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Automatic Water Level Controller for Overhead and Underground Water Tank

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Abstract— *This is an Arduino-based automatic water level controller. Here, we are going to measure the water level with the help of Float switch fluid level controller sensors. The Float switch fluid level controller sensors use the principle of a "2-way switch". The motor pump automatically turns ON when the water level is low. There is a lot of drinking water crisis in India and also in other countries. Today we need to preserve water at any cost. In India, we can see many houses as overhead tanks and they keep on overflowing water. It wastes a lot of water as well as electricity. If we do not do anything on this matter, then we can face a huge scarcity of water. In this project, implement an automatic water level controller so that we no longer have to manually switch ON and switch OFF the motor. The device automatically detects the water level, when it is low, hence triggering the relay which turns on the motor. This helps in reducing wastage of water as well as electricity. This also reduces manpower as we no longer need to operate it manually.*

Keywords— ***Water Level Detector, water crisis, overhead tanks, water level controller, Float switch.***

I. INTRODUCTION

An automatic water level controller for overhead and underground water tanks is a smart device designed to efficiently manage water levels in both types of tanks. This innovative system utilizes sensors to detect water levels and activates pumps to fill or empty the tanks as needed, ensuring a consistent supply of water. By automatically regulating the water flow, it prevents overflow or dry running, optimizing water usage and reducing wastage. With its user-friendly interface and reliable operation, this controller offers convenience and peace of mind to users, making it an indispensable solution for maintaining optimal water levels in residential, commercial, and industrial settings [1].

In modern water management systems, ensuring efficient utilization and conservation of water resources. The effective control of water levels in both overhead and underground tanks. To address this need, automatic water level controllers have emerged as invaluable tools. These controllers employ technology to monitor and regulate water levels, offering convenience, reliability, and conservation benefits.

An automatic water level controller for both overhead and underground water tanks is a comprehensive solution designed to streamline the process of managing water supply. It comprises a network of sensors, valves, and a control unit that work seamlessly to maintain optimal water levels in the tanks [2].

The automatic water level controller for overhead and underground water tanks offers numerous benefits, including improved efficiency, reduced water wastage, and enhanced convenience for users. By leveraging cutting-edge technology, it addresses the challenges associated with water management, contributing to sustainable usage and conservation efforts [3].

II. RESEARCH MOTIVATION

The research aims to develop an automatic water level controller for both overhead and underground tanks to address inefficiencies in manual monitoring, reduce water wastage, and ensure consistent supply. By integrating advanced sensors and control systems, the solution offers convenience and efficiency in water management, crucial for regions facing water scarcity. This technology

promotes sustainability by optimizing water usage and minimizing human error. Additionally, it caters to diverse user needs by accommodating different types of storage systems. Overall, the research is motivated by the pressing need for improved water management solutions to meet the challenges of the modern world**.**

III. OBJECTIVES

The objectives of developing an Automatic Water Level Controller for both overhead and underground water tanks are multifaceted, addressing key concerns in water management and conservation.

The primary aim is to enhance efficiency in water usage. By automating the process of maintaining desired water levels in tanks, the system ensures that water resources are utilized optimally without unnecessary wastage. This is particularly crucial in regions facing water scarcity or where water is a precious commodity [4].

Secondly, the objective is to reduce manual intervention in water level management. Traditional methods of monitoring and adjusting water levels in tanks require constant human oversight, which can be time-consuming and prone to errors. The automatic controller eliminates the need for such manual intervention, providing convenience to users and freeing up time for other tasks.

Thirdly, safety is a key objective of the Automatic Water Level Controller. Overflow from tanks can lead to property damage and pose safety hazards. By preventing overflow through automated monitoring and adjustment of water levels, the system helps to mitigate these risks, ensuring the safety of both property and individuals [5].

Moreover, the versatility of the controller is an important objective. It should be adaptable to different settings and applications, including residential, commercial, and agricultural contexts. This ensures that the benefits of efficient water management can be realized across various sectors, contributing to overall water conservation efforts. Reliability and durability are also crucial objectives. The controller should be designed to withstand environmental factors and operate consistently over the long term. This ensures that users can depend on the system for uninterrupted water level management, thereby promoting sustained water conservation practices [6].

Overall, the objectives of developing an Automatic Water Level Controller for overhead and underground water tanks encompass efficiency, convenience, safety, versatility, reliability, and durability. By addressing these objectives, the system aims to contribute to sustainable water usage practices and environmental conservation efforts [7].

IV. COMPONENT USED

1. **Water pump:** A water pump is used to move, compress, or transfer water from a lower level to a higher one. The main purpose of a water pump is to transfer water between two points and to get rid of excess water. It is often used in construction sites, tunnels, riverbeds, residential buildings, etc [8]. water pump is physically shown in Fig.1.

Fig.1: Water Pump

2. **Float switch sensor:** A float switch is a type of 2-way switch which operates the float of the sensor as shown in Fig.2. If the water level is low then 1 switch is ON but the water is filled then the sensor floats and then the 2 switches are operated then the water motor is OFF [8].

Fig.2: Float Switch Sensor

3. **LED 3V:** LED, or light-emitting diodes, are semiconductor devices that emit light when an electric current passes through them. LEDs are physically shown in Fig.3. Commonly operated at 3 volts, LEDs offer energy-efficient illumination in various applications such as lighting [9].

Fig.3: LED 3V

4. **Relay 12V:** A relay is an electrically operated switch that controls the flow of electricity in circuits. Rated at 12 volts, relays are commonly used to control high-power devices with low-power signals [9]. 12 V Relay is physically shown in Fig. 4.

Fig. 4: 12 V Relay

5. **Resistance:** Resistance is a fundamental property of materials that opposes the flow of electric current. Measured in ohms (Ω), it determines how much a material impedes the flow of electricity [10]. It is physically shown in Fig. 8.

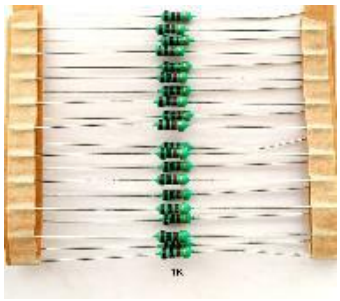

Fig. 5: Resistance

6. **Arduino Nano:** The Arduino Nano is a compact, versatile microcontroller board based on the ATmega328P chip as shown in Fig.6. It offers a wide range of features including digital and analog input/output pins, USB connectivity, and compatibility with the Arduino IDE [2].

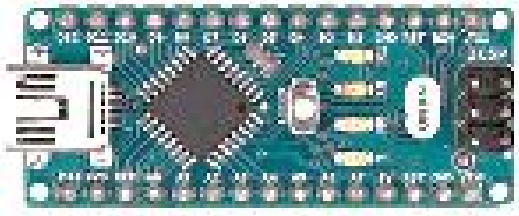

Fig.6: Arduino Nano

7. **Transistor:** Transistors are semiconductor devices crucial in electronic circuits for amplification, switching, and signal modulation. They control the flow of current between two terminals based on the voltage applied to a third terminal [9]. It is physically shown in Fig. 7.

Fig.7: Transistor

8. **Diode:** A diode is a semiconductor device that allows current flow in one direction while blocking it in the opposite direction. It is physically shown in Fig. 8.

Fig. 8: diodes

9. **Buzzer:** The buzzer is an electromechanical device that produces a buzzing sound when an electrical current passes through it. Commonly used in alarms, timers, and signalling systems, it consists of a coil of wire and a vibrating armature that creates the buzzing noise, alerting users to a particular event or condition [9]. A buzzer is shown in Fig. 9.

Fig.9: Buzzer

10. **Switch:** A control is defined as an on-off switch when its function is to open or close an electrical circuit in a stable manner as shown in Fig.10.

Fig. 10: Switch

11. **Breadboard PCB:** A breadboard is a reusable solderless prototyping tool used to build and test electronic circuits as shown in Fig. 11. It consists of a

grid of holes for inserting components and metal strips for connectivity.

Fig.11: Breadboard PCB

12. **Wire:** A wire is a flexible metallic conductor as shown in Fig. 12, especially one made of copper, usually insulated, and used to carry electric current in a circuit.

Fig. 12: Wire

13. **Storage tank:** A storage water tank is a container designed to hold water for domestic, industrial, or agricultural use, providing a reserve for when water demand exceeds supply or during emergencies.

V. WORKING

The automatic water level controller for overhead and underground tanks operates through a simple yet effective mechanism to ensure consistent water levels and prevent overflow or dry-running situations. It typically comprises sensors placed at different levels within the tanks. For the overhead tank, sensors are installed at the desired high and low water levels, while for the underground tank, sensors are positioned at the upper and lower thresholds.

When the water level in the overhead tank drops below the set low level, the controller activates the water pump to refill the tank from the underground reservoir. Conversely, when the water level in the overhead tank reaches a high level, the controller stops the pump to prevent overflow. Simultaneously, the controller monitors the water level in the underground tank. If the level falls below the lower threshold, indicating insufficient water, it triggers an alarm or notification to alert the user. This ensures timely refilling of the underground tank to maintain a continuous water supply. The controller relies on microcontroller-based circuitry to process sensor inputs and control the pump operation accordingly. It may incorporate additional features such as LCD displays for real-time monitoring, manual override switches, and battery backups for uninterrupted operation during power outages. Overall, the working principle of the automatic water level controller involves intelligent monitoring of water levels in both overhead and underground tanks, coupled with automated pump control to maintain desired levels and prevent wastage or shortage of water. The picture of the completed system is shown in Fig. 13.

(a)

(b)

Fig.13: Pictures of the Project

VI. CONCLUSION

The automatic water level controller for both overhead and underground tanks present a pragmatic solution for effective water management. By automating the maintenance of desired water levels, it promotes the

optimal use of water resources while reducing waste and the need for manual intervention. This system brings convenience and reassurance to users by eliminating the necessity for constant monitoring and manual adjustments of water levels in tanks. Furthermore, it improves safety by preventing overflow and potential property damage due to water overflow. Its adaptability makes it suitable for various settings, including residential, commercial, and agricultural applications. With its proven reliability and durability, it ensures prolonged functionality, thus fostering sustainable water usage practices. Overall, investing in the automatic water level controller for overhead and underground tanks is a worthwhile endeavor, delivering tangible benefits to users and contributing to environmental sustainability efforts.

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