PROJECT ABSTRACT

RO Water Purifier Health Monitor with Service Dashboard

A purifier-health monitor that watches inlet/outlet TDS, computes membrane rejection, tracks flow for filter-life estimation, and runs a service dashboard with filter-life bars, flush control and service logging.

Project type: Hybrid — hardware prototype + dashboard

Availability: Built to order

Suitable branches: IoT & Embedded, Electronics / E&TC

Technologies: ESP32 · TDS sensing · Flow sensing · Filter-life estimation · HTML/JS dashboard · Arduino IDE

Price: Request a quotation

Prepared by Projectech · projectech.in — for academic project reference.

1. Introduction / Background

RO purifiers fail gradually: the membrane loses rejection, pre-filters choke and flow drops, and the user notices only when the water tastes wrong or the tank runs dry. Service is calendar-based, so filters are changed too early or far too late. Continuous health monitoring fixes the information gap: TDS in and out gives membrane rejection, flow rate reveals choking, and throughput-based life estimation tells the service team which filter actually needs changing. This project builds that monitor on an ESP32 around a three-stage filter rig with TDS probes, a YF-S201 flow sensor and a service dashboard.

2. Problem Statement

Without instrumentation, purifier maintenance is blind: membranes age invisibly, choked pre-filters strain the pump, and service visits replace parts on schedule rather than on condition. The project instruments the water path so each stage's health is measurable — rejection percentage for the membrane, flow drop for the pre-filters — and turns the readings into a service plan on the dashboard.

3. Objectives

- Measure inlet and outlet TDS and compute membrane rejection percentage.
- Measure permeate flow rate to detect pre-filter choking.
- Estimate remaining filter life per stage from throughput and time.
- Provide dashboard flush control and service-visit logging.
- Alert on rejection drop, flow drop and filter-life expiry.

4. Proposed Methodology

TDS probes sample the feed and permeate lines while the flow sensor measures throughput. The firmware computes rejection = 1 – outlet/inlet, accumulates litres per stage for life estimation, and watches for the signature patterns: falling rejection (membrane ageing), falling flow at constant pressure (choked pre-filter). The dashboard renders filter-life bars, the TDS trend, flush control and the service log; the buyer calibrates the TDS probes against a reference solution.

5. System Architecture / Working

The **hydraulic layer** (three filter housings, pump, TDS probes, flow sensor), the **controller layer** (ESP32: sampling, rejection math, life estimation, alert engine), and the **service layer** (dashboard with filter-life bars, trends, flush trigger and service log).

6. Hardware / Software Requirements

- ESP32 development board (controller + Wi-Fi).
- Two TDS sensor probes (inlet + outlet).
- YF-S201 flow sensor; three-stage filter housings with pump.
- Single-page service dashboard (HTML/CSS/JS); Arduino IDE firmware.

7. Expected Outcomes

- Live rejection percentage and flow rate from the instrumented filter rig.
- Per-stage filter-life bars with replacement alerts on the dashboard.
- Flush control and a timestamped service log demonstrated end to end.
- Complete student kit: prototype, firmware, wiring docs, calibration procedure, report, PPT and viva Q&A.;

8. Applications

- Hostel, school and office RO plants needing condition-based service.
- Water-ATM and community purifier operators tracking fleet health.
- Plumbing/HVAC students learning instrumentation of fluid systems.

9. Future Scope

- Auto-flush scheduling driven by measured rejection decay.
- Multi-plant fleet dashboard for service contractors.
- Leak-detection and auto shut-off on abnormal flow signatures.