

Solar Water Pump Controlling System: A Power Saving Application

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ABSTRACT

Nowadays the modern technologies are helpful in all aspects of our life. Due to this lots of development done in the field of agricultural. The solar energy converted into electrical energy by photo voltaic cells. This energy stored in batteries during the daytime to run the water pump for agriculture and distribute the water to the farm. The project is designed to operate the water pump at four different time slots. It prevents the difficulties of switching the pump on/ off manually. Real time clock interfaced to Arduino then Arduino give command to the corresponding relay to start the load and another command to switch off the load is programmed by the user. A matrix keypad helps to entering different time slots. Switching the pump ON/OFF manually these difficulties can be overcome using this project. There be an inbuilt real time clock (RTC) which keeps tracking the time and thus switches ON/OFF the pump accordingly. In this project, solar panel used to charge the battery an LCD display is interfaced to the to display time.

Keywords: Solar power, RTC, Arduino UNO, LCD, buzzer, relay, AC pump.

1. INTRODUCTION

The energy issue is a worldwide concern, given the intermittent emergencies in the power segment. Over the previous decade, the energy areas of numerous nations persevered through extreme changes with boost to the decentralization of force era, giving the circulation arranges a focal part in this new model. Energy era assumes a key part in human life, alongside method for transportation, media communications, water and sanitation. Nonetheless, both the era and utilization of vitality ought to be taken care of congruously and fitting to the earth, so that regular assets can be utilized soundly and reasonably. From the perspective of supply, the oil emergency and shakiness in the accessibility of such source brought about ascent in the cost of fossil energizes, in this manner expanding the working expenses of the electrical division organizations working force plants nourished by these data sources. Be that as it may, new ecological necessities have constrained organizations in the segment to incorporate natural expenses in their exercises because of a few inborn issues, for example, confiscation, ranges of flooding for hydroelectric, corrosive rain brought on by the emanation of carbon dioxide from warm power plants and radiation by mischances in atomic power plants. A sun oriented fuelled pumping framework technique needs to assess the way that require for water system framework water changes consistently. Sun oriented controlled frameworks are being favoured for use in mounting nations rather than different types of substitute energy since they are especially solid and can likewise display long haul monetary repayment. Sunlight based controlled water pumping frameworks can be the most appropriate answer for lattice segregated provincial ranges in poor nations where the levels of sun powered radiation are particularly high.

Sun powered controlled water pumping frameworks (SPPS) can supply to fundamental needs of people in general like supply drinking water, water for water system and so forth without the

requirement for any sort of fuel or wide upkeep. A substantial scale SPPS can work well for more than 240 individuals at any given moment. The sun-oriented PV boards have built up on numerous occasions their capacity to dependably create enough power straightforwardly from sun-oriented radiation to power cultivate creatures and sun-based water system frameworks. Sun oriented water pumps discover their utilization for the most part in little scale or gathering of individuals based water system fields, as large scale water system requires extensive volumes of water which thus requires a sun based PV cluster astoundingly vast in size. As the water possibly essential just amid a few section of the year, an expansive PV cluster would offer overabundance vitality which isn't of need required, in this way making the framework in efficient. Sunlight based PV water pumping frameworks are for the most part utilized for water system and drinking water purposes in Bangladesh. Bigger SPPS can appropriate around 140,000 litres of water/day from an aggregate head of 10 meters.

2. PV ENERGY

As of late, there was an expansion in the utilization of option vitality sources to supplement the worldwide vitality grid. In any case, such wellsprings of worldwide renewable vitality era have impacts also, imperatives, forcing a few restriction. These points of confinement are critical for the arranging and plan of practical vitality strategies, requesting particular reviews for getting great exhibitions in the establishment of frameworks, keeping in mind the end goal to dodge genuine results. Renewable vitality sources are delegated hydro, warm sun powered, photovoltaic sun based, wind, sea, geothermal and biomass. These sources utilize normal assets, for example, wind, water, sun powered radiation what is more, warmth as the working guideline for its era. Thus, the uses of renewable vitality sources are very differing and have been looked for by a few clients .The essential photovoltaic unit is known as a sun powered cell, which together in bunches frame the photovoltaic boards, interconnected components that make the electric generator out of a photovoltaic establishment. The boards change over radiation into electrical vitality by the photovoltaic impact. Such a wonder should be possible in light of the fact that the board is made of semiconductor materials with properties. Its generation of power is the photovoltaic impact in view of direct on the other hand circuitous change of daylight. The immediate daylight is amazingly essential for the era of photovoltaic vitality once the circuitous approach does not create a perfect execution to the framework. Subsequently, the boards ought to have the capacity to catch the greatest measure of sun-based radiation amid the day. The off-lattice generators are those with no association with the electrical dissemination organize. These frameworks are generally introduced in places not served by power dissemination organizations, hence requiring the utilization of a battery bank to store the produced vitality and to give it amid the time of no sun powered radiation. They are for the most part made from photovoltaic boards, charge controller, batteries, and inverters.

3. PROPOSED METHODOLOGY

We have demonstrated this project by built a prototype model of solar powered pumping system. We have used AC pump and connected it to the relay driver circuit. A relay is used for switching operation. By running this prototype model, we got results as water supplied to the farm, garden. When set time is equal to real time. The status of the pump can be known by using LCD display. The

supply of water is completed by using submersible pump. We have used real time clock (RTC). which have display real time and real date on LCD by interfacing with the Arduino. We have set the time for running of the pump. Arduino compare this set time with the real time which is display on LCD. After that, whenever set time is equal to real time Arduino gives command to corresponding relay to turn on the load. Generally, relays mostly are used for protection, but here we have used for switching purpose. So, by using relay, AC pump is operating and supply of water from tank or reservoir to the farm is to be done. The solar panel is used to covert the solar energy into electrical energy and stored supply into the battery in chemical form. One diode is connected between solar panel and battery.

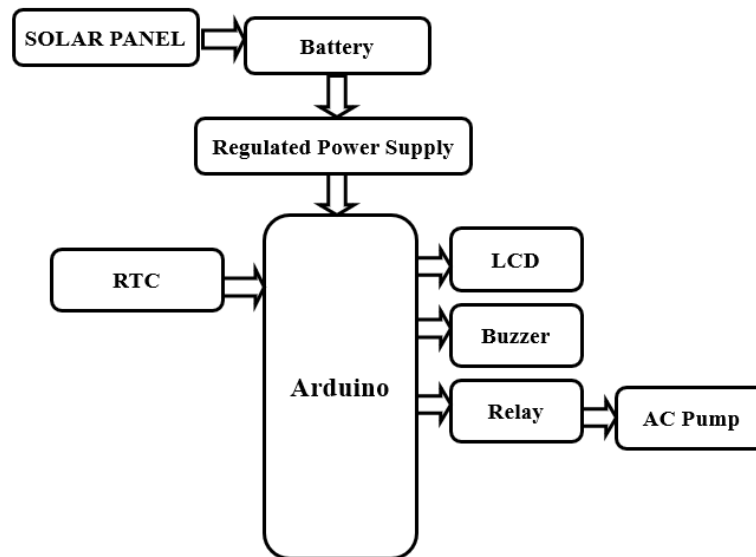


Figure 1. Proposed block diagram.

Advantages

- Energy is saved.
- Dependable and long life.
- Produces water when it is required most.
- Low labour and preservation costs.
- No fuel costs.
- Easy to take away, transport and store.
- Non-polluting.

4. EXPERIMENTAL SETUP

4.1. LCD

LCD is liquid crystal display technology works by blocking light. Specifically, it is made of two pieces of polarized glass that contain a liquid crystal material between them. A backlight creates light that passes through the first substrate. It is used for display purpose.



Figure 2. LCD module.

4.2. Buzzer

A buzzer or beeper audio signalling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers, and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

4.3. Arduino

Arduino Uno is a microcontroller board based on 8-bit ATmega328P microcontroller. Along with ATmega328P, it consists other components such as crystal oscillator, serial communication, voltage regulator, etc. to support the microcontroller. Arduino Uno has 14 digital input/output pins (out of which 6 can be used as PWM outputs), 6 analog input pins, a USB connection, A Power barrel jack, an ICSP header and a reset button.

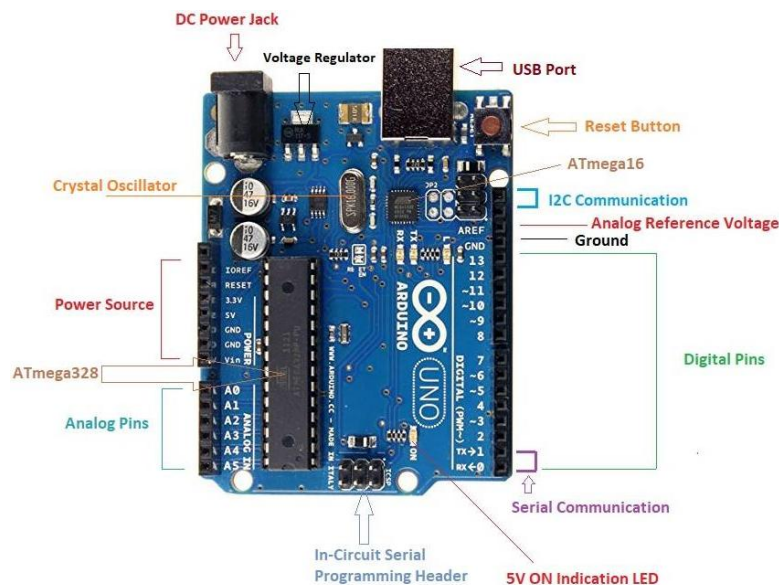


Figure 3. Arduino UNO microcontroller.

Arduino can be used to communicate with a computer, another Arduino board, or other microcontrollers. The ATmega328P microcontroller provides UART TTL (5V) serial communication which can be done using digital pin 0 (Rx) and digital pin 1 (Tx). An ATmega16U2 on the board channels this serial communication over USB and appears as a virtual com port to software on the computer. The ATmega16U2 firmware uses the standard USB COM drivers, and no external driver is needed. However, on Windows, a .inf file is required. The Arduino software includes a serial monitor which allows simple textual data to be sent to and from the Arduino board. There are two RX and TX LEDs on the Arduino board which will flash when data is being transmitted via the USB-to-serial chip and USB connection to the computer (not for serial communication on pins 0 and 1). A Software

Serial library allows for serial communication on any of the Uno's digital pins. The ATmega328P also supports I2C (TWI) and SPI communication. The Arduino software includes a Wire library to simplify use of the I2C bus.

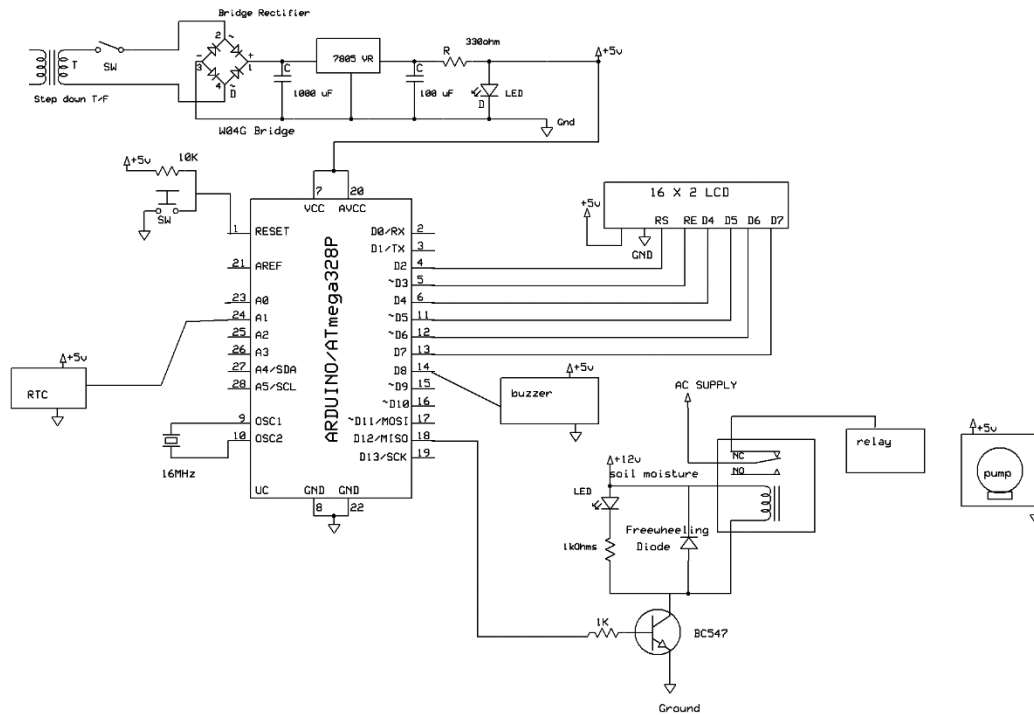


Figure 4. Schematic circuit of proposed system.



Figure 5. Hardware set up of proposed solar water pumping system.

5. CONCLUSIONS

This article presented a solar water pump with smart time control project provide the unique features like it provide zero maintenance. Long useful life, no fuel requirement, no contamination, and comparatively easier installation etc compared to the diesel power pumping system. Solar water pump with smart timing control provides different time slots for pump working. It also reduces the human efforts. One advantage of this system is produces water when it's needed most this system makes a batter way to develop in area where grid electricity is unavailable and alternative sources do not provide sufficient energy.

6. FUTURE SCOPE

With headway in innovation, the frameworks can be made all the simpler to utilize. The proposed framework can be further enhanced by conveying a GSM show. The client can deal with the engine pump from an out of reach area utilizing his cell phone. The client can likewise get the water level sign of the tank and overhead stockpiling tank on his cell phone. These advances are now open in the market; however as of now they are not all that well known. Likewise, to check the rightness of the dirt, the framework can be settled with sensors like; Humidity sensor, pH sensor, Temperature sensors and so forth which can supply the client with data about the dirt condition through a SMS on his cell phone.

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