HYPPOS






From Data To Performance

Polymer quality in real time to cut off-spec, shorten grade transitions, release product faster and trace every lot




The Problem: Operational Blindspots in Polymers Production

	Challenge	What it costs the producer
1	**Conservative grade transitions**	Cut points follow time-based rules, not measured quality: off-grade runs longer and prime is downgraded
2	**Upsets spoil whole silos**	Without forward tracking, a short upset forces a whole silo or blend to be sold as non-prime
3	**Hidden raw material overuse**	Monomer, catalyst and additives are allocated pro-rata to batches, hiding overdosing and losses
4	**Manual batch records**	Batch data is re-keyed between DCS, LIMS and ERP; staff time goes on reconciliation and month-end close
5	**Errors that reach customers**	Wrong batch numbers or certificates of analysis across hundreds of grades lead to claims
6	**Slow product release**	Finished goods wait for pellet samples and lab results, tying up inventory and working capital
7	**Weak lot genealogy**	A complaint or recall cannot be narrowed to the affected lots, a major exposure for high-value grades such as cable compounds

2 to 5%

of production fails to meet specification during normal operations.

€4M to €8M

annual loss per plant from grade transitions alone*.

2 to 4 hr

between lab MFR results (up to 8 hr), so operators steer on old data**.

* Industry average transition losses 1.5–3%, mostly sold at 50–70% of prime value; 400 ktpa plant. ** Liu, IFAC 2005; APMonitor, Polymer Melt Flow Rate. Non-prime and scrap sales of off-grade: US DOE, Chemical Industry Profile, ch. 2. Challenges derived from Hyperion benefit-lever analysis.

HYPPOS

Process Intelligence Platform

- Material Tracking
- Soft Sensors
- Live Quality Tracking

Continuous polymer production deserves **Continuous Intelligence.**

Material Tracking

Complete digital ancestry for every packed lot. Complaints resolved in hours. Supplier deviations scoped in minutes. Audit-ready by design.

Soft Sensors

MFR and XS predicted every 2-5 minutes from live DCS data. Grade transitions managed on evidence, not time-based rules. New models in weeks.

Live Quality Tracking

A continuous quality profile on every lot, not a single lab result. Intra-lot drift visible. Cut decisions supported in real time.

HYPPOS: Products Suite

Native Chemicals production AI technology – Process mode agnostic

HYPPOS Core



- Material Tracking
- Quality Tracking
- Workflows
- Connectivity
- Data Broker
- Open API

HYPPOS Intelligence



- Quality Prediction
- Process Analytics
- ML Models
- Data science API

HYPPOS Operations UI



- Process visualization
- Workflows control
- Visual diagnostic
- Engineering dashboards
- API

HYPPOS Insights



- Data aggregation
- Data visualization
- KPIs
- Production reports
- API

MODULAR | INTEROPERABLE | CYBERSECURE

HYPPOS: What Delivers Module By Module

MODULE 01

Material Tracking

Virtual lot windowing on continuous production. Every packed lot gets a complete digital ancestry: catalyst identity, additive lots and quantities, in/out timestamps per process unit, and all lab results linked to the exact production window.

Supports real-time divert control: when an out-of-range virtual window is detected, material can be redirected to a review silo before it reaches packing.

MODULE 02

Soft Sensors

ML regression models that infer critical quality parameters from live process data, updated every 2 to 5 minutes. Currently deployed: MFR and XS in the reactor zone for polypropylene.

New models are developed in weeks via a proven pipeline: process analysis, dataset composition, training, shadow validation, release. Online retraining nearly complete.

COMBINED

Live Quality Tracking

When Material Tracking and Soft Sensors run together, each virtual lot accumulates a continuous quality profile at 2 to 5 minute resolution across its full production window.

A lot record is no longer a single lab result. It is a time-series quality trace showing exactly how MFR and XS evolved from reactor to silo, for every lot, every time.

HYPPOS: Live Quality Tracking

WHAT IT IS

Continuous quality profile on every virtual lot

When Soft Sensors run inside HYPPOS alongside Material Tracking, each virtual lot window accumulates a continuous quality profile: predicted MFR and XS at 2–5 minute resolution across the full lot duration. The digital batch record is no longer a single lab result attached to a lot: it is a time-series quality trace showing how the product evolved during production. time-series quality profile

predicted MFR per lot | predicted XS per lot | time-series quality profile

WHAT IT ENABLES

Quality visibility no other system provides

A lot that shows acceptable lab results may still have experienced a quality excursion during production: a brief drift that averaged out by the time the sample was taken. The continuous profile reveals this. Operators can flag lots for additional testing based on the profile, not just the final lab value. This is a fundamentally different quality assurance capability.

intra-lot quality drift detection | risk-based lot flagging

GRADE TRANSITIONS

Real-time cut decision support

During grade changes, the soft sensor provides a live quality trace that shows progression from the old grade spec toward the new one. Operators can see when the transition is complete: in the reactor, in real time: rather than waiting for the first post-transition lab result. Conservative time-based cut rules are replaced by evidence-based decisions, reducing transition off-spec volume by an estimated 20–35% depending on plant and grade pair.

transition monitoring | cut decision support | off-spec reduction



HYPPOS: Unlocking Value With Soft Sensors

WHY LAB AND ONLINE ANALYZERS FALL SHORT

DIMENSION	LAB ANALYSIS	ONLINE ANALYZER	HYPPOS SOFT SENSORS
Feed frequency	1-4 h turnaround	Continuous / near-real-time	Every 2-5 min
CAPEX	Low (existing lab)	Very high (€150K-€500K+)	Low: software only
OPEX / maintenance	Lab staff, consumables	High: probes, calibration, spares	Model monitoring only
Failure risk	Low	High: fouling. Drift, downtime	No hardware to fail
Time to deploy	Already in place	Months (procurement + install)	Weeks (model dev cycle)
Expandability	Manual process per parameter	One analyzer = one parameter	New models via same pipeline
Integration with lot record	Single point per lot	Possible, not standard	Native: continuous profile per lot

MODEL DEVELOPMENT METHODOLOGY: THE **HYPPOS** PIPELINE

01
Process Analysis
Identify relevant DCS variables. Map process zones, lags, and dead times. Define prediction target and update frequency.

02
Dataset Composition
Align lab results with process history. Handle time delays, grade boundaries, and missing data. This is where continuous-process know-how is critical.

03
Training
Model selection, hyperparameter tuning, cross-validation across production campaigns. Target: stable accuracy across grades and operating modes.

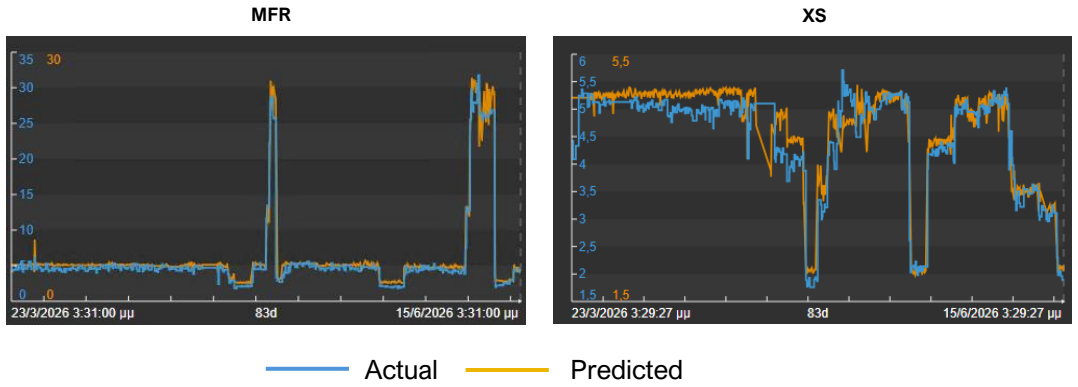
04
Launch & Validation
Shadow deployment alongside lab results. Accuracy tracked on live data. Bias correction applied if needed. Operator confidence built during this phase.

05
Release
Model goes live in HYPPOS UI. Predictions surfaced per lot window, per grade, per shift. Lab results continue as ground truth for ongoing drift monitoring.

HYPPOS: Proven Results – VALIDATED in Real Production

HELLENiQ ENERGY

- 220 ktpa PP production, Thessaloniki
- MFR and XS soft sensors live 24/7, every 5 min, **99.8%** uptime
- Model accuracy R^2 **0.94** (MFR) and **0.91** (XS)
- **20%** less off-spec material and **25%** shorter grade transitions
- **€350,000/yr** margin uplift, 2× the agreed expected case
- Annual licence and support agreement (2027 term)



Validated benefits per year

€350K margin uplift	**20%** less off-spec material	**25%** shorter grade transitions
3,550 t CO_2e avoided (estimated)	**690 MWh** energy saved for the same prime output	**€302K** indicative CO_2 value at €85.10/t

Margin uplift per year: realised vs agreed expected case



HYPPOS: Proven Results – VALIDATED in Real Production

بروج
Borouge

- **23 years** of material tracking
- **16 polymer lines** covered: 5 PP, 7 PE, 2 LDPE, 2 XLPE
- **US$4.77M documented** savings from OLPA (Borouge 2019 Sustainability Report)
- Borouge-1 (2003), Borouge-2 upgrade (2009), Borouge-3 with OLPA and forward tracking (2016)
- Borouge 4: batch tracking and operational logic SAT 2026



HYPPOS quality tracking: lot-level MFR through silos and blends. Image for illustrative purposes only.

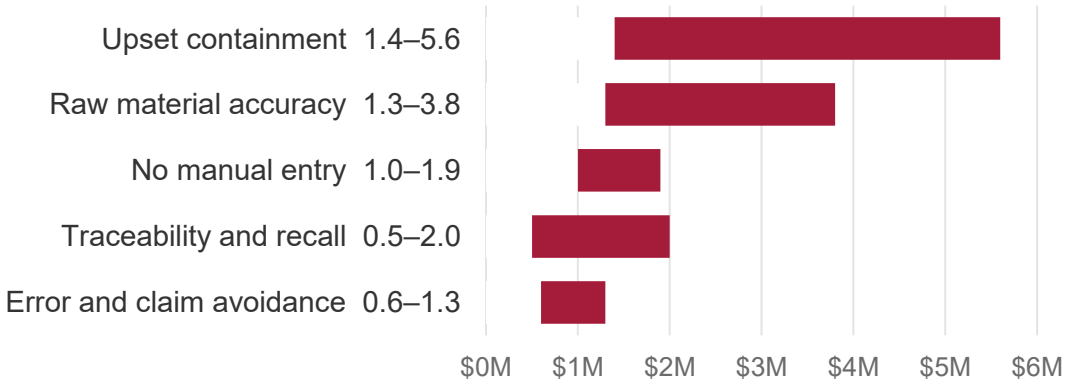
Estimated benefit potential per year

$7–22M*
recurring, site-wide (mid ≈ $15M)

$2.0–5.7M*
recurring, Borouge 4 scope (mid ≈ $3.8M)

$5.5–11M*
one-off working capital, site-wide

Site-wide recurring benefit by lever (US$M per year, estimated range)



Plus inventory working capital released once: $5.5–11M site-wide ($1.3–2.6M Borouge 4). Site-wide recurring total ≈ $7–22M across all benefit levers.

*** Ranges are estimates, not validated savings.**

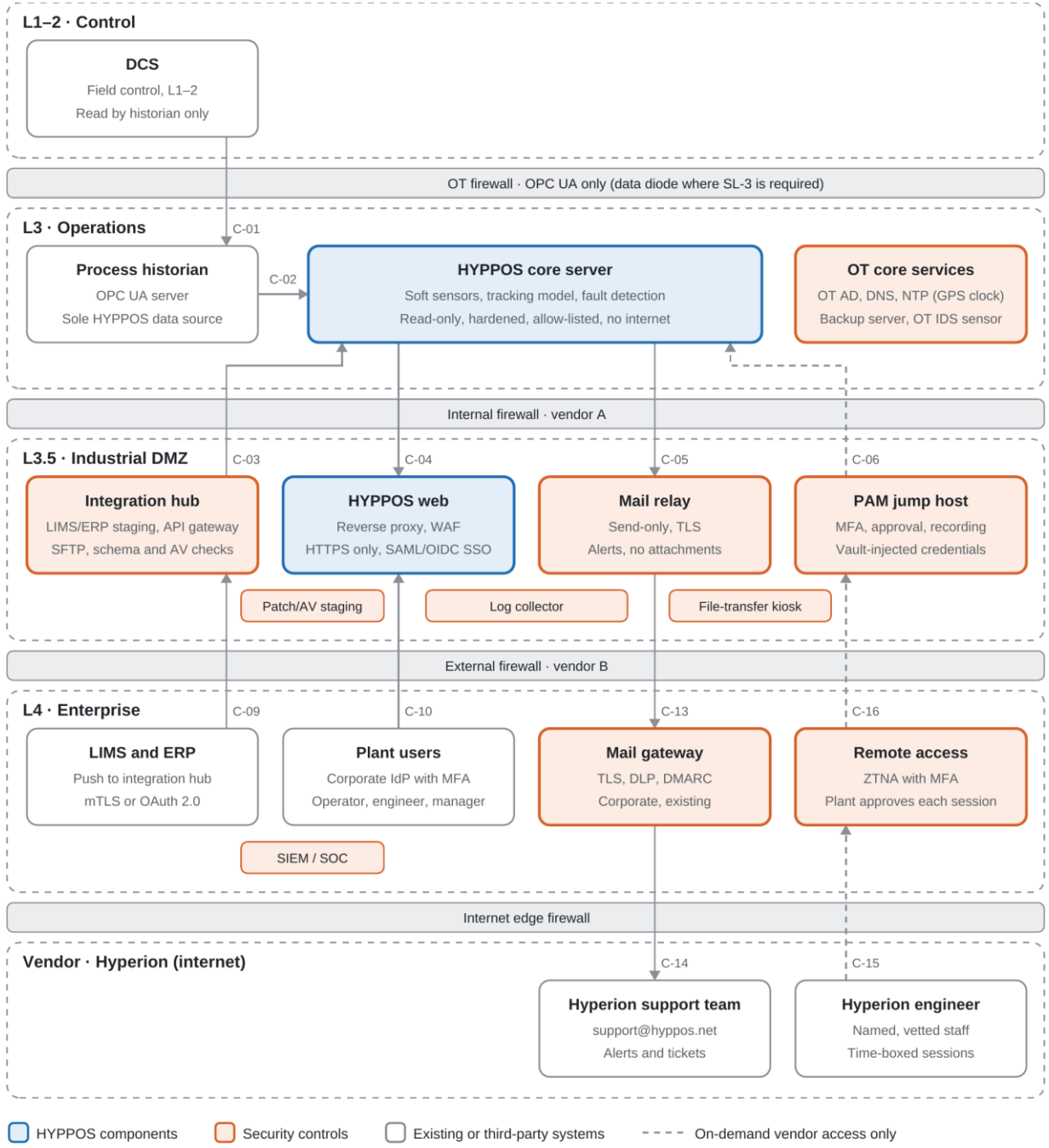
HYPPOS

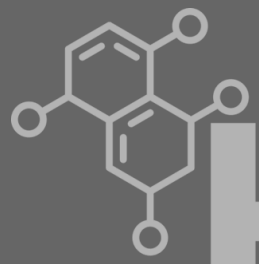
High Level Architecture

Built on international cyber security standards
Designed to IEC 62443 and NIST SP 800-82, the main standards for securing industrial systems.

Secure by design, safe by default
Security is built into the architecture from day one, and the plant keeps running safely even if HYPPOS is offline.

Fits the plant's existing IT and OT setup
HYPPOS follows the same network and security setup customers already run, with clear ownership for the IT and OT teams.





HYPPOS