

Automatic Water Tank Overflow Controller using Ultrasonic Sensor

A non-contact ultrasonic tank controller with hysteresis pump control, sump dry-run interlock, LCD level display and event logging.

1. Introduction / Background

Two classic domestic failures: the overflowing overhead tank and the pump burned out by dry running.

This controller removes the human from the loop: a waterproof ultrasonic sensor measures tank level without touching water, automating pump start/stop with hysteresis, while a sump interlock prevents dry-run pumping.

2. Problem Statement

Float switches jam and probes corrode; manual pump operation wastes water and risks motors. Non-contact ultrasonic sensing plus proper hysteresis-band control and a dry-run interlock is clean, honest control engineering for a domestic single-pump setup.

3. Objectives

- Measure tank level non-contact with a waterproof ultrasonic sensor.
- Automate pump start/stop with a hysteresis dead band.
- Block dry-run pumping via a sump interlock with buzzer/LCD annunciation.

4. Proposed Methodology

The JSN-SR04T pings the water surface at fixed intervals; echo time converts to level percent against buyer-calibrated empty/full marks. The controller starts the pump at the low mark and stops at full, with separate levels preventing chatter. The sump interlock is checked before every start and during runs; a dry sump blocks pumping and raises the alarm. Events are logged for the report.

5. System Architecture / Working

- Sensing: JSN-SR04T under tank lid; sump float/second sensor as interlock.
- Control: Arduino state machine with hysteresis band; relay/contactors pump output; manual override switch.
- Interface: 16x2 LCD (level %, pump state, faults); buzzer; pump event log.

6. Hardware / Software Requirements

- Arduino Uno (or ESP32), JSN-SR04T waterproof ultrasonic sensor, sump float switch, pump relay/contactors, 16x2 LCD, buzzer, manual switch, demo tanks/pump.
- Arduino IDE (C/C++); 5 V DC logic.

7. Expected Outcomes

- A working controller preventing overflow and dry-run on a demo rig.
- Buyer-calibrated level marks and hysteresis band.
- A complete report, PPT and viva Q&A; on ultrasonic ranging, hysteresis and interlock logic.

8. Applications

- Domestic overhead-tank automation (via qualified installer).
- Farm/irrigation tank management.
- Teaching level control and hysteresis.

9. Future Scope

- GSM low-water alerts.
- Multi-tank sequencing.
- Flow-meter leak detection.

10. Conclusion

The controller solves the two real failure modes with proper sensing and control practice, scoped plainly to a demo rig with deployment by qualified trades.