

LOOP PERFORMANCE MONITORING

Improved Evaporator Efficiency Delivers Sizeable Utility Gains

\$343K+

ANNUALIZED ENERGY
SAVINGS

A global pectin producer eliminated feed-driven density swings on its MVR evaporator by implementing a Feed-Forward (FFWD) control strategy which improved the Overall Controller Effectiveness (OCE) of its product density control. With concentration now held on target and less steam and power used per ton, the plant realized estimated annualized savings of **\$343,000**.

THE CHALLENGE

Every Feed Upset Reached the Product

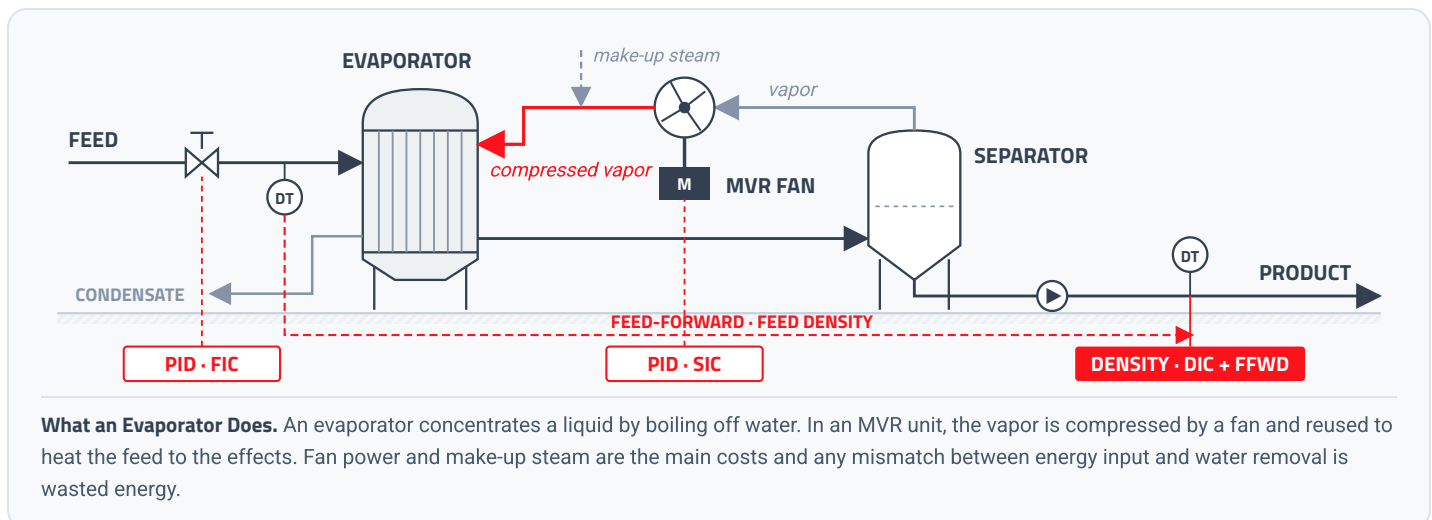
The customer concentrates pectin extract in a mechanical vapor recompression (MVR) evaporator before downstream processing. Product concentration, measured as density in %solids, is held by a feedback density controller that adjusts the evaporator's steam flow. The steam flow determines how much water is boiled off per ton of feed.

Feed density into the evaporator varied from batch to batch. Every feed upset passed straight through to the product because the product density controller could only react after the density

had already drifted. Feed density disturbances caused high steam use, variable production throughput, and product concentration off specification.

Operators compensated for the resulting swings the way most plants do: by running the unit conservatively and accepting extra steam and power as the cost of keeping product within limits.

Retuning the product density controller alone could not solve the problem. A controller that only measures product density cannot see a change in feed density until it has already affected the product, so the loop's performance was limited by its control strategy.



Steam use

When the feed density changes, heat input is determined to match the water to be removed, so make-up steam is no longer spent over-evaporating.

Power use

As feed density changes, the Feed-Forward (FFWD) controller determines the fan power needed as the vapor load changes.

Product quality

A loop that stays close to Setpoint spends more time within tolerance, raising OCE and reducing off-spec product.

Throughput

Energy and quality gains can come without cutting feed rate, so gains in energy consumption do not require losses to throughput.

Measurable, Loop by Loop

The connection between PID performance and evaporator economics is not theoretical. **PlantESP™** is the leading control loop performance monitoring (CLPM) solution. PlantESP actively monitors PID performance on a plant-wide basis, and it has been successfully deployed on dozens of evaporators.

Among its metrics, PlantESP scores every loop using Overall Controller Effectiveness (OCE). Like OEE, OCE is a composite KPI that assesses three operating attributes — Availability, Performance, Quality — and facilitates the benchmarking of individual PID loops, unit operations, and entire facilities.

≥ 95% **AVAILABILITY**
Time in Normal —
auto/cascade

≥ 90% **PERFORMANCE**
Time Not Saturated — off
limits

≥ 85% **QUALITY**
% Good Error within
tolerance

OCE = Time in Normal × Time Not Saturated × % Good Error

A loop meeting all three thresholds scores at **72.7%** — the threshold for world-class control. In contrast, because the terms multiply a loop running 80/80/80 falls to **51.2%**. OCE highlights weakness in any one dimension — which is why it gauges control quality and financial exposure alike.

**FRAMING POOR
PERFORMANCE AS LOST
PROFIT**

88%

Density error reduced 1.69 → 0.20
%solids (AAE)

\$277K

Annual steam savings: 17.72 →
11.49 kg/MT (~35%)

\$66K

Annual power savings: 14.56 →
9.26 kWh/MT (~34%)

DIGITAL LIFECYCLE SOLUTIONS

A project-based, control-strategy-improvement offering purpose-built for interactive, multi-loop unit operations like an MVR evaporator — engage to find and fix the losses, then sustain the gains.

ENGAGE
01 — 04

01 KICK-OFF

Prioritize by Strategy

Rank loops, units, and areas against the plant's own goals — density, energy, throughput.

02 MONTHLY

Identify Bad Actors

Control Station engineers pinpoint that scope's top 10 bad-actor loops every month.

03 MONTHLY

Tune the Loops

Four hours per month of direct, hands-on tuning support to resolve those loops.

04 AS NEEDED

Strategy Change

When tuning cannot close the gap, escalate to a more strategic assessment and action plan.

SUSTAIN
ONGOING

QUARTERLY

Assess the Value

Financial impact of the 10–20% typical PGE gain from resolved bad-actor tuning.

MONTHLY

Track OCE Live

Unit Operation Performance Indicators in PlantESP keep the OCE trend visible.

QUARTERLY

Report to Stakeholders

Benchmark against industry peers for sponsors and non-technical stakeholders.

ANNUAL

Plan the Roadmap

Update a one-to-three year plan for closing whatever performance gap remains.

DECADES OF DOMAIN EXPERTISE

Control Station is the process industry's leading provider of controller performance monitoring and analytics. PlantESP™ supports hundreds of facilities worldwide, backed by an engineering team focused solely on process control.

Next Step: Where Is Your Unit Losing Energy?

Start with a performance assessment of your evaporators and other unit operations. Contact us for a no-obligation loop performance assessment and a site-specific estimate of the opportunity hidden in your regulatory controls.

[REQUEST AN ASSESSMENT](#)