powered systems are being preferred for use in developing countries instead of other forms of alternative energy because they are extremely durable and can also exhibit durable economic benefits. Solar powered water pumping systems can be the most appropriate solution for grid-isolated rural locations in poor countries where the levels of solar radiation are extremely high. Solar powered water pumping systems (SPPS) can cater to basic needs of the public like provide drinking water, water for irrigation etc without the need for any kind of fuel or extensive maintenance. A large-scale SPPS can serve well over 240 people at a time. The solar PV panels have proven time and time again their ability to reliably produce sufficient electricity directly from solar radiation to power livestock and solar irrigation systems. Solar water pumps find their use mainly in small scale or community based irrigation fields, as large scale irrigation requires large volumes of water which in turn requires a solar PV array extremely large in size. As the water maybe required only during some parts of the year, a large PV array would provide excess energy which isn't necessarily required, thus making the system in efficient. Solar PV water pumping systems are mainly used for irrigation and drinking water purposes in India. Larger SPPS can deliver around 140,000lts of water/day ESP8266 is Wi-Fi enabled system on chip (SoC) module developed by Express if system. It is principally used for development of IoT embedded applications. Soil moisture measurement is important for agricultural to help farmers for manage their irrigation systems more efficiently. Knowing soil moisture conditions on their fields, farmers able to generally use less water

to grow a crop, they are also able to increase the quality of the crop by improved management of soil moisture during plant growth stages

2. Block Diagram :

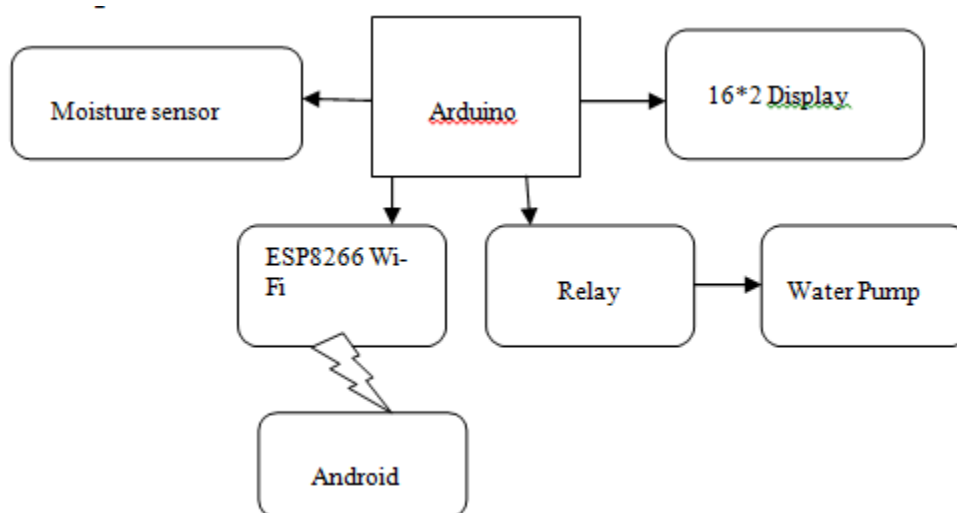


Fig 1: Block diagram

□ **Solar Panel** : Expose the cell to light, and the energy from each photon (light particle) hitting the silicon, will liberate an electron and a corresponding hole. If this happens within range of the electric field's influence, the electrons will be sent to the N side and the holes to the P side, resulting in yet further disruption of electrical neutrality. This flow of electrons is current; the electrical field in the cell causes a voltage and the product of these two is power .

□ **Arduino**: Arduino is a microcontroller board based on the ATmega328P .It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset Button. Output of moisture sensor is sensed and this signal sends to android device through wi-fi module.

□ **Moisture sensor**: Soil moisture measurement is important for agricultural to help farmers for manage their irrigation systems more efficiently. Knowing soil moisture conditions on their fields, farmers able to generally use less water to grow a crop, they are also able to increase the quality of the crop by improved management of soil moisture during plant growth stages. Soil moisture sensor can be used to detect moisture, when the soil is dry, the module outputs a high level, whereas output low.

□ **Wi-Fi Module (ESP8266)**: Wi-Fi module send the data to cloud and android device access the data and user control the motor operation and again send these data to arduino controller board. The controller board control the water pump.

□ **LCD Display**: Liquid Crystal Display screen is an electronic display module. A 16x2 LCD display is very basic module. It is very commonly used in various devices and circuits. A 16x2 LCD means it can display 16 characters per line and there are 2 lines.

□ **Water Pump**: Water pumps pump liquid by means of the centrifugal force developed by rotation of a slice the Kinetic energy imparted to the liquid by slice rotation is converted to potential energy by making. The liquid to flow through volute, casing involutes.

3. Working of Proposed System :

In methodology we have focused on the engineering aspect and the business aspect of water conservation system. The engineering side of the paper deals with the operation of water pump in different time slots for power saving application and also how it works for man power saving. In this system there are two modes for operation.

❖ **Manual Mode**: In manual mode we are going to set different times slots, according to that switches of solar water pump will work on pre-describe time .

❖ **Automatic Mode**: In automatic mode moisture sensor is used for detecting moisture containing in soil, once moisture will detected ,sensor gives command to arduino and with the help of relay (here we are going to use relay as switch) operation of water pump will be done.

4.Experimental Setup :



Fig 2:Prototype model

5. Rating and specifications:

5.1. Rating and specifications of solar panel

table no. 1: rating and specification of solar panel

Parameter Rating	Specification
Open circuit voltage (Voc)	10.1V
Maximum system voltage (Vdc)	1000V
Peak power (P)	3W

5.2. Rating and specification of the water pump

table no. 2: rating and specification of the water pump

Parameters Specification	Specification
Material	Engineering Operating
Operating voltage	3~5V
Continuous Working Life	500Hours
Driving Mode	DC Magnetic Driving
Maximum Lift	40~110mm
Outlet Outside Diameter	7.5mm

6. RESULT

I. Manual mode :

In manual mode we can operate motor manually in given pre-describe time.



Fig 3: Android App for Manual mode

II. Auto mode :

In this mode the motor will operate depending upon the condition of soil moisture sensor. With the help of case study of soil, we find out the moisture level and according to that we have selected the specified value (we considered it as 30).

- ❖ When soil is having less moisture i.e. less than that of specified value (below 30) of that soil moisture, then motor will be in ON condition.



Fig 4: Auto mode when motor is in ON condition

- ❖ When moisture of soil is wet or above the specified value (above 30), at this condition then the motor will be in OFF condition.



Fig 5: Auto mode when motor is in OFF condition

7. CONCLUSION :

Solar water pump with time control system provides the exclusive features like it provides zero maintenance, lengthy useful life, no fuel requirement, no contamination and comparatively easier installation etc. compared to the diesel power pumping system. Solar water pump with timing control provides different time slots for pump working. It also decreases the human efforts. Advantage of this system is it produces water when it's needed most; this system makes a better way to develop in areas where grid electricity is unattainable and alternative sources do not provide sufficient energy.

8. REFERENCES :

- 1) Aliyu A.G. and Sambo A.S., Study of photovoltaic solar water pumping system in various climate conditions, Journal of Solar Energy, Vol.8 (1), pp. 345-354, 1989.

- 2) Ghoneim A.A., Design optimization of photovoltaic powered water pumping systems .Energy Conversion and Management, Vol. 47, pp 1449-1463,2006.
- 3) Glasnovic Z. and Margeta J., Maximum area that can be economically irrigated by solar photovoltaic pumping system. Journal of Irrigation and Drainage Engineering, Vol.135(1), pp. 44-49,2009.
- 4) Khatib T., Design of photovoltaic water pumping system at minimum cost for Palestine: a review. Journal of applied sciences, Vol.10(22), pp. 2773-2784,2010.
- 5) M. Dursun, —Education purpose switched reluctance motor driver for photovoltaic array irrigation system, in *Proc. I. International Vocational and Technologies Congress, İstanbul*, pp.595-60

