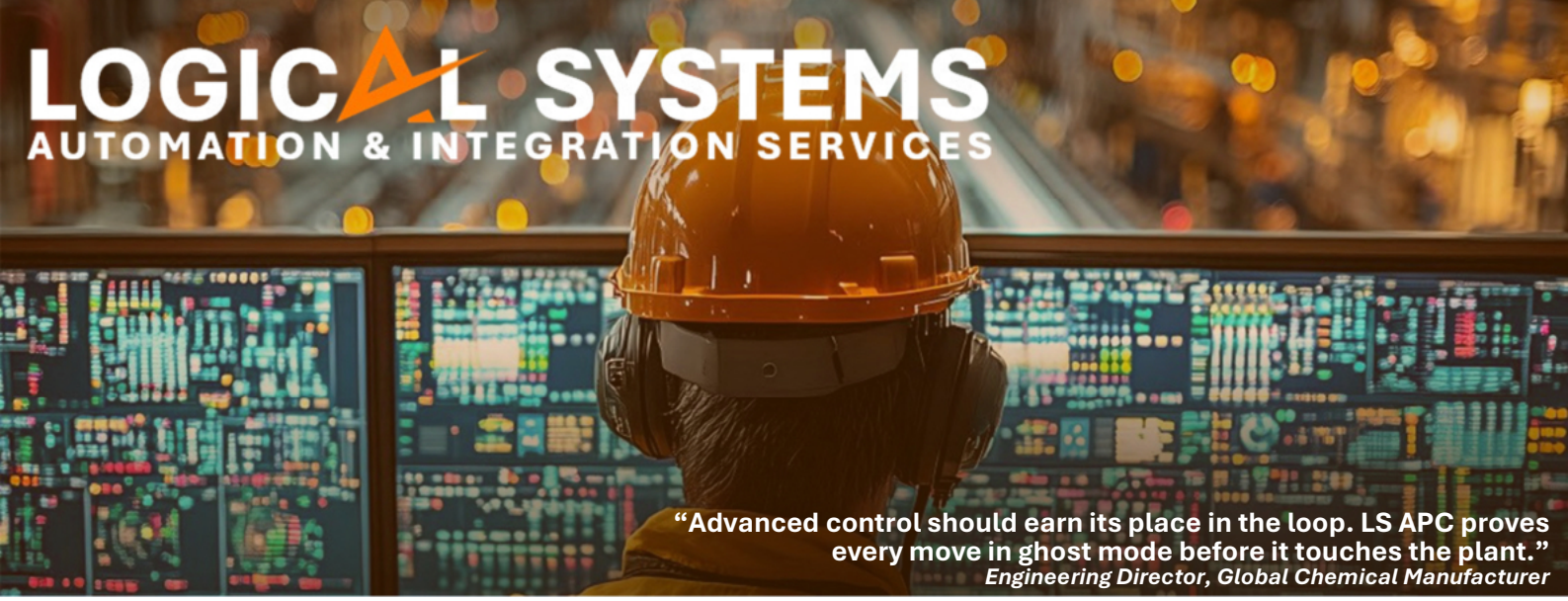
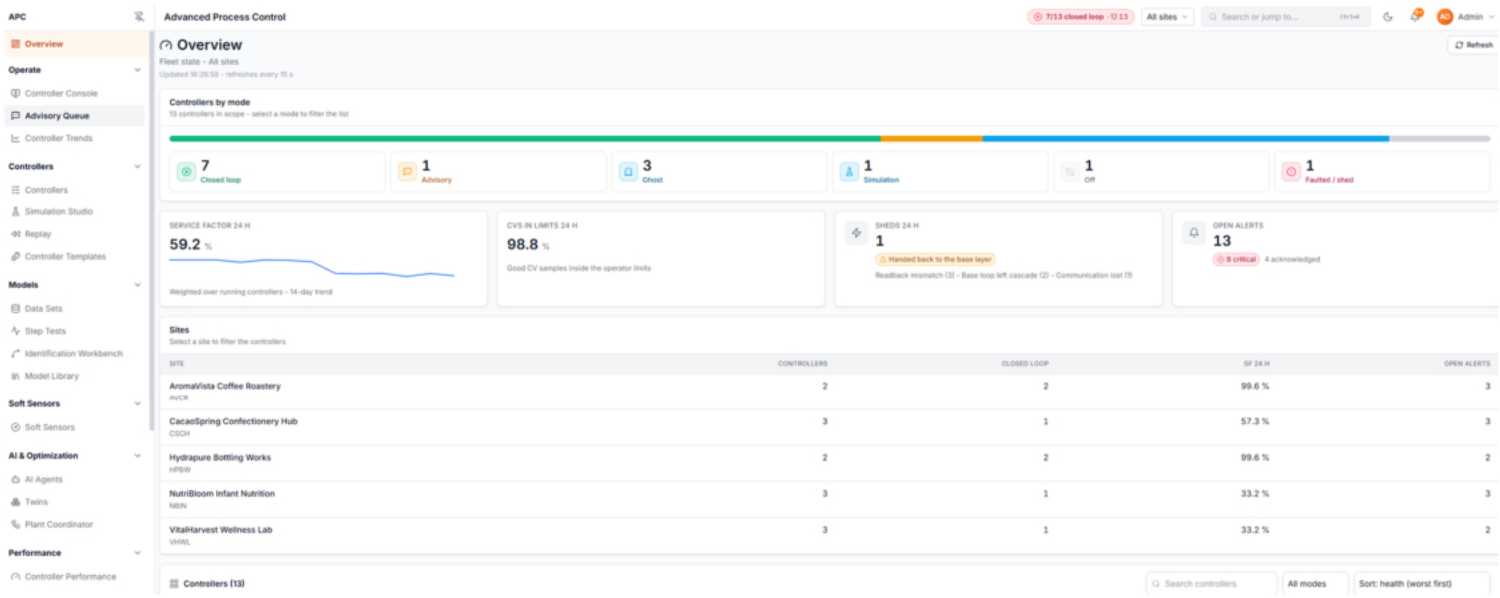


DATASHEET

Advanced Process Control

Prove Every Move. Measure Every Gain. Run Closer to Limits.

Most process units still run on base-layer PID loops tuned years ago, with operators keeping a comfortable distance from every limit. Columns, reactors, dryers, evaporators, kilns, mills and boilers all have interacting variables, dead times and constraints that single loops cannot coordinate, so quality swings, specifications are met with costly give-away and energy is spent on margins nobody asked for. Traditional advanced process control closes that gap, but usually as a separately licensed suite tied to a vendor’s control system, built with desktop tools by specialists and hard to sustain once the project team has moved on. The LOGICAL SYSTEMS Advanced Process Control (APC) application upgrades the control layer you already have instead of replacing it. Running natively on the Ignition® platform, APC sits above your DCS and PLC loops and writes supervisory setpoints through Ignition to any loop it can reach, such as Logix, S7, Modbus or OPC UA to any DCS with no separate APC server required. Multivariable model predictive control predicts every controlled variable over its horizon and makes the smallest setpoint moves that keep the unit on target inside every limit, while AI soft sensors estimate lab qualities every cycle and a steady-state optimizer steers toward the most economic operating point.

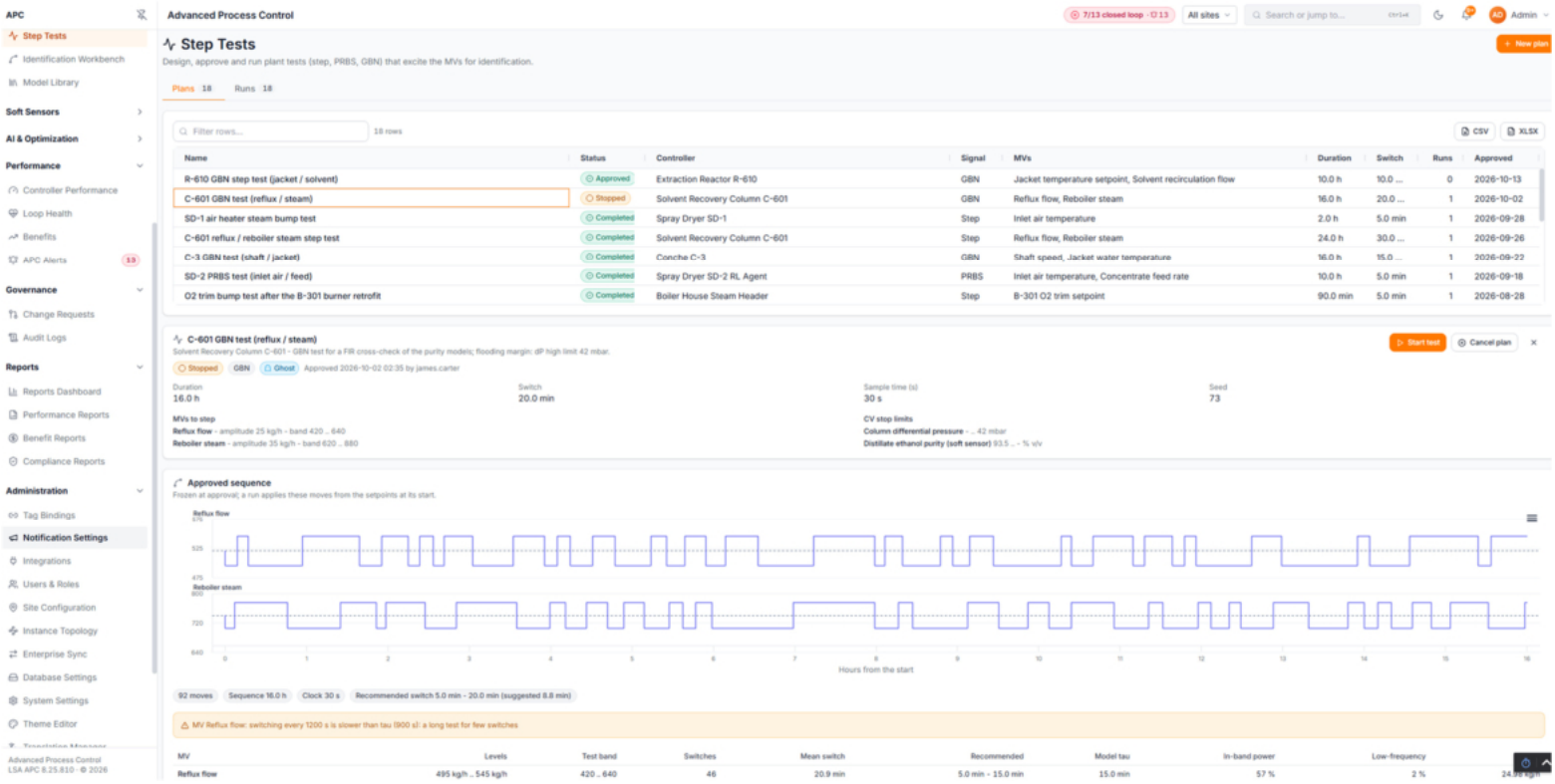


Nothing moves the plant until it is proven. Every controller, AI agent and strategy runs first in ghost mode on live data, or in simulation against a digital twin or replayed history, and is promoted to advisory and closed loop one approved gate at a time. The regulatory layer, its interlocks and your safety systems stay exactly where they are: a heartbeat watchdog hands every loop back to the base layer on any fault, and APC is never part of the safety layer. APC also keeps the benefits it creates. Service factor, constraint activity, model quality and base-loop health live in one module, every cycle can be replayed with the reason for each move, and a benefits ledger values each controller against a baseline recorded before commissioning, priced with your own economics. From one unit to a global fleet, every controller runs on its own site gateway and synchronizes with the Global instance over the Ignition Gateway Network.

Multivariable Control, Native to Ignition

Every Unit at Its Best Operating Point, Inside Every Limit

APC writes only inside the operator band while its heartbeat is alive: every write is checked against its readback, SIS and ESD tags cannot be bound, and if the heartbeat stops, the PLC or DCS returns the loops to local automatic at their last setpoint. Every engineering change runs through MOC with 21 CFR Part 11 e-signatures.



Complete Advanced Control Stack

Multivariable MPC

QP-based predictive control with setpoint, range and zone CVs, move suppression and ranked constraint relaxation; nonlinear MPC and bumpless model-set switching.

Process Models

Step-response, FIR, ARX, FOPDT, subspace and first-principles models, gain-bounded neural networks and hybrids, each graded A to D with a validity envelope.

AI Soft Sensors

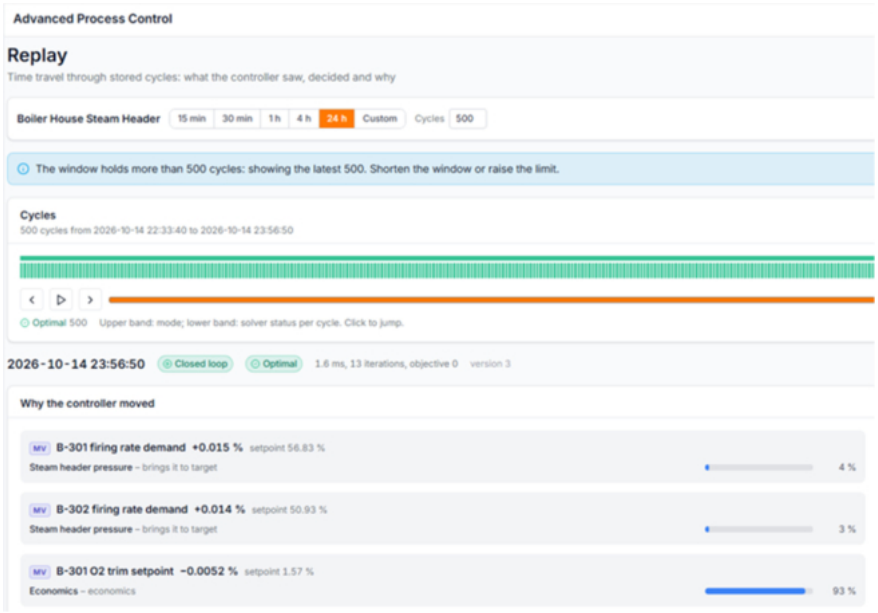
OLS, PLS, neural and hybrid estimates of lab qualities every cycle, bias-corrected by each LIMS, analyzer or manual result and published as CVs.

Economic Optimization

Steady-state LP / QP targets for cost, energy, emissions, throughput and quality give-away, with a plant coordinator for shared limits.

AI Agents

Reinforcement-learning policies trained on digital twins, with every move projected through a hard constraint shield.

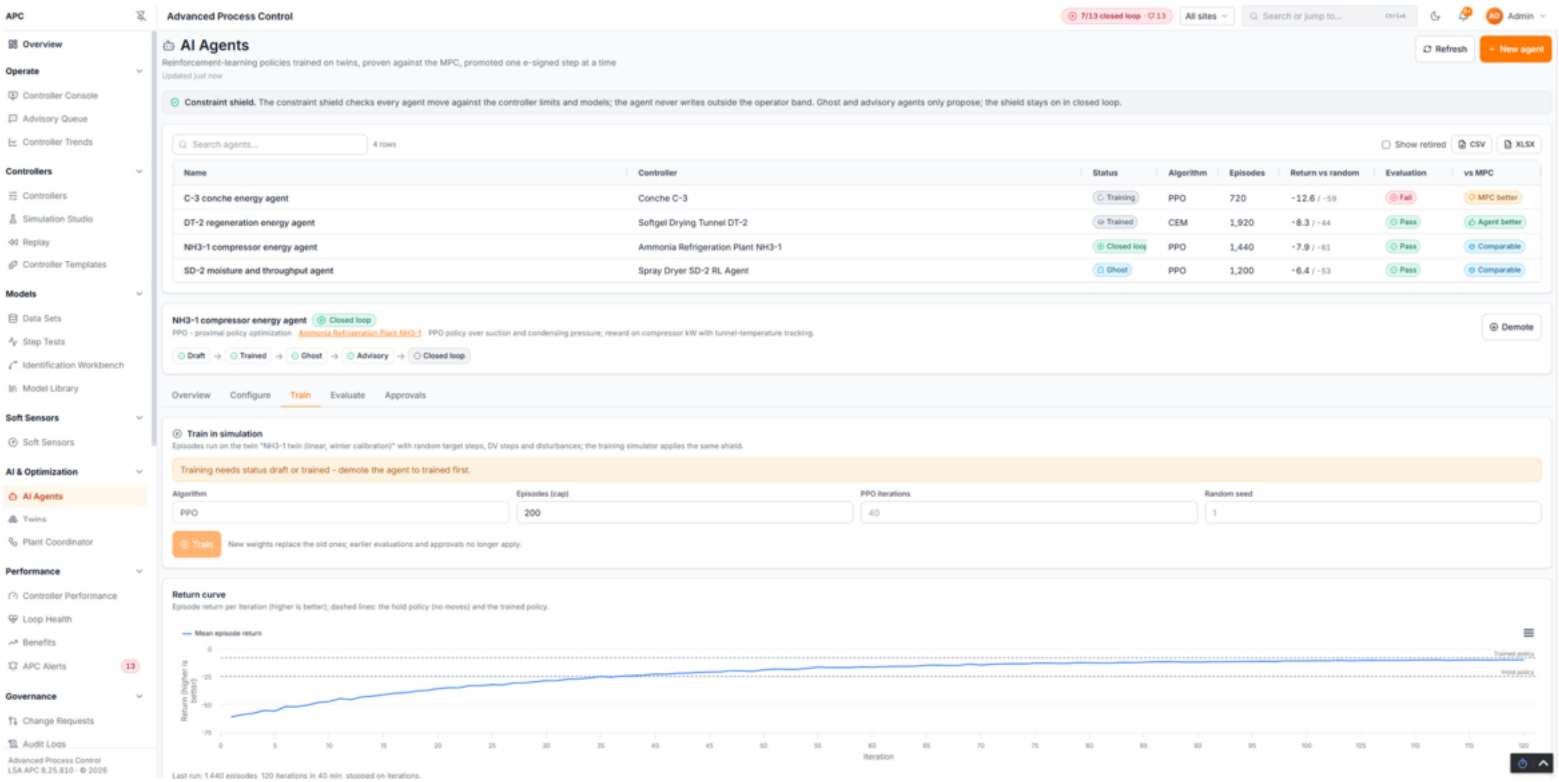




Proven Before It Moves

Data-Driven or Physics-Based Models, Ghost Mode and Governed Promotion

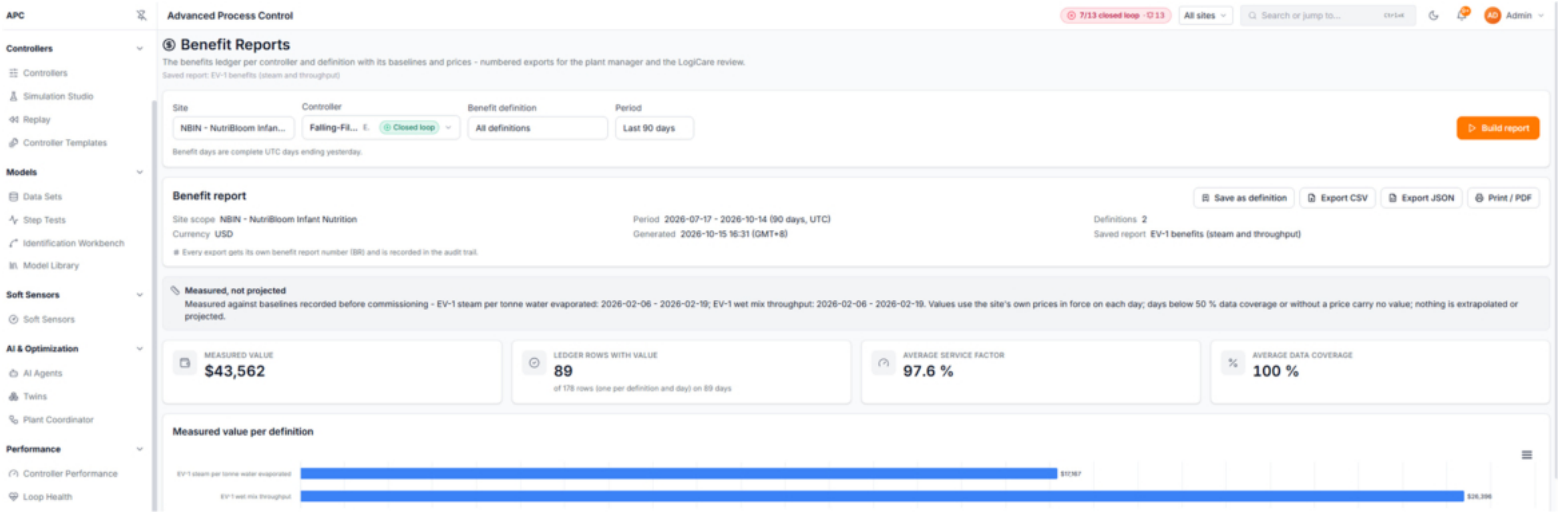
Every controller starts with models you can trust. The step-test designer plans open-loop steps or closed-loop PRBS and GBN micro-steps inside approved limits, and the identification workbench fits FIR, ARX, FOPDT and subspace models from step tests, sliced history or closed-loop data, alongside first-principles equations and gain-bounded, monotonic neural networks. Each model receives a quality grade from A to D and a validity envelope, and the gain matrix is checked for relative gain, condition number and collinearity before a controller is commissioned. Promotion runs one gate at a time. A controller moves from Off to Ghost, where it computes every move on live data but writes nothing, then to Advisory, where operators accept the moves, and finally to Closed Loop. Simulation runs beside Ghost against a digital twin or replayed history for proof and operator training. Advisory needs evidence (model grade, ghost hours, and prediction error inside the commissioning criteria) alongside a digitally signed and approved change request. Closed Loop needs true permissives, a live watchdog, and good data. Reinforcement-learning agents follow the same path, with each step e-signed, while the constraint shield stays on in every mode.

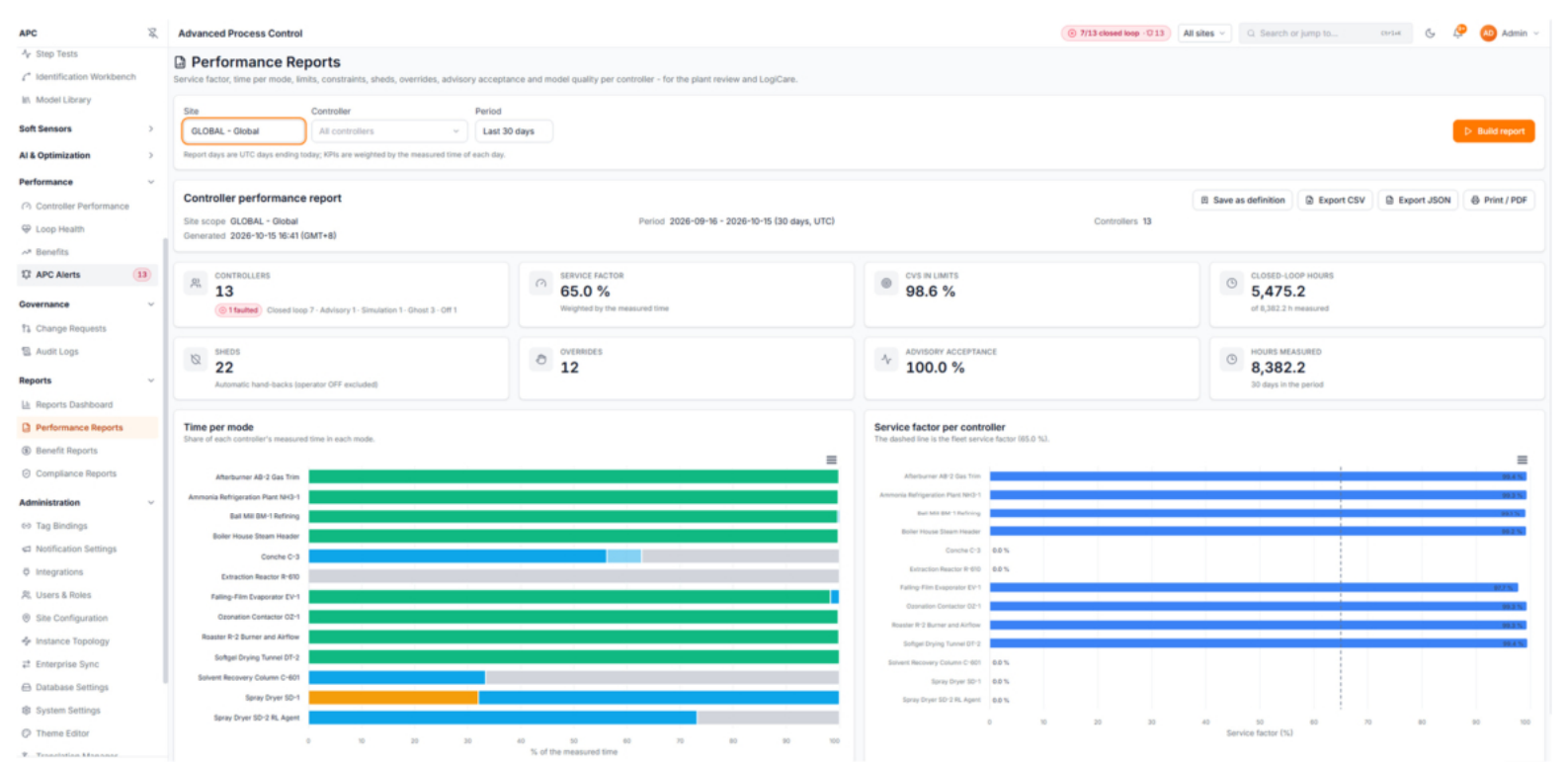


Sample Industry Use Cases

- **Refining & Petrochemicals**: columns, fractionators and fired heaters held at their constraints.
- **Chemicals & Pharmaceuticals**: reactors and solvent recovery with soft-sensed purity under change control.
- **Food, Dairy & Nutrition**: spray dryers, evaporators and roasters held on moisture and quality targets.
- **Cement & Minerals**: kilns, mills and separators balanced for throughput, fuel and quality.
- **Utilities & Energy**: boilers, steam headers, refrigeration and compressors coordinated across units.

Benefits are measured, not projected. Before commissioning, APC records a baseline for each benefit KPI; afterwards a daily benefits ledger compares actual performance with that baseline and values the difference with the site's own prices, ready for benefit reports and management reviews.





Key Features and Benefits

Features

- Multivariable MPC with setpoint, range and zone CVs and ranked constraint relaxation
- Nonlinear MPC, bumpless model-set switching and grade-change trajectories
- Step tests and identification: FIR, ARX, FOPDT, subspace, neural and hybrid models
- Model grades A to D, validity envelopes and gain-matrix checks
- AI soft sensors with lab bias update, confidence band and drift alarms
- Steady-state LP / QP economics with a plant coordinator for shared limits
- Reinforcement-learning agents trained on twins, inside a hard constraint shield
- Ghost, simulation, advisory and closed-loop modes with e-signed promotion
- Heartbeat watchdog, readback checks and shedding to the base layer
- Cycle replay, KPIs, base-loop health, MOC, e-signatures and audit trail

Benefits

- Run closer to limits with less variability and quality give-away
- Upgrade the control you have - no rip-and-replace, no extra server
- Every controller proven on live data before it moves the plant
- Operators see every prediction, limit and reason for each move
- Models and soft sensors that stay accurate as the process changes
- Base layer and safety systems always stay in charge
- Benefits measured against your own recorded baseline
- Audit-ready records for regulated environments

Technical Requirements

System Requirements

Ignition® (8.1.+) Core Modules, Quad-core processor, 16 GB RAM, 10 GB free disk space

Supported Operating Systems

Windows Server 2019/2022/2025, Windows 10/11, macOS (X, 10.16+), Linux (Ubuntu, CentOS, RHEL)

Supported Protocols

OPC UA, Allen-Bradley Logix, Siemens S7, Modbus TCP and any Ignition tag provider; REST API (JSON payloads)

Supported Databases

Microsoft SQL Server, Oracle, MySQL, MariaDB, PostgreSQL, any database with JDBC driver

Supported Browsers

Chrome, Firefox, Safari, Microsoft Edge, Perspective on phones & tablets



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