

Auto Water Level Controller

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Abstract: *The Auto Water Level Controller is a system that helps control the water level in a tank automatically. It uses sensors to check how much water is in the tank and turns the motor ON when the water is low and OFF when the tank is full. This system saves water, electricity, and protects the motor from damage. It reduces the need for manual checking and makes water management easier and more efficient. The system can be used in homes, buildings, and farms to ensure a constant water supply without wastage.*

Keywords: Auto Water Level Controller, Water Level Monitoring, Ultrasonic Sensor, Float Sensor, Relay Module, Arduino, Motor Pump, Microcontroller, Automation System, Water Management, Smart Water Control, Liquid Level Detection, Overflow Protection, Dry Run Protection, Energy Saving, IoT-based System, Home Automation, Smart Tank System, Automatic Pump Control, Sustainable Technology

I. INTRODUCTION

Water is one of the most important natural resources essential for human life. We use it every day for drinking, cooking, cleaning, farming, and in industries. However, in many places, a large amount of water gets wasted because people forget to switch off the motor when the water tank is full. Sometimes, the motor also gets damaged when it runs without water in the source. To overcome these problems, an Auto Water Level Controller can be used. This system helps to automatically control the water level in the tank without the need for continuous human monitoring.

The Auto Water Level Controller is a simple and smart system that uses sensors to detect the water level in a tank. When the water level becomes low, the system automatically turns the motor ON to fill the tank. When the tank becomes full, the motor is turned OFF automatically. This process helps to save water, electricity, and time while protecting the motor from damage caused by dry running.

In many homes and buildings, people still operate the motor manually, which is time-consuming and leads to water wastage. The automatic water level controller solves this by continuously monitoring the water level and controlling the motor using sensors, a microcontroller (like Arduino), and a relay module. In advanced models, IoT (Internet of Things) technology can be added to monitor and control the system remotely using a smartphone or web dashboard. The system is highly useful for homes, schools, hospitals, offices, and farms, ensuring an uninterrupted water supply while saving electricity and extending motor life.

This project supports the vision of smart homes and smart cities by promoting automation and efficient water management. It is a low-cost, reliable, and eco-friendly solution that helps reduce water wastage and supports sustainable development.

II. LITERATURE SURVEY

Over the years, many researchers and engineers have developed different types of automatic water level controllers to improve water management. The main goal of these systems is to save water, reduce electricity usage, and remove the need for manual operation of pumps. In the beginning, simple float switches were used to control the motor. When the water level dropped, the float moved down and turned the motor ON, and when the tank became full, it moved up and



turned the motor OFF. Although this method was easy and low-cost, it was not very reliable, as float sensors could get stuck or damaged.

Later, microcontroller-based systems were introduced using sensors like conductive, capacitive, or ultrasonic types. These sensors sent signals to the microcontroller, which controlled the motor through a relay. Such systems were more accurate, flexible, and provided better safety for the motor by preventing overflow and dry running. In 2018, ultrasonic sensors were used to measure the water level without touching the water, reducing maintenance issues. In 2019, an Arduino UNO-based system with LEDs and a relay module was developed to show tank levels and control the motor automatically.

Recent studies (2020–2022) introduced IoT and AI features. These systems send water level data to mobile apps, allowing users to monitor and control the motor remotely. With cloud storage and data analysis, they can even predict water usage. Such smart systems promote water conservation and support the idea of smart homes and sustainable cities.

III. PROBLEM STATEMENT

In most homes, buildings, and industries, water tanks are still filled manually by turning the motor ON and OFF. This manual process often causes problems like water overflow, wastage, and motor damage. When people forget to switch off the pump, water overflows from the tank, leading to unnecessary loss of water and electricity. Similarly, when the pump runs without water in the source, it can damage the motor due to dry running.

These issues occur mainly because there is no automatic system to monitor and control the water level. Manual operation requires constant attention, which is difficult in today's busy life. In places like apartments, schools, and hospitals, where large amounts of water are needed every day, this problem becomes even more serious.

Therefore, there is a need for an automatic system that can control the water level efficiently without human involvement. The Auto Water Level Controller solves this problem by using sensors to detect the water level and automatically turning the motor ON or OFF. This system helps to save water, reduce electricity usage, and protect the motor from damage while providing a simple and cost-effective solution for better water management.

IV. AIM AND OBJECTIVES

Aim: The main aim of the Auto Water Level Controller is to automatically monitor and control the water level in a tank without human involvement. The system is designed to prevent water overflow, avoid dry running of the motor, and ensure continuous water availability while saving electricity and water. **Objectives:**

- To reduce water wastage by preventing overflow from storage tanks.
- To protect the motor from dry running and overheating when there is no water in the source.
- To save electricity by running the motor only when required.

V. SYSTEM ARCHITECTURE

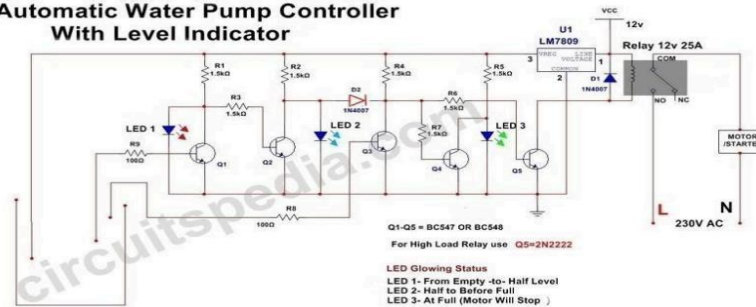
The system architecture of the Auto Water Level Controller consists of several main components that work together to automatically control the water level in a tank. The key components include a microcontroller, water level sensors, a relay module, a motor pump, and a power supply.

The sensors are placed at different levels inside the water tank to detect whether the tank is empty, half full, or full. These sensors send signals to the microcontroller, which acts as the brain of the system. Based on the sensor readings, the microcontroller decides whether to turn the motor ON or OFF. The relay module works as an automatic switch that controls the power supply to the motor. When the microcontroller sends a signal, the relay turns the motor ON to fill the tank or OFF when the tank is full. The power supply unit provides the required voltage to all the components in the system.

This simple and reliable architecture helps in reducing manual effort, saving water and electricity, and protecting the motor from damage. It can be easily implemented in homes, offices, and industries for efficient water management.



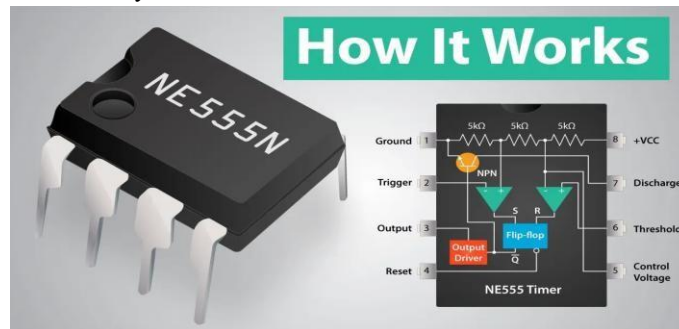
Automatic Water Pump Controller With Level Indicator



VI. COMPONENTS

• 555 Timer IC

The 555 Timer IC is a small electronic chip used for timing and control applications. It can work in three modes astable, monostable, and bistable. In an auto water level controller, it helps generate timing pulses, control motor operations, and provide accurate switching automatically without manual effort.



• Resistors

A resistor is an electronic component that controls or limits the flow of electric current in a circuit. It helps protect sensitive components from damage by reducing excess current. In an auto water level controller, resistors are used to regulate voltage and ensure stable operation of sensors and other parts.



• Capacitor

A capacitor is an electronic component that stores and releases electrical energy. It helps smooth voltage fluctuations and provides stable power in a circuit. In an auto water level controller, capacitors are used for filtering, noise reduction, and maintaining steady operation of sensors and microcontroller circuits.



• 12V SPDT Relay

A 12V SPDT Relay (Single Pole Double Throw) is an electromechanical switch used to control high-voltage devices with a low-voltage signal. In an auto water level controller, it connects or disconnects the motor based on signals from the controller, helping to automate the ON/OFF operation safely and efficiently.



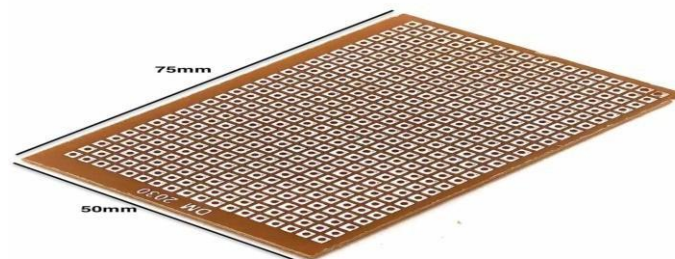
• Connectors

Connectors are small components used to join different parts of an electronic circuit, allowing easy connection and disconnection of wires or devices. In an auto water level controller, connectors link sensors, relays, and the microcontroller, ensuring proper electrical contact and making the system easy to assemble, maintain, and troubleshoot.



• 0 PCB

A Zero PCB (Printed Circuit Board) is a general-purpose board used for building and testing electronic circuits without designing a custom PCB. It has pre-drilled holes with copper pads for soldering components. In an auto water level controller, it helps connect all parts neatly and ensures stable circuit performance.



• Wires

Wires are used to connect different components in an electronic circuit, allowing electric current to flow between them. In an auto water level controller, wires connect sensors, relays, the microcontroller, and the motor. They help in signal transmission and power supply, ensuring smooth and reliable system operation.





• Pump Motor

A pump motor is an electrical device used to move water from one place to another, such as from a storage tank to an overhead tank. In an auto water level controller, the pump motor automatically turns ON or OFF based on water levels, helping to save water and electricity efficiently



VII. WORKING

The Auto Water Level Controller works by automatically monitoring the water level in a tank and controlling the motor pump accordingly. The system uses sensors placed at different heights in the water tank to detect the water level such as low, medium, and full. These sensors send signals to the microcontroller, which acts as the main control unit of the system.

When the water level falls below the minimum level, the microcontroller receives a signal from the sensor and turns ON the motor through the relay module. The motor then starts pumping water into the tank. As the water level rises, the sensors continuously send updates to the microcontroller. When the tank reaches the maximum level, the upper sensor sends a signal to the microcontroller, which then turns OFF the motor automatically. This prevents overflow and saves water. If there is no water in the source, the system also prevents the motor from running dry to avoid damage.

This automatic process ensures efficient use of water and electricity without the need for manual checking. It makes the system reliable, safe, and convenient for everyday use in homes and industries.

VIII. RESULTS

The Auto Water Level Controller system was successfully developed and tested to control the water level in a storage tank automatically. The system worked efficiently by turning the motor ON when the water level was low and OFF when the tank became full. During testing, it was observed that the sensors accurately detected different water levels and sent correct signals to the microcontroller. The relay module responded quickly, ensuring smooth motor operation without delay.

The system helped to eliminate water overflow, which reduced water wastage. It also prevented dry running of the motor, protecting it from overheating or damage. Power consumption was reduced because the motor operated only when needed. The system performed reliably in different conditions and was easy to install and maintain. It can be used in homes, schools, offices, and industries where regular water supply management is required. The results proved that the Auto Water Level Controller is an effective, low-cost, and energy- saving solution for daily water management problems.

IX. ADVANTAGES & APPLICATIONS



• **Advantages**

- Saves Water: Stops overflow and reduces wastage of water.
- Saves Electricity: Turns off the motor automatically when the tank is full.
- Motor: Prevents damage caused by dry running.
- Less Human Effort: No need to manually switch the motor on or off.
- Low Cost: Easy to install and maintain with affordable components.

• **Applications**

- Homes: Used to fill overhead water tanks automatically.
- Apartments : Manages water supply for multiple tanks efficiently.
- Farms: Controls water pumps for irrigation automatically.
- Industries: Helps maintain constant water levels in industrial tanks.
- Schools & Hospitals: Ensures continuous water supply without overflow or shortage.

X. FUTURE SCOPE

The Auto Water Level Controller has a wide scope for future development and improvement. In the coming years, this system can be enhanced by adding IoT (Internet of Things) technology, allowing users to monitor and control the water level from their smartphones or computers. With mobile applications, users can receive real-time notifications about the tank status and control the motor from anywhere.

The system can also be improved by adding cloud storage to record daily water usage, which will help in analyzing and managing water consumption more efficiently. Artificial Intelligence (AI) and Machine Learning (ML) can be introduced to predict water usage patterns and automatically adjust motor operations based on user habits and weather conditions. Solar power integration can make the system more energy- efficient and suitable for remote areas where electricity supply is limited. The design can be made more compact, waterproof, and durable for long-term use.

XI. CONCLUSION

The Auto Water Level Controller is an efficient and reliable system that automatically manages the water level in a tank. It helps prevent overflow, saves water, reduces electricity use, and protects the motor from damage. The system is simple, low-cost, and easy to install, making it suitable for homes, buildings, and industries. It reduces human effort and ensures a constant water supply. Overall, this project provides a smart and eco-friendly solution for daily water management and supports the goal of sustainable living through automation and resource conservation.

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