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Automated Water Control System For Underground Sump

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Abstract: This state-of-the-art water management system accomplishes two main goals that lead to unmatched efficiency and safety. Initially, its unique automated shut-off system makes use of Arduino Uno technology and water level sensors to determine when the sump fills up to capacity. This causes the incoming water supply valve to close, preventing overflow and water waste. To ensure equipment durability and dependability, the system also includes dry run prevention, which uses sensors and control logic to stop pump and motor activity when water levels fall below a key threshold. Because of its clever design, which combines relays, battery-operated motor, water level sensors, and complex control algorithms, the system operates at its best with the least amount of human involvement. This system redefines industry norms for optimum efficiency, safety, and dependability by offering a holistic solution for sustainable water management.

I. INTRODUCTION

In today's infrastructure, managing water resources is essential, and subterranean sump pumps are an essential part of water delivery networks. But inefficiencies in traditional water management systems, such as overflow and dry running, are common and can lead to water waste, equipment damage, and higher maintenance expenses. Due to these difficulties, creative solutions are required in order to maximise water level control, guarantee the dependable operation of vital machinery, and encourage the sustainable use of water.

The goal of this research article is to improve water management practices by introducing a new automated control system for subterranean sump pumps that addresses these issues. Utilising cutting-edge sensors, microcontrollers, and control algorithms, this system seeks to offer real-time water level monitoring and control, eliminating overflow and dry running, and guaranteeing

II. OBJECTIVES Main goals are :

1. Automated Water Management: Create an underground sump pump system by designing and developing an automated water management system.
2. Overflow Prevention: Install an automated shut-off system to stop overflow and water waste.
3. Equipment Protection: By implementing dry run avoidance, you can avoid dry running and guarantee the longevity of your equipment.

Subordinate Goals

1. System Integration: For best system performance, integrate sophisticated sensors, relays, and control algorithms.
2. Efficient Operation: Reduce the need for human intervention and make sure everything runs as safely as possible.
3. Sustainable Water Management: Offer a thorough approach to underground sump pumps' sustainable water management.

Aims for Evaluation

1. System Performance: Assess and test the efficiency, dependability, and performance of the system.
2. Comparative Analysis: List the benefits of the suggested solution in comparison to the current water management techniques.

III. IMPLEMENTATION

I. Sensors of Water Level

Install ultrasonic or float sensors in the subterranean sump to monitor water levels. Attach sensors to an Arduino Unomicrocontroller to transfer data.

2. The microcontroller Arduino Uno

- Gather information from water level sensors and process it
- Relays for controlling the water supply valve and pump
- Implement algorithms for automated shut-off and dry run prevention.

3. Incorporations

Manage the pump and water supply valve using signals from the Arduino Uno

- Turn on and off the pump and valve to avoid overflow and dry running.

4. Water Supply Valve

Regulate the amount of water that enters the sump using relay signals.

- Turns off automatically when the sump reaches capacity.

5. Motor and Pump

- Use relay signals to regulate the sump's water flow.
- Turns off automatically when the water level falls below a certain threshold

6. Battery-operated motor

- Supply electricity to operate the water supply valve.

Maintain uninterrupted functioning in the event of a power interruption.

7. Algorithms and Control Logic

- Install an automated shut-off system to stop overflow
- Use dry run prevention to safeguard machinery.
- Constantly assess and modify system performance

8. Interface with Users

- Give users the ability to change settings and parameters as needed - Monitor water levels and system status in real-time

9. Energy Source

- Guarantee a consistent power supply to every system component.
- Install a backup power supply to ensure ongoing operations

10. Connection and Wiring

- Ensure dependable control signals and data transmission; - Securely and effectively connect all components.

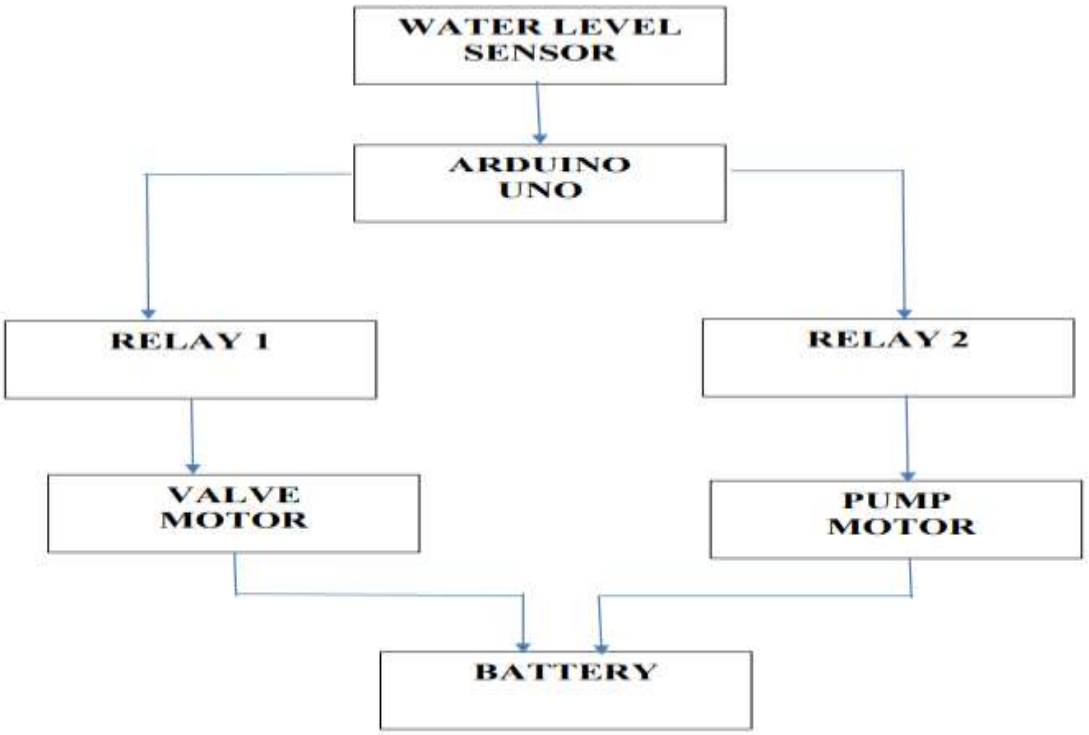

Fig 1 : Block Diagram OF Automated Water Control System For Underground Sump

IV. RESULTS AND DISCUSSION

The Automated Water Management System demonstrated exceptional performance in reducing the hazards of overflow and dry running. This ensures optimal use of water resources by utilising advanced sensors, relays, and complex control logic in a synergistic manner. The system's ability to accurately control water levels, which reduces the need for human intervention and increases operating safety, highlights its exceptional resilience, adaptability, and dependability. This new system, which outperforms traditional systems in terms of efficiency, safety, and sustainability, marks a paradigm shift in water management techniques. It is characterised by an intuitive user interface, scalability, and cost-effectiveness.

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