

Arduino based Smart Submersible Pump Controller

Abhishek Srivastava¹

¹Hobbyist, New Delhi, India

Abstract: *Nowadays, the drinking water is becomes a big issue. It might very big global problem. As we say that the third world war might be for water. Hence, it is time to think to preserve water. In home based water tank, the one problem is very common to us that the control of water level of overhead tank, as a result the wastage of water is increasing day by day. But we all know water is very precious to us. This problem can be controlled by an electronic circuit consists with some electronic components, that circuit is called 'Arduino based Smart Submersible Pump Controller'. The operation of Arduino based Smart Submersible Pump Controller works upon the fact that water conducts electricity. So water can be used to open or close a circuit. As the water level rises or falls, different circuits in the controller send different signals. These signals are used to switch ON or switch OFF the motor pump as per our requirements.*

Keywords: Arduino, Microcontroller, Smart Pump, Simple Water Level, Indicator, Alarm.

1. Introduction

The total amount of water available on Earth has been estimated at 104 billion cubic kilometers, enough to cover the planet with a layer of about 3 kilometers. About 95% of the Earth's water is in the oceans, which is unfit for human consumption. About 4% is locked in the polar ice caps, and the rest 1% constitutes all fresh water found in rivers, streams and lakes which are suitable for our consumption. A study estimated that a person in India consumes an average of 135 litres per day. This consumption would rise by 40% by the year 2025. This signifies the need to preserve our fresh water resources.

This circuit is a smart functional submersible controller using Arduino. The circuit displays the level of water in the tank and switches the motor ON when the water level goes below a predetermined level. The circuit automatically switches the motor OFF when the tank is full. The water level and other important data are displayed on a 16x2 LCD display. The circuit also monitors the level of water in the sump tank (source tank). If the level inside the sump tank is low, the motor will not be switched ON and this protects the motor from dry running. A beep sound is generated when the level in the sump tank is low or if there is any fault with the sensors.

1.1 Advantages and Features

A Smart Submersible Pump Controller is a device that manages water levels on a variety of systems such as water tanks, pumps and swimming pools. The basic function of a water level controller is to regulate water flow and optimize system performance. These devices have four main advantages.

Saves Power

Using a smart submersible controller saves power. This is because water levels are controlled automatically, which limits the amount of electricity used. As a result, less water and power are used to regulate a water supply. In an age where energy conservation is of utmost importance, using one of these devices is very beneficial.

Saves Money

Since a smart submersible controller conserves power, it saves money, as well. Basically, water regulation is optimized through these devices, which means that wasted electricity and wasted water is kept at a minimum. That saves a substantial amount of money over time.

Works Automatically

Another big advantage is that this device works it-self. Thanks to timer switches, there is no need to operate them manually. This means that the frustrations involved with monitoring something like a water tank is minimized, and the water levels will be where they should be.

Maximizes Water

Additionally, water usage can be maximized with a smart submersible controller. Often, submersible pumps get more use during the middle of the day. A smart submersible controller is helpful because it automatically provides more water during the middle of the day and less water at night. As a result, water remains at its appropriate level at all times.

1.2 Applications

This Smart Submersible Pump Controller can be used in Hotels, Factories, Homes, Apartments, Commercial complexes, Drainage, etc. It can be fixed for single phase motor, three phase motors, and Fuel level indicator in vehicles. This is also used in the huge container companies on the tank walls.

2. Technical Aspects

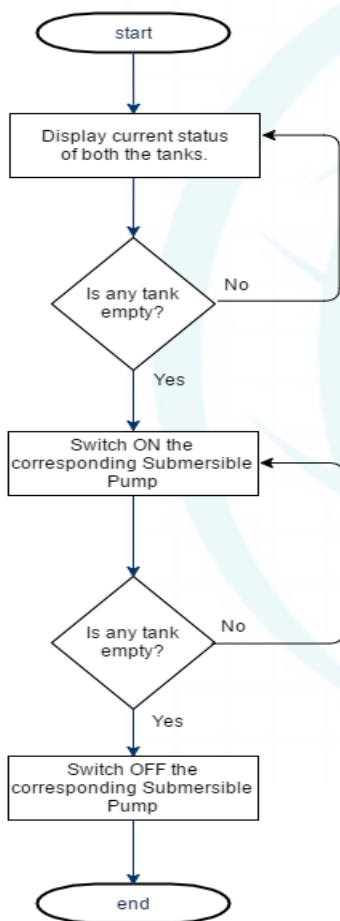
2.1 Process of Manufacture

The Arduino based Smart Submersible Pump Controller's basic feature is used to measure the level of overhead tanks and sump tanks. The sensor assembly consists of four aluminum wires arranged at 1/4, 1/2, 3/4 and full levels in the tank. The dry ends of these wires are connected to analog input pins A1 (1/4th), A2 (1/2th), A3 (3/4th) and A4 (full) of the Arduino respectively. A fifth wire is positioned at the bottom of the tank. Resistors R6 to R9 are pull down resistors. The dry end of this wire is connected to +5V DC.

When the water touches a particular probe, electrical connection is established between that probe and the +5V probe because water has slight conductivity. As a result current flows through that probe and this current is converted into a proportional voltage by the pull down resistor. Arduino reads the voltage dropped across each pull down resistor for sensing the level of water in the tank. Same method is used for measuring the level of water in the sump tank.

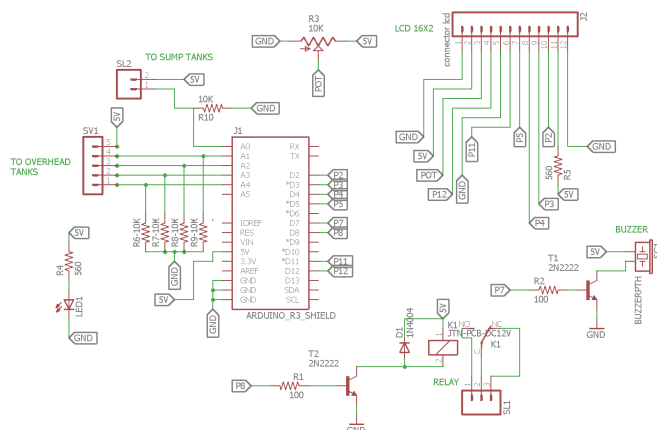
Digital pin 7 of the Arduino controls the buzzer and digital pin 8 controls the motor. Transistor T1 drives the buzzer and resistor R2 limits the base current of T1. Transistor T2 drives the relay. Resistor R1 limits the base current of T2. D1 is a freewheeling diode. POT R3 is used to adjust the contrast of the LCD. Resistor R5 limits the current through the back light LED. Resistor R4 limits the current through the power ON LED.

2.2 Flowchart



The flow chart is described for this project. Initially, LCD will display the current level status of the overhead tank. There are five different levels specified for the overhead tank. These levels are low, 1/4, 1/2, 3/4 and full. If the overhead tank is empty then Arduino switch on submersible with the help of relay. If the overhead tank is full, then the water pump will be automatically stopped with the help of relay as well as displayed on the LCD. And if the sump tank is empty then the circuit will display low level on LCD and switch on the buzzer i.e. beep....beep sound.

2.3 Circuit Diagram



3. Results

The experimental model was made according to the circuit diagram and the results were as expected. The submersible pump switch ON when the overhead tanks was about to go dry and switched OFF when the overhead tanks was about to overflow.

4. Conclusions

- This system is very beneficial in rural as well as urban areas.
- It helps in the efficient utilization of available water sources.
- If used on a large scale, it can provide a major contribution in the conservation of water for us and the future generations.

In these days, when Earth’s reserve of consumable water is decreasing every moment, every drop has its value. Smart Submersible Controller is a simple yet effective way to prevent wastage of water. Its simplicity in design and reliable components make it an ideal piece of technology for the common man.

5. Future Works

My sole intension of undertaking this project was to establish a cheaper, viable and simple configurable device which can solve our water wastage problem. I have very successfully implemented this system. It is a promising application made by the use of Arduino. This system can be implemented using Level sensors which would render an accurate water level and it can be operated using Android App/Smart Phones.

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