

Sieve Shaker Machine Controller & Analysis System

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 sieve shaker machine.

THE PROBLEM

A sieve shaker is a precision laboratory instrument used widely in pharmaceutical manufacturing: it drives a powder sample through a stack of calibrated sieves at a controlled amplitude and duration, and the operator weighs what each sieve retained to determine the sample's particle-size distribution. In a pharmaceutical context, this result isn't just useful — it is a documented, traceable output that quality teams and regulators expect to be able to audit. Done manually — dials for parameters, paper for results, spreadsheet for calculations — the workflow introduced operator error at every step, produced records that were difficult to archive or search, and offered no real audit trail. The client needed the entire process moved into the machine: parameters entered on screen, the machine controlled directly by software, particle-size distributions calculated automatically, and every run stored with full traceability.

WHAT WE BUILT

We delivered this as a complete system across two tightly coordinated layers. The backend is the layer that talks directly to the machine's drive electronics — it receives the test parameters selected on screen, translates them into precise hardware control signals, manages the shaking run in real time, watches for faults, and signals completion back to the application. The frontend runs on a Raspberry Pi 5 with a 7-inch industrial touchscreen embedded in the machine housing, and covers everything the operator interacts with. A live dashboard shows current run status, elapsed time, and amplitude in real time. A method library lets operators save standard test setups and reload them in one tap, so a routine powder test never requires re-entering the same parameters again. After each run, a reporting engine automatically takes the per-sieve weights and calculates the complete particle-size distribution — retained weight, percentage retained, cumulative percentage retained, and percentage passing for every sieve in the stack — then plots the gradation curve and derives the standard indicators: D10, D30, D60, coefficient of uniformity (Cu), and coefficient of curvature (Cc). Reports are stored inside the system, searchable by date, sample name, or operator, and can be printed or exported without leaving the machine interface. A full audit trail logs every user action and system event with a timestamp. User management, system configuration, and backup and restore are grouped in a separate admin area, keeping those functions cleanly separated from the day-to-day operating workflow.

WHAT IT DOES

- ✓ Operator enters test parameters — amplitude, duration, sieve stack, sample weight, and test mode — on the 7-inch touchscreen and starts the run with a single tap
- ✓ Backend sends precise control signals to the machine's drive electronics, executing the run to the exact selected parameters and monitoring for faults throughout
- ✓ Live dashboard shows run progress, elapsed time, and machine status in real time
- ✓ Method library stores standard test configurations for one-tap reuse — no repeated manual parameter entry, no entry errors
- ✓ After each run, the system automatically calculates the full particle-size distribution across every sieve: retained weight, % retained, cumulative % retained, and % passing
- ✓ Reports include a bar chart of the distribution, a gradation curve, and derived standard indicators — D10, D30, D60, coefficient of uniformity (Cu), and coefficient of curvature (Cc)
- ✓ Every report is stored inside the machine, searchable by date, sample, or operator, and printable or exportable directly from the interface
- ✓ Full audit trail records every user action and system event with a timestamp — supporting pharma-grade traceability and compliance requirements
- ✓ Backup and restore protects all saved methods, reports, and settings; user management and system configuration live in a separate admin area

OUTCOME

The client received a machine that functions as a complete, self-contained pharmaceutical laboratory instrument — from parameter entry and hardware control through to a printed, audit-ready particle-analysis report — with no manual calculation, no separate PC, and no paper records. Every run is consistent regardless of who operates the machine, and every result is fully traceable back to the exact parameters, operator, and timestamp under which it was produced.