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PHARMACEUTICAL EQUIPMENT

Media Degasser

Embedded Linux | Raspberry Pi 5 | Touchscreen GUI | Hardware Control Backend | Automated Report Generation | Audit & Compliance

CLIENT

A Mumbai-based supplier of precision pharmaceutical and laboratory equipment, serving major pharma companies across India and internationally. They required a complete embedded control and reporting system for their dissolution media preparation instrument, supplied in two variants: a standard version and an advanced audit-compliant version for regulated environments.

THE PROBLEM

Dissolution testing is one of the most routine and tightly regulated assays in pharmaceutical quality control, and the quality of the dissolution media going into each test vessel directly affects the validity of the result. Media must be prepared at a precise temperature, fully degassed to prevent bubble interference, and dispensed in exact volumes — consistently, every time, across every vessel in the run. Done with conventional lab equipment — water baths, vacuum pumps, manual pipetting — the process was slow, dependent on operator technique, and produced no traceable record of how each batch of media was prepared. For clients operating under regulatory frameworks, the absence of an electronic audit trail was a compliance gap. The client needed the entire preparation workflow moved into a single instrument: operator-controlled from a touchscreen, with the machine handling heating, degassing, and dispensing automatically, and every preparation recorded with full traceability.

WHAT WE BUILT

We built the system across the same two-layer architecture used across the client's instrument range. The backend handles all direct hardware control — it drives the inline heating element, manages the vacuum degassing cycle, monitors temperatures and pressures in real time, controls the dispense mechanism, and detects whether a vessel is correctly positioned before any media is released. The frontend runs on a Raspberry Pi 5 with a 7-inch industrial touchscreen and handles everything the operator touches. A method library lets labs save their standard media preparations — target temperature, degassing duration, dispense volume and mode — so a routine preparation requires nothing more than selecting the method and confirming the run. After each preparation, a report is generated automatically, recording the method used, the actual temperature and volume achieved, the operator, and a full timestamp. Reports are stored on the instrument, searchable and exportable without a separate PC. A complete audit trail logs every user action and every system event.

The system was delivered in two versions. The standard version provides the full control and reporting workflow. The advanced audit-compliant version adds the additional layer that regulated environments require: role-based user access with electronic signatures, locked audit trail records that cannot be modified or deleted, and a data integrity architecture that meets the electronic records requirements of pharmaceutical regulatory agencies. Both versions share the same hardware platform and operator interface — the compliance layer is built into the software, not bolted on as a separate system.

WHAT IT DOES

- ✓ Operator selects a saved method — or configures a new one — on the 7-inch touchscreen, setting target temperature, degassing parameters, dispense volume, and dispense mode
- ✓ Backend controls the inline heating element and brings media to the exact target temperature before any degassing or dispensing begins
- ✓ Vacuum degassing cycle runs automatically, removing dissolved gases from the media to the set duration and pressure
- ✓ Vessel-presence sensor confirms a dissolution vessel is correctly positioned before the dispense cycle starts — no media is released to an empty or misaligned position
- ✓ Media is dispensed gravimetrically or volumetrically into each vessel, to the exact quantity set in the method
- ✓ Preparation report generated automatically after each run: method used, actual temperature and volume, operator identity, date and time
- ✓ All reports stored on the instrument and searchable by date, method, or operator — printable or exportable without leaving the interface
- ✓ Full audit trail records every user action and system event with a timestamp
- ✓ Advanced audit-compliant version adds role-based access control, electronic signatures, and a tamper-evident audit trail for regulated pharmaceutical environments
- ✓ Method library, reports, and settings protected by backup and restore; user management and system configuration in a separate admin area

OUTCOME

The client received an instrument that turns media preparation from a multi-step manual process into a single, operator-confirmed run — with heating, degassing, and dispensing handled automatically and every preparation fully documented. The standard version gives labs a consistent, traceable workflow with no separate PC required. The advanced audit-compliant version gives regulated facilities a compliant electronic records system built into the instrument itself, with no additional software layer needed to meet audit requirements.

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