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# Automatic Water Overflow Cut-Off Circuit

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*Abstract :* *In India, there is a severe drinking water crisis. It could very soon become a global crisis. Automatic Water cut-off circuit can provide a solution to this problem" The operation of water level controller works upon the fact that water conducts electricity. Different sensors in the circuit send different signals depending on whether the water level is rising or falling. The motor pump is switched on or off based on these signals. So, the main objective of this project is to design and develop an automatic water cut-off circuit to maintain the outlet process of the water level at its desired level. Basically, one such way of Considering this aspect of comfort zones and the prevention of wastage of resources, a design of an automated overflow control circuit unit was proposed in this project. An overall review of the system's operation and performance was conducted.*
*Keywords -* *Prevention of wastage of water, Cut-off Circuit, Controller, Switch, Motor pump.*

## I.     INTRODUCTION

We were assigned the task of making a mini project in our third year of mechanical engineering to solve a problem in the society in 2021. We named it Automatic Water Overflow Cut-Off Circuit. The purpose of this project is to save electricity by using a single circuit for the water cut-off and therefore, we gain advantage of it by running the pump motor for a specific time duration which eliminates the concern of forgetting to turn off the motor every time the water is turned on. Taking a closer look at the technology, every step we take is related to it. By using sensors, we implement the new technology in the control unit of the water tank and overcome the shortcomings of the existing systems. In many cases, we forget to start the water pump in time, or even if we start, we forget to turn off the water pump, which results in a huge waste of both water and electricity. Our automatic switch for water pump solves this type of problem. Upon the water level falling below a certain predetermined level, the pump will start and automatically shut off when the water level rises in the overflow level.

## II.     PROBLEM DEFINITION

### 2.1 Problem Statement

Our existence depends on water, and we cannot waste it. Water scarcity is a problem in many villages around the world, including in India. Whenever possible, we should conserve water. There are many reasons why water is wasted, and one of them is overflowing water tanks. It is a problem that occurs everywhere, like in our homes, hotels, offices, and industries. There is a lot of water wasted. To minimize this loss of water, an automatic overflow cut-off will be installed in the tank. Both water and electricity will be saved.

### 2.2   Objectives

1.   save Electricity as well as Electric bill.
2.   Appropriate running of water pump.
3.   To eliminate the concern about water pump switch on and off.
4.   Ensure that water is available in the water tank.

## III.     METHODOLOGY

Due to the high complicity and difficulty in manufacturing of the electrical circuit, we are going to design a project to replace the use of circuit in the water tank by using Arduino. In our day-to-day life, due to the lack of

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attention, there is a huge loss of drinking water by not switching off the motor. This problem can be overcome by using this project.
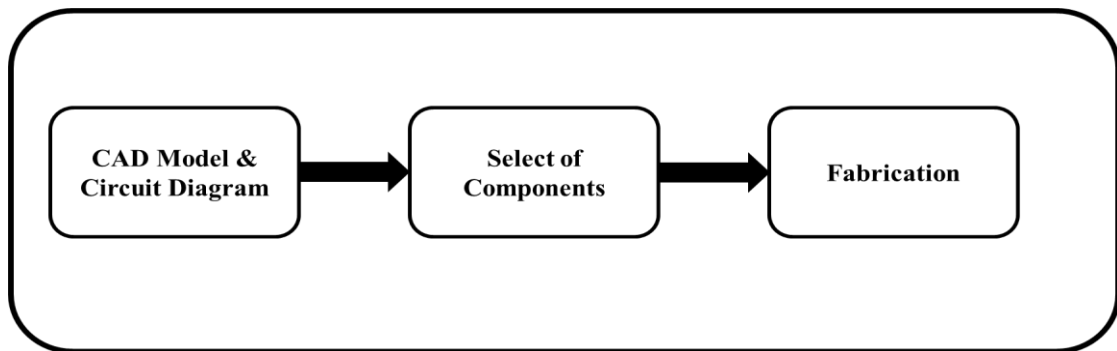


Fig 2.1.Working diagram

### 3.1 Manufacturing processes
### 3.1.1 Soldering

Solder is melted by using an iron with a temperature controller. Upon heating to temperatures above its melting point, around 600 degrees Fahrenheit, it melts, which then cools, creating the soldered joint. Solder can also be removed with a de-soldering tool. In circuit boards and copper pipe joints, solder is used to create strong permanent bonds. The solder core can also come in two types and diameters: lead and lead free, as well as between 032" and 062". However, inside the solder core is flux, which strengthens and improves its mechanical properties. Lead-based solders were once used in soldering, but regulations have led to a move away from lead-based solders to lead free solders, which may be made of antimony, bismuth, brass, copper, indium, tin, or silver. A flux can sometimes chemically clean the metal by preventing oxidation and prevent impurities from accumulating at the joint site, such as oil, dirt, and oxidation. In electrical joints, rosin flux is used to improve the mechanical strength and electrical contact. The surface tension can also be reduced by applying a 'wetting agent'.
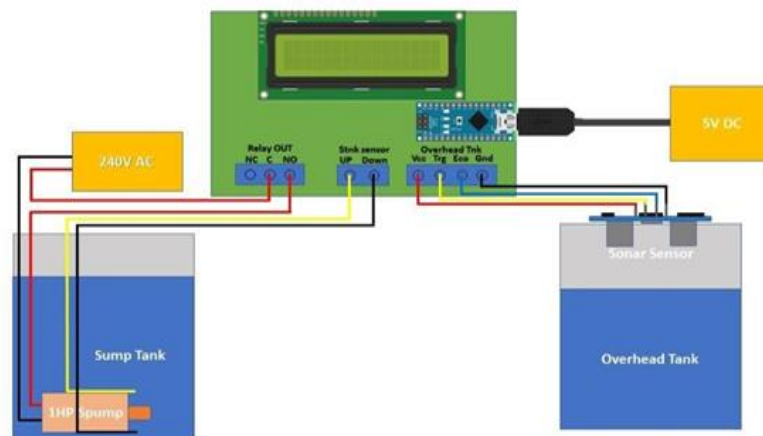
### 3.2 Partial Results



Fig 3.2.1. Circuit Diagram

As shown in the circuit diagram above, all the components are connected in accordance with their function. In order to operate the Arduino, a 5V DC supply is provided, and the components are soldered to the breadboard. Further details are presented below.

Fig 3.2.2 .Block Diagram

- The first block is Arduino Nano, which is the brain of this project. All other units will be adjusted based on the input from the sensors.
- A 16x2 LCD display is located in the second block. This unit displays the Water Level in percentage as well as in a bar diagram, and it also displays the Pump status. When the Sump tank is empty, this section will alert us.
- Sonar sensor is the third block. This sensor measures the level of water on the overhead tank.
- CALCULATION: Sonar Sensor:
  Speed of sound (v) = 340 m/s
  $\qquad$ = 0.034 cm/μs
  Time (t) = Sound Wave Travel Time (μs)
  Distance (s) = t × 0.034/2

- Sonar Sensors emit ultrasound at 40 kilohertz, which travels through the air and bounces back to the module if it encounters an object or obstacle on its way.
- Arduino measures sound wave travel time in microseconds with the echo pin on Ultrasonic sensor.
- You can find the distance by using the formula shown here, taking into account the travel time and speed of the sound.
- The sump water level sensor is the fourth block. Two copper wires are dipped in the sump water tank. We will sense the presence of water using an Analog pin on the Arduino Nano.
- A push button is the fifth block in this circuit, which is used to measure the height of the Tank when it is installed. Additionally, you can use this to replace the old water tank with a new one.
- Water Pump with Internal Relay is the sixth block. Using the internal relay, Arduino will control the water pump. Using the relay present on the circuit, any 1 HP single phase Water pump can be started without starters.
- Using the Seventh block for the same purpose, replace the internal relay with any relay that runs on 5V DC to get a better power rating to drive the Water pump.
- The eighth block is the Buzzer, which signals when the sump tank is empty.

## IV.     FIGURES AND TABLES

### 4.1 PART LIST AND COMPONENTS

| SR.NO | PARTS | SPECIFICATIONS |
|---|---|---|
| 1 | Arduino Nano | Microcontroller Atmel ATmega328 Operating Voltage (logic level): 5V Input Voltage (recommended): 7V ~ 12V Input Voltage (limits): 6V ~ 20 V Digital I/O Pins: 14 (of which 6 provide PWM output) Analog Input Pins: 8 DC Current per I/O Pin: 40mA Flash Memory: 32KB (ATmega328) (of which 2 KB used by bootloader) SRAM: 2KB (ATmega328) EEPROM: 1KB (ATmega328) Clock Speed: 16MHz |

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| 2 | 16*2 LCD Display | A 16x2 lcd means it can display 16 characters per line and there are 2 such lines. In this lcd each character is displayed in 5x7 pixel matrix. jhd162a<br>Black text on green background<br>Connection port is 0.1" pitch, single row for easy breadboarding and wiring<br>Pins are documented on the back of the lcd to assist in wiring it up |
|---|---|---|
| 3 | 5V Relay | PCB Mount Sugar Cube Spdt Relay<br>Package Contents: 5 x Relays<br>5V or 6 Volts |
| 4 | Piezo Buzzer | 5V Piezo Buzzer<br>Item Weight: 9.00 grams<br>Manufacturer Series Number: BUZZER-5V<br>Brand Name: OLatus |
| 5 | Push Button | Brand: OCR<br>Material: Fabric<br>High precision mechanism design offers perfect operation and long service life. |
| 6 | LED | 5MM clear white<br>Voltage: 3.0 v - 3.3V<br>CURRENT: 50ma, ultra-bright lighting |
| 7 | BC 547 Transistor | BC 547 NPN Amplifier Transistors<br>Comes as set of 5<br>Long lasting product |
| 8 | IN4007 Diode | Brand: REES52<br>Color: multicolor<br>Manufactured series number: B018KAJBKG |
| 9 | 220 Ω Resistor | 220 ohm 1/4w 5% carbon film resistor<br>Manufacturer: HE Retail Supplies |
| 10 | Trimpot 10k Ω Variable Resistor | Brand name: Seloky<br>Specification Met : Rohs<br>Material: resistor |
| 11 | 10k Ω Resistor | Brand : Electrobot<br>Included components: 100 x 10K OHM CARBON FILM RESISTORS |
| 12 | 1K Ω Resistor | 1k Ohm 1/4w<br>5% Carbon Film Resistor, Set Of 100 Resistance |
| 13 | 3P PCB Screw Terminal Block Connector | PCB Terminal Block; Rated Value : 300V 10A<br>Pole Quantity : 3 Pole; Pitch : 3.5mm/ 0.14'<br>Size : 11 x 7 x 9mm/ 0.43' x 0.27' x 0.35' (L*W*H);Material : Plastic, Electric Parts<br>Colour : Silver Tone, Green; Net Weight : 14g |
| 14 | Female Pin Header Connector Strip | Brand: MIGDREEM<br>Item Diameter: 0.78 inches<br>Item Thickness: 0.58 inches |
| 15 | Male Pin Header Connector Strip | Product Name : Pin Header; Position : 40; Dual-row 40pin 2.54mm<br>Pin Pitch : 2.54mm/ 0.1";Total Size : 202 x 10 x 2.5mm/ 7.8" x 0.4" x 0.1"( L*W*H);Weight : 50g |
| 16 | 5V Relay Board (optional) | Manufacturer: Esooho<br>Dimensions: 2.44 x 1.34 x 0.16 inches<br>5V 1-Channel Relay Module Low Level Triger for Arduino |
| 17 | Jumper wire | Brand: CenryKay<br>Material; copper |

## V.     CONCLUSION

The purpose of this paper was to develop a simple and low-cost water level indicator. Not only is it for water tanks, but it is also used for oil levels and chemical laboratories. Our system was designed using Arduino as a platform and local materials to keep the cost low. The system has been designed in such a way that its components will prevent water from being wasted. The entire system is automatic. There is no need for an expert to operate it. There isn't much cost associated with it. Future research and development are much more feasible with this design. Despite the fact that it is a project, we hope some modifications will be made to it to allow a reasonable level of usage diversity.

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