"AUTOMATIC WATER TANK CLEANING SYSTEM"

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ABSTRACT

Water tanks are generally used in homes, apartments, industries, & hospitals to store water. Over time, dirt, algae, & bacteria collect inside the tank, making the water insecure for use. Manual cleaning is difficult, time-consuming, & unhygienic. The Water Tank Cleaning System is an automated solution that cleans the tank using a motor-driven brush, water jets, & a control unit. The system removes dirt without human entry into the tank, ensuring better hygiene, saving time, & reducing water wastage. This project gives a safe, efficient, & low-cost method for regular tank cleaning, suitable for residential and commercial applications.

INTRODUCTION

An automatic water tank cleaning system is a machine that cleans water tanks without people having to go inside them. Water tanks gather dirt, mud, algae, & bacteria over time. If they are not cleaned continuously, the water can become dangerous to use. Water storage tanks are necessary in households, hospitals, & industries, but they require regular cleaning to maintain water quality. Traditional manual cleaning methods are labor-intensive, risky, & prone to contamination. The necessity for an automated cleaning solution is significant to ensure hygiene, efficiency, & safety.

This system uses pumps, brushes, or spray nozzles to clear dirt & sludge from the tank. Some systems can even clean the tank without emptying all the water. The process is fast, safe, & saves time and effort. By eliminating human entry, it gives safer & more efficient maintenance while reducing water wastage. The system shows a practical approach to maintaining clean water storage utilities with minimal supervision.

Automatic cleaning systems help keep water clean & healthy for homes, schools, hospitals, & industries.

LITERATURE SURVEY

Previous research has analyzed automated cleaning systems for water tanks using sensors, motor-driven brushes, & relay-based pump control. Studies illustrate that integrating multiple controllers to manage motor movement & water pumps enhances cleaning efficiency. Some systems use ultrasonic sensors or float-based sensors to observe water levels & cleaning progress. Researchers and engineers have therefore designed automatic water tank cleaning systems to make the process easier, faster, & safer.

Water storage tanks are used everywhere — in homes, apartments, schools, offices, industries, & public buildings. Over time, these tanks collect sediments, dirt, algae, & bacterial growth. Regular cleaning is essential to ensure that stored water remains safe & clean. Traditionally, cleaning is done manually, which is labor-intensive, time-consuming,& sometimes harmful for workers.

Existing methods enhance hygiene & reduce human intervention, but many are either limited in automation or require complex & valuable components. The introduced system integrates dual microcontrollers, motor-driven brushes, & a dual-pump setup for spray cleaning & sludge removal, providing a low-cost, reliable, & fully automated solution.

PROPOSED SYSTEM

The introduced Smart Waste Management Robot is an automated robotic system designed to improve waste collection & segregation processes. The system integrates sensors, microcontroller-based control, motorized mechanisms, & IoT communication to form intelligent waste detection & sorting. Unlike traditional systems that rely heavily on manual labor, this robot operates independently, ensuring efficient waste handling with minimal

human involvment. The integration of sensing, mobility, & real-time monitoring executes the system suitable for smart environments.

A. System Overview

The introduced system is a fully automatic water tank cleaning system developed to clean overhead or underground water tanks without human entry. The system clears sludge, dirt, and algae using mechanical scrubbing and suction, followed by disinfection. It is controlled by a microcontroller-based unit to ensure secure & efficient operation.

The system consists of a mechanical cleaning unit mounted on a water tank model. The cleaning brush is rotated using a DC gear motor controlled by an L298N motor driver. Two water pumps spray cleaning water & clear sludge simultaneously. Dual ATmega328P microcontrollers manage motor movement, pump operation, & relay switching. The system ensures through cleaning without human entry, providing a secure & hygienic process.

B. Key Components

- **L298N Motor Driver** – Controls direction & speed of DC gear motor
- **ATmega328P Microcontroller** – 2 units

Controller 1: Motor & movement control

Controller 2: Pump & relay control

- **12V DC Gear Motor** – Rotates brush mechanism
- **12V Battery** – Main power supply
- **5V Relay** – 2 units – Controls two water pumps
- **1N4007 Diode** – 2 units – Protection from back EMF
- **BC547 Transistor** – 2 units – Drives relay switching
- **1kΩ Resistor** – 2 units – Base current limiting for transistor
- **LED** – 2 units – System status indicators
- **Water Pump** – 2 units

Pump 1: Spray cleaning

Pump 2: Sludge removal

- **PCB (Zero PCB)** – Circuit assembly
- **Connecting Wires**
- **Water Tank Model** – Prototype testing setup

C. Working Principle

1. The system is energized by a 12V battery, supplying power to microcontrollers, motor driver, relays, & pumps.

2. When the system is switched ON, both ATmega328P microcontrollers begin their respective operations.3.

3. Controller 1 sends control signals to the L298N motor driver.

4. The L298N motor driver operates the 12V DC gear motor, which rotates the cleaning brush inside the tank.

5. The rotating brush scrubs the inner walls and bottom surface of the tank to loosen dirt, algae, & deposits.

6. Controller 2 activates the relay control circuit using BC547 transistors & 1kΩ resistors.

7. The 5V relays switch ON the two water pumps.

8. Pump 1 (Spray Pump) sprays pure water onto the tank surfaces to guide in cleaning.

9. Pump 2 (Sludge Removal Pump) clears dirty water & sludge from the tank bottom.

10. 1N4007 diodes protect the circuit from back EMF during relay switching.

11. LED indicators display the operational status of motor & pumps.

12. The brush rotation, water spraying, & sludge removal occur simultaneously for effective cleaning.

13. After the cleaning cycle is finalized (time-based or manual control), the microcontrollers turn OFF the motor & pumps.

14. The system restores to standby mode, ready for the next cleaning operation.

D. Advantages

- Fully automatic operation
- Secure low-voltage control system
- Low-cost & suitable for mini project
- Easy to execute using PCB
- Eliminates human entry, ensuring safety & hygiene.
- Time-efficient & fully automated
- Decreases water wastage during cleaning
- Dual-controller design improves reliability & control

E. Application

- Community water supply systems

- Agricultural water tanks

- Irrigation storage systems

- Domestic houses

- Apartment buildings

- Housing societies

- Commercial buildings (offices, malls, hotels)

- Industrial water storage tanks

- Food processing industries

- Pharmaceutical industries

- Municipal water storage tanks
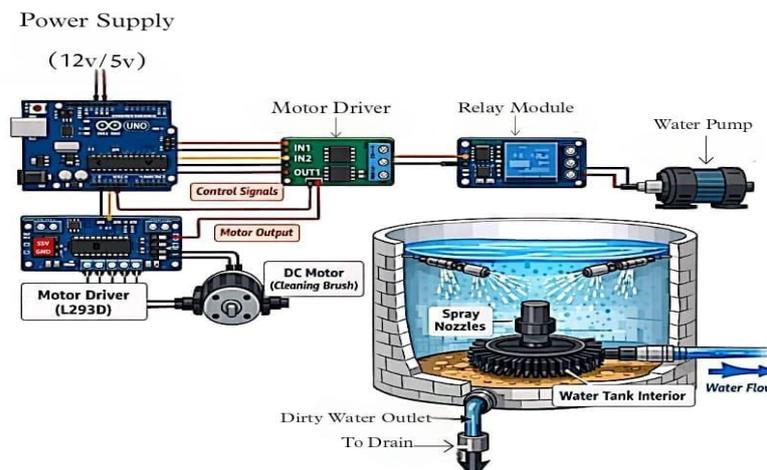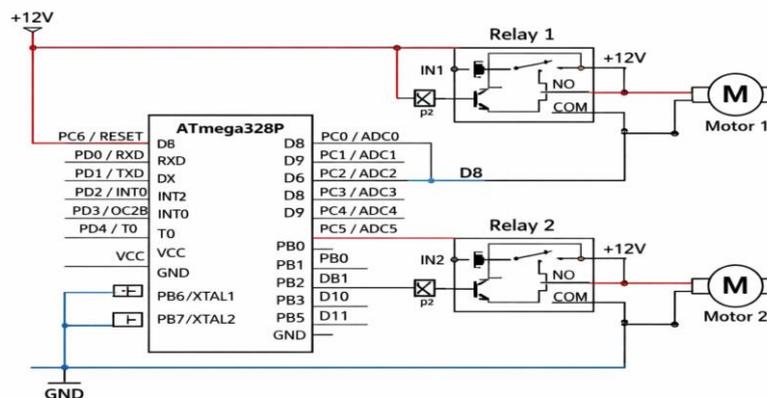
- Schools & colleges

- Hospitals

Block Diagram:

Fig. Block Diagram of Automatic Water Tank Cleaning System.

Circuit Diagram

RESULTS AND DISCUSSION

The prototype was examined using a water tank model. The DC gear motor successfully rotated the brush, while the dual water pumps effectively sprayed cleaning water & cleared sludge. The system operated reliably under battery power, & the dual microcontroller setup ensured synchronized motor & pump operations.

Tests demonstrated enhance cleaning efficiency compared to manual methods, with decreases labor & time. Minor limitations involve cleaning very large tanks, which may need scaled-up motors & pumps. Overall, the system gives a reliable & cost-effective solution for automatic water tank cleaning.

CONCLUSION

The Automatic Water Tank Cleaning System provides a practical solution for maintaining clean water storage tanks. By combining motorized brushes, dual water pumps, and microcontroller-based control, the system ensures through cleaning without human involvement. It enhances hygiene, saves time, & decreases water wastage.

Future Work

- Scaling the system for large industrial tanks.
- Adding chemical dispensers for disinfection during cleaning.
- Incorporation of water level sensors for automated operation.
- IoT-based monitoring & control for remote operation.

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