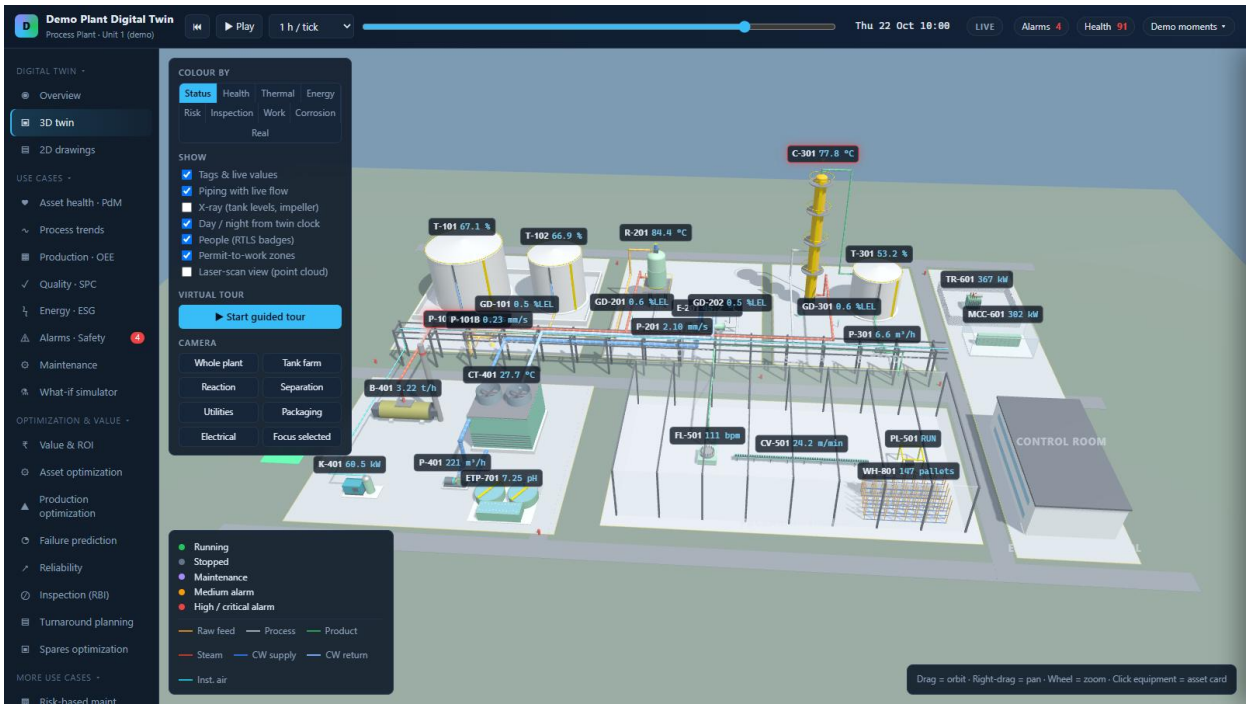
Demo Plant – Unit 1

Digital Twin – Business Case Guide

47 business cases · what each one does, the data it needs, what the app shows, the improvement figures, and a step-by-step test with the expected result



All plant data in this demo is generated (fictional facility). Figures quoted are what the app shows at the stated twin time; values move with the time bar.

How to open the app and test a case

Open the app	Double-click D:\DigitalTwin\Open_Digital_Twin.bat (opens app\index.html in the browser, works offline), or open the shared claude.ai link. For the AI assistant with your own key, use the local copy – the shared copy cannot call external APIs.
Twin clock (top bar)	The slider moves the whole twin through 30 days of data (28 Sep – 27 Oct 2026, 10-minute steps). ⏮ goes back a day, ▶ Play replays, LIVE returns to now (Tue 27 Oct 23:50). Every page, chart, the 3D model and the drawings follow this clock.
Demo moments ▾	Top-right menu that jumps straight to a story event: it sets the time, opens the right page and selects the asset. Each case page below names its demo time.
Sidebar	Pages are grouped: Digital twin, Use cases, Optimization & value, AI & data, M&R and HSE, Operations & planning, Oil & gas, More use cases, Data. Click a group title to collapse or expand it.
Asset inspector	Click any equipment (3D, drawings, tables) to open its data sheet: live tags with sparklines, alarms, work orders, documents, "Locate in 3D".
Test tables	On every case page, "Do this" is the action and "You should see" is the expected result at the stated twin time. If a value differs slightly, check the time on the top bar first.
Downloads	CSV/SVG export and Print work in the local copy; they are hidden in the shared claude.ai copy.

THE STORY IN THE DATA

- 13 Oct – reactor temperature overshoot → off-spec lots (Quality, Costing)
- 3–20 Oct – compressed-air leak on K-401 (Energy, Process twin)
- 15 Oct – APFC capacitor failure, power factor 0.87 (Drawings) · substation geofence breach (People)
- 13–22 Oct – P-101A bearing degrades, trips 22 Oct; standby P-101B takes over (Health, Prediction, Coordination)
- 19 Oct 10:30–10:40 – gas release at E-201 flange: hot work suspended, ESD-1, muster, pH excursion, PSSR restart (Permits, Alarms, People, Barriers, Environment, PSSR)
- 21–23 Oct – corrosion-inhibitor pump trip (Corrosion) · 24 Oct – man-down alert at night (People)
- Now (27 Oct) – raw material B (T-102) running out, P-201 early misalignment, TA-2027 planning (Overview, Spares, Turnaround, Terminal)
- Oil & gas assets (separate, same clock): coke drum B fast quench, 14 Oct CS-2 trip, 16 Oct jetty storm, 18 Oct hydrate-margin squeeze

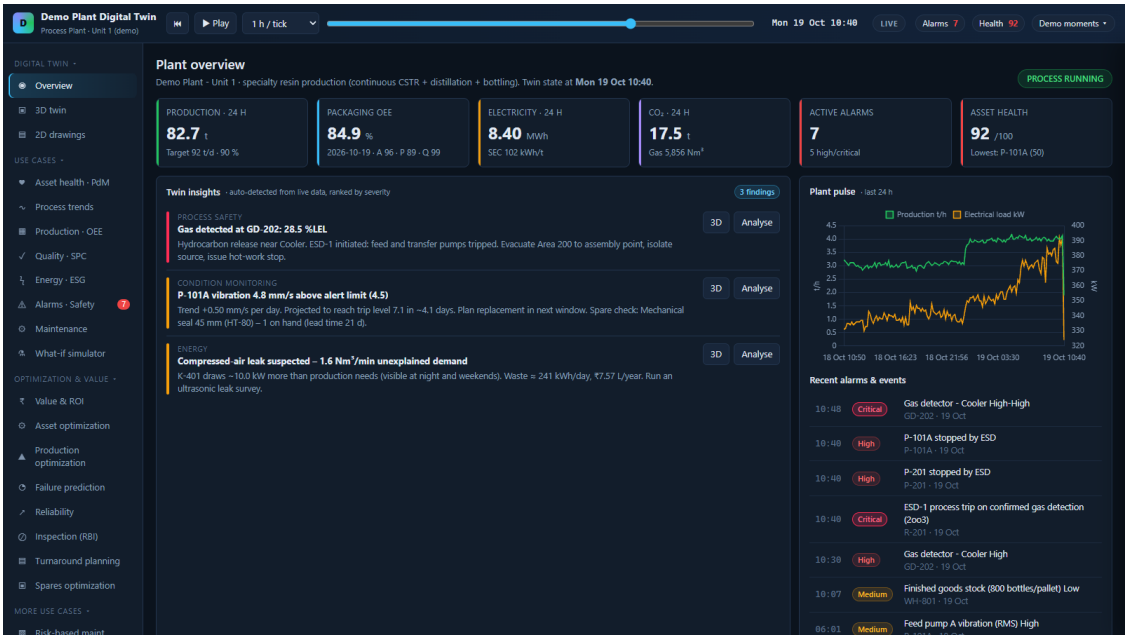
Index of business cases

#	Business case	Sidebar group	Demo time
1	**Plant overview & twin insights**	Digital twin	Gas leak & ESD trip (Mon 19 Oct 10:40)
2	**3D digital twin**	Digital twin	P-101A at trip limit (Thu 22 Oct 10:00)
3	**Live 2D drawings (P&ID, plot plan, single-line)**	Digital twin	Power-factor drop (Thu 15 Oct 12:00)
4	**Asset health & predictive maintenance**	Use cases	P-101A bearing degrading (Sat 17 Oct 14:00)
5	**Process historian & trends**	Use cases	Heat-exchanger fouling (Thu 15 Oct 15:00)
6	**Production & OEE**	Use cases	Live (Tue 27 Oct 23:50)
7	**Quality & SPC with root cause**	Use cases	Reactor overshoot → off-spec (Tue 13 Oct 05:00)
8	**Energy & ESG**	Use cases	Compressed-air leak (Sat 10 Oct 03:00)
9	**Alarms, events & safety**	Use cases	Gas leak & ESD trip (Mon 19 Oct 10:40)
10	**Maintenance (CMMS) view**	Use cases	Live (Tue 27 Oct 23:50)
11	**What-if simulator**	Use cases	Live (Tue 27 Oct 23:50)
12	**Value & ROI of the digital twin**	Optimization & value	Live (Tue 27 Oct 23:50)
13	**Asset performance optimization**	Optimization & value	Live (Tue 27 Oct 23:50)
14	**Production optimization**	Optimization & value	Live (Tue 27 Oct 23:50)
15	**Early failure prediction**	Optimization & value	Bearing fault seen before the alarm (Sat 17 Oct 12:00)
16	**Reliability improvement**	Optimization & value	Live (Tue 27 Oct 23:50)
17	**Inspection optimization (RBI)**	Optimization & value	Live (Tue 27 Oct 23:50)
18	**Turnaround planning (TA-2027)**	Optimization & value	Live (Tue 27 Oct 23:50)
19	**Spare-parts optimization**	Optimization & value	Live (Tue 27 Oct 23:50)
20	**Risk-based maintenance**	More use cases	Live (Tue 27 Oct 23:50)
21	**People & safety (RTLS)**	More use cases	Emergency muster (Mon 19 Oct 10:40)
22	**Digital permit-to-work & SIMOPS**	More use cases	Hot work auto-suspended (Mon 19 Oct 10:30)
23	**True cost per batch**	More use cases	Off-spec lots cost (Tue 13 Oct 12:00)
24	**Supply chain & customer delivery (OTIF)**	More use cases	Export order empties warehouse (Mon 12 Oct 20:00)
25	**Environmental compliance (CEMS & effluent)**	More use cases	Effluent pH excursion (Mon 19 Oct 12:00)
26	**Shift handover report**	More use cases	Live (Tue 27 Oct 23:50)
27	**Operator training simulator**	More use cases	Live (Tue 27 Oct 23:50)
28	**Data connectivity & Unified Namespace**	More use cases	Live (Tue 27 Oct 23:50)
29	**Ask the twin – AI assistant (Claude)**	AI & data	Live (Tue 27 Oct 23:50)
30	**Asset knowledge graph**	AI & data	Live (Tue 27 Oct 23:50)
31	**Automated data collection & quality**	AI & data	During the gas release (Mon 19 Oct 11:00)
32	**Inspection execution hub (field capture + remote XR)**	M&R and HSE	Live (Tue 27 Oct 23:50)
33	**Corrosion monitoring system**	M&R and HSE	Inhibitor pump trip (Thu 22 Oct 06:00)
34	**Work pack manager**	M&R and HSE	Live (Tue 27 Oct 23:50)
35	**PSSR automation (pre-start-up safety review)**	M&R and HSE	PSSR before restart (Mon 19 Oct 13:00)
36	**Risk & barrier visualization (bowtie)**	M&R and HSE	Barriers during gas release (Mon 19 Oct 10:40)
37	**Asset & process twin unification**	Operations & planning	Compressed-air leak period (Sat 10 Oct 03:00)
38	**Inter-department coordination**	Operations & planning	Live (Tue 27 Oct 23:50)
39	**Sustainability – O&M twin**	Operations & planning	Live (Tue 27 Oct 23:50)

#	Business case	Sidebar group	Demo time
40	**Production planning – dynamic planning twin**	Operations & planning	Live (Tue 27 Oct 23:50)
41	**Shipping plan risk & disruption**	Operations & planning	Live (Tue 27 Oct 23:50)
42	**Production impact from terminal operations**	Operations & planning	Live (Tue 27 Oct 23:50)
43	**Coke drum digital twin + gen-AI cycle report**	Oil & gas	Live (Tue 27 Oct 23:50)
44	**Digital twin for jetties**	Oil & gas	Jetty storm stoppage (Fri 16 Oct 15:00)
45	**Flow assurance modelling**	Oil & gas	Hydrate margin squeeze (Sun 18 Oct 03:00)
46	**Subsurface-to-surface constraints optimization**	Oil & gas	Live (Tue 27 Oct 23:50)
47	**End-to-end gas network visualization**	Oil & gas	Gas network CS-2 trip (Wed 14 Oct 09:00)

1. Plant overview & twin insights

Where: Digital twin → Overview **Demo time:** Gas leak & ESD trip (Mon 19 Oct 10:40)



WHAT IT IS AND HOW IT IS USED

One screen that tells a plant manager how the unit is doing right now: production against target, packaging OEE, energy, CO_2, alarms and asset health, plus an insights engine that reads the live data and ranks what needs attention.

Who uses it: Plant manager, shift supervisor, control-room lead – at the start of every shift and whenever something changes.

DATA REQUIRED

- Process tags from the DCS (flows, levels, temperatures) every 10 min
- Packaging line counts and stops
- Energy meters (electricity, gas, steam)
- Alarm journal, asset health indices
- Tank levels and delivery bookings for supply warnings

AVAILABLE IN THE APP

- 6 headline KPI tiles that follow the twin clock
- Twin insights: auto-detected findings ranked by severity, each with 3D and Analyse buttons
- Area status strip and asset health summary
- Time bar: drag back in time, Play, LIVE; Demo moments menu jumps to the story events

KEY FIGURES / IMPROVEMENT

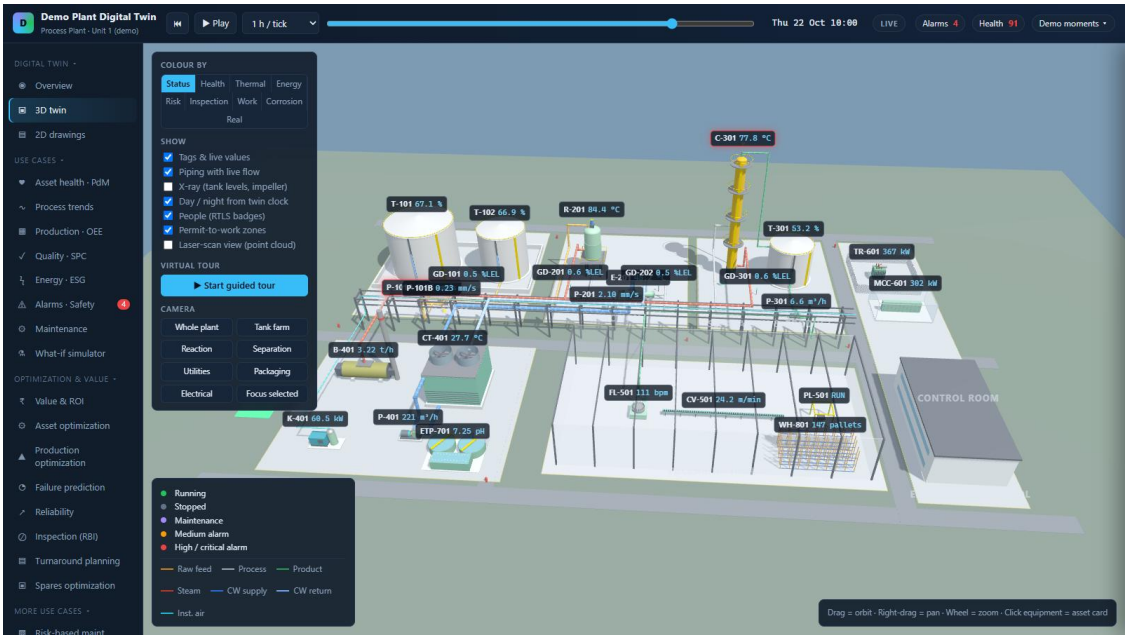
- Live: 93.9 t/24 h (102 % of 92 t target), OEE 86.8 %, health 93/100 (lowest P-201 = 68)
- Three ranked insights now: T-102 raw material runs out in ~12 h, P-201 early fault signature, hot-work request on an in-service tank

TEST IT YOURSELF

#	Do this	You should see
1	Open the app (Open_Digital_Twin.bat) and click Overview.	Twin time Tue 27 Oct 23:50, LIVE badge lit, 3 insights listed.
2	Read the first insight card.	SUPPLY CHAIN – Raw material B (T-102) runs out in ~12 h, level ~21 % falling ~18 %/day.
3	Click Demo moments ▾ → "Gas leak & ESD trip".	Time jumps to Mon 19 Oct 10:40; 7 active alarms (5 high/critical).
4	Return to Overview.	Top insight: PROCESS SAFETY – gas at GD-202 28.5 %LEL, ESD-1 tripped feed & transfer pumps; production 82.7 t (90 %).
5	Press LIVE.	Back to 27 Oct; the gas insight disappears.

2. 3D digital twin

Where: Digital twin → 3D twin **Demo time:** P-101A at trip limit (Thu 22 Oct 10:00)



WHAT IT IS AND HOW IT IS USED

A navigable 3D model of the whole unit – tanks, reactor, exchangers, column, utilities, packaging hall, substation, effluent plant and warehouse – coloured live by status, health, temperature, energy, risk, inspection due, open work or corrosion, so anyone can see where a problem is without reading tag lists.

Who uses it: Operators, maintenance planners, HSE, visitors and management reviews; also the base for the virtual tour and remote XR review.

DATA REQUIRED

- Asset register with coordinates (E/N) and geometry
- Live tag values and asset health
- RTLS badge positions and permit zones
- Risk, inspection due dates, open work orders, corrosion probes (for the colour layers)

AVAILABLE IN THE APP

- 9 colour modes: Status, Health, Thermal, Energy, Risk, Inspection, Work, Corrosion, Real
- Toggles: tag labels, piping with animated flow, X-ray (tank levels, impellers), day/night from twin clock, people, permit zones, laser-scan point cloud
- Guided virtual tour (8 stops) and camera presets per area
- Click any equipment → asset inspector with live tags, alarms, WOs and documents

KEY FIGURES / IMPROVEMENT

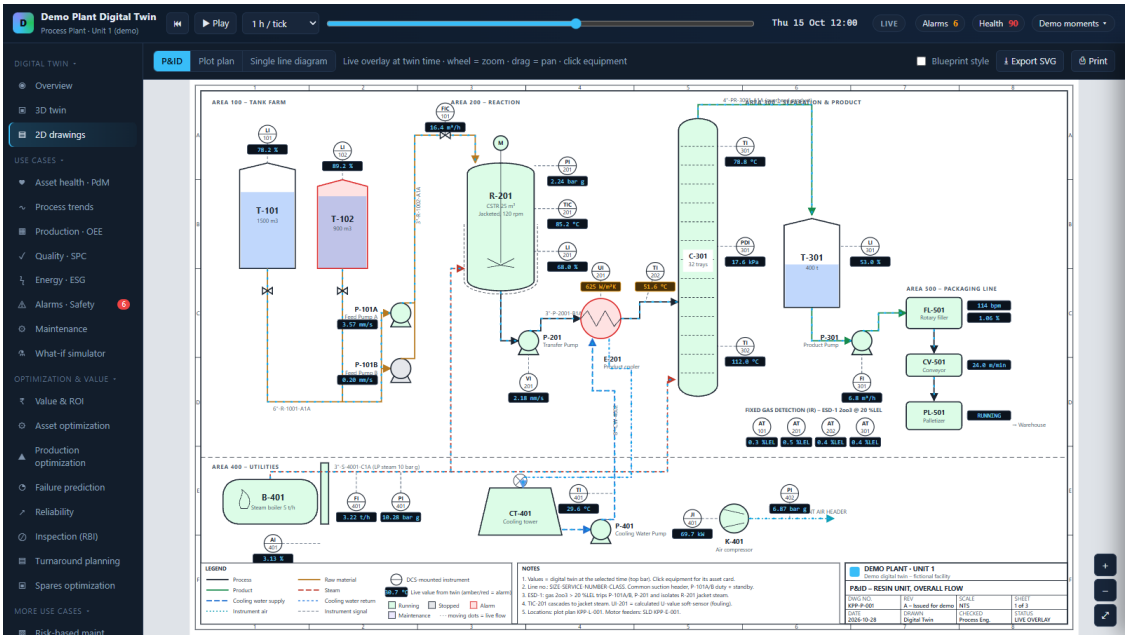
- Finds the faulty asset in seconds instead of scrolling tag lists
- Same model reused for training, tours, XR inspection pins and permit visualisation

TEST IT YOURSELF

#	Do this	You should see
1	Demo moments ▾ → "P-101A at trip limit".	3D view focuses P-101A; label shows ~7.35 mm/s; asset coloured red (HH vibration).
2	Colour by → Health, then Risk, then Corrosion.	Colours change per layer; P-201/P-101A stand out on Health and Risk.
3	Tick Laser-scan view.	Plant redrawn as a point cloud; info line shows point count.
4	Click ▶ Start guided tour.	Camera flies through 8 stops with a caption panel for each area.
5	Click the tank T-102 in 3D.	Inspector opens with level, alarms, open WO and documents.

3. Live 2D drawings (P&ID, plot plan, single-line)

Where: Digital twin → 2D drawings **Demo time:** Power-factor drop (Thu 15 Oct 12:00)



WHAT IT IS AND HOW IT IS USED

Engineering drawings that are alive: the P&ID shows current values on every instrument, the plot plan shows people and permits on the site layout, and the single-line diagram shows electrical loads and the power-factor problem – the drawings engineers already trust, now connected to data.

Who uses it: Process and electrical engineers, operators, permit issuers, contractors during induction.

DATA REQUIRED

- P&ID, plot plan and SLD geometry (here drawn by the twin)
- Live tag values per instrument tag
- Electrical measurements (TR-601 kW, PF, MCC loads)
- RTLS positions and permit zones for the plot plan

AVAILABLE IN THE APP

- 3 sheets with title blocks, grid references and line numbers
- Live overlay at twin time; click equipment to open the inspector
- Wheel zoom, drag pan, fit; blueprint style toggle
- Export SVG / Print (local copy only)

KEY FIGURES / IMPROVEMENT

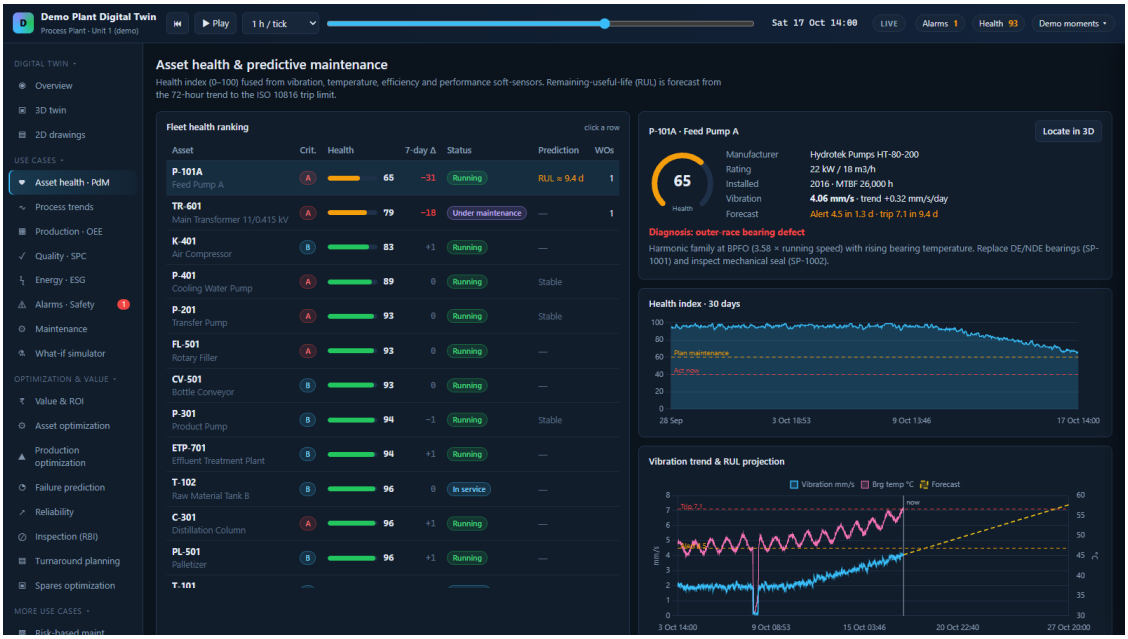
- No more walking to a DCS screen to read a value off a drawing
- APFC capacitor failure seen directly on the SLD (PF 0.87)

TEST IT YOURSELF

#	Do this	You should see
1	Demo moments ▾ → "Power-factor drop".	Drawings view opens at Thu 15 Oct 12:00.
2	Click "Single line diagram".	TR-601 shows PF ≈ 0.87 with the APFC capacitor bank flagged.
3	Click "P&ID".	Instrument bubbles (LI-101, TIC-201, FIC-101…) carry live values.
4	Click "Plot plan".	Areas A100–A700, people dots and permit zones on the layout.
5	Scroll to zoom, drag to pan, click R-201.	Inspector opens for the reactor.

4. Asset health & predictive maintenance

Where: Use cases → Asset health · PdM **Demo time:** P-101A bearing degrading (Sat 17 Oct 14:00)



WHAT IT IS AND HOW IT IS USED

A 0–100 health index per asset fused from vibration, temperature, efficiency and performance soft-sensors, with remaining useful life (RUL) forecast from the trend to the ISO 10816 trip limit – so repairs are planned before the failure instead of after it.

Who uses it: Reliability engineer, maintenance planner, condition-monitoring technician.

DATA REQUIRED

- Vibration (mm/s RMS), bearing temperature, motor current per rotating asset
- Efficiency / U-value soft-sensors for exchangers and boiler
- Run status (to ignore stopped periods)
- Work-order history

AVAILABLE IN THE APP

- Fleet health ranking with criticality, 7-day change, status, RUL, open WOs
- Click a row → trend with alert/trip limits and forecast line
- Locate in 3D
- RUL fitted on running samples only (no false trends when a pump is stopped)

KEY FIGURES / IMPROVEMENT

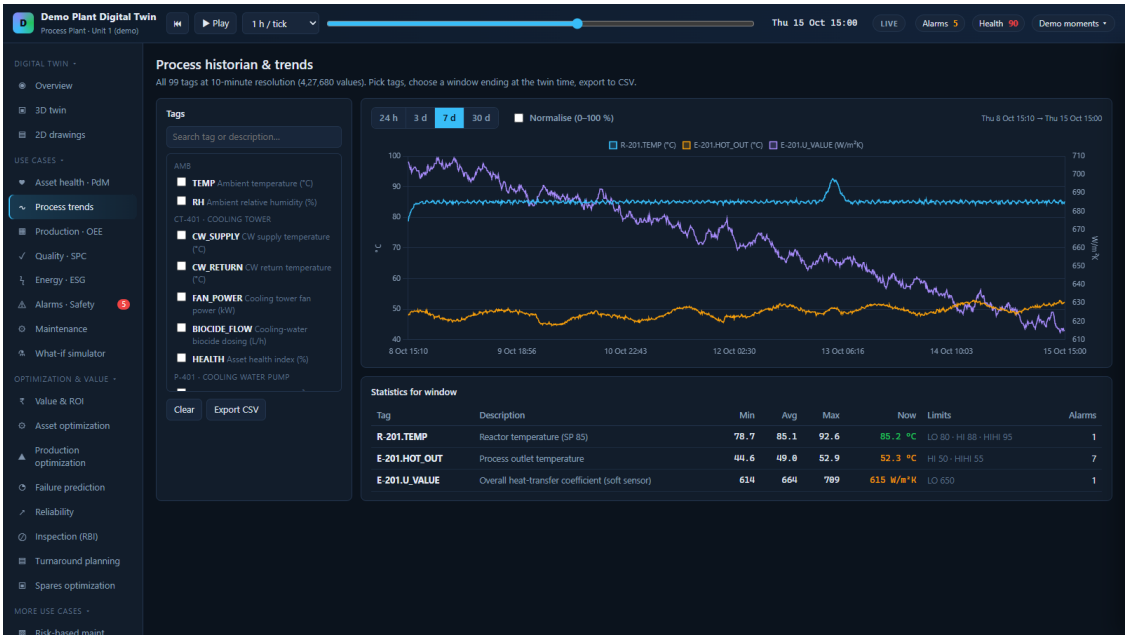
- At 17 Oct 14:00: P-101A health 65 (−31 in 7 days), RUL ≈ 9.4 d – weeks of warning
- Feeds risk-based maintenance, failure prediction and the turnaround scope

TEST IT YOURSELF

#	Do this	You should see
1	Demo moments ▾ → "P-101A bearing degrading".	Health view at Sat 17 Oct 14:00.
2	Look at the top row of the fleet ranking.	P-101A Feed Pump A, criticality A, health 65, 7-day Δ −31, RUL ≈ 9.4 d, 1 WO.
3	Click the P-101A row.	Vibration trend rising toward alert 4.5 and trip 7.1 mm/s with forecast.
4	Drag the time slider forward to 22 Oct.	Health keeps falling; at 22 Oct 10:00 vibration reaches the trip limit.
5	Press LIVE and re-check.	P-201 now shows the early fault (misalignment).

5. Process historian & trends

Where: Use cases → Process trends **Demo time:** Heat-exchanger fouling (Thu 15 Oct 15:00)



WHAT IT IS AND HOW IT IS USED

A historian for all 99 tags at 10-minute resolution (427,680 values): pick tags, choose a window ending at the twin time, see statistics and export to CSV – the everyday tool for troubleshooting and reporting.

Who uses it: Process engineers, operators, data analysts.

DATA REQUIRED

- All process, utility, health, environmental and corrosion tags (10-min)
- Tag metadata: description, unit, asset

AVAILABLE IN THE APP

- Tag search and tick-box selection grouped by asset
- Window 24 h / 3 d / 7 d / 30 d, normalised view
- Statistics table (min, mean, max)
- Export CSV (local copy)

KEY FIGURES / IMPROVEMENT

- E-201 U-value shows the fouling saw-tooth and the cleaning recovery
- Replaces spreadsheets assembled from DCS exports

TEST IT YOURSELF

#	Do this	You should see
1	Demo moments ▾ → "Heat-exchanger fouling".	Trends view at Thu 15 Oct 15:00 with E-201 tags.
2	Type "U_VALUE" in the tag search and tick it.	E-201 overall heat-transfer coefficient trend appears.
3	Choose the 30-day window.	U falls steadily, then jumps back after cleaning.
4	Read the statistics table.	Min / mean / max per selected tag.

6. Production & OEE

Where: Use cases → Production · OEE **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

Overall equipment effectiveness for the packaging line (availability × performance × quality) with a downtime Pareto and log, plus resin output vs packed – showing where capacity is lost.

Who uses it: Production manager, packaging supervisor, continuous-improvement team.

DATA REQUIRED

- Filler / conveyor / palletiser run status and counts
- Stop events with reason codes
- Good / reject bottle counts
- Resin production rate

AVAILABLE IN THE APP

- OEE, A, P, Q tiles for the period
- Daily OEE breakdown and downtime Pareto
- Loss by category, daily production vs packed
- Downtime log (133 events)

KEY FIGURES / IMPROVEMENT

- Period OEE 79.8 % (A 94.2 %, P 85.8 %, Q 98.78 %); 2,594 t resin, 2.54 M good bottles
- Speed loss vs 130 bpm is the biggest lever – used by Production optimization

TEST IT YOURSELF

#	Do this	You should see
1	Click Production · OEE.	OEE 79.8 %, availability 94.2 % (24.1 h unplanned stops).
2	Look at the downtime Pareto.	Top reasons such as bottle jams and supply delays.
3	Scroll to the downtime log.	Latest: 27 Oct 15:16 FL-501 bottle jam, 7 min.

7. Quality & SPC with root cause

Where: Use cases → Quality · SPC **Demo time:** Reactor overshoot → off-spec (Tue 13 Oct 05:00)



WHAT IT IS AND HOW IT IS USED

Statistical process control on every 4-hour lot (viscosity, purity, moisture, colour) with control limits, Cpk, and a root-cause view that links lot quality back to reactor temperature from the twin.

Who uses it: Quality manager, lab, process engineer.

DATA REQUIRED

- LIMS lab results per lot
- Lot start/end times and grade
- Reactor temperature history from the twin

AVAILABLE IN THE APP

- Grade tabs KX-200 / KX-350
- Individuals control chart with spec and ±3σ limits
- Scatter: reactor temperature vs viscosity (R^2, slope)
- Lot register with release / hold status

KEY FIGURES / IMPROVEMENT

- Root cause proven: 16.1 cP per °C, R^2 0.83 – the 13-Oct overshoot made the off-spec lots
- KX-200 Cpk 0.63 → target ≥ 1.33 shows the control improvement needed

TEST IT YOURSELF

#	Do this	You should see
1	Demo moments ▾ → "Reactor overshoot → off-spec".	Quality view at Tue 13 Oct 05:00, grade KX-200.
2	Read the tiles.	90 lots, right-first-time 96.7 %, 3 held, Cpk 0.63.
3	Look at the root-cause scatter.	R^2 ≈ 0.83, slope 16.1 cP/°C.
4	Lot register top row.	Lot made at ~88 °C with viscosity ~505 cP → held.

8. Energy & ESG

Where: Use cases → Energy · ESG **Demo time:** Compressed-air leak (Sat 10 Oct 03:00)



WHAT IT IS AND HOW IT IS USED

Metered electricity by area, natural gas, steam, water and CO_2 (scope 1 and 2) with cost per tonne, and twin-calculated saving opportunities such as the compressed-air leak, boiler burner drift and power factor.

Who uses it: Energy manager, ESG reporting, utilities engineer.

DATA REQUIRED

- MCC / transformer electricity meters by area
- Gas flow, steam raised, water make-up
- Compressor power, boiler flue O_2 and efficiency, power factor
- Emission factors and tariffs

AVAILABLE IN THE APP

- Electricity, gas, specific energy, CO_2, water and utility cost tiles
- Night-load analysis for K-401 (leak period vs after repair)
- Boiler efficiency & flue O_2 chart, power factor chart
- Energy-saving opportunity list with ₹ and tCO_2

KEY FIGURES / IMPROVEMENT

- Air leak: ~8 kW wasted (3–20 Oct) ⇒ ₹6.3 L/yr and 53 t CO_2/yr avoided by the repair
- 30 days: 258 MWh, 99 kWh/t, 209 kg CO_2/t, utility cost ₹1.01 Cr

TEST IT YOURSELF

#	Do this	You should see
1	Demo moments ▾ → "Compressed-air leak".	Energy view at Sat 10 Oct 03:00.
2	Find "Compressed-air leak: K-401 power by hour of day".	Night power far above the after-repair profile.
3	Press LIVE.	Footnote quantifies the leak: ~8.4 kW, ₹6.33 L/yr, 52.7 t CO_2/yr.
4	Demo moments → "Boiler burner drift".	Flue O_2 ≈ 5.8 %, efficiency −3 points.

9. Alarms, events & safety

Where: Use cases → Alarms · Safety **Demo time:** Gas leak & ESD trip (Mon 19 Oct 10:40)



WHAT IT IS AND HOW IT IS USED

Alarm journal with ISA-18.2 performance metrics (alarms per day, standing, chattering, acknowledge time), state-based suppression during shutdowns, fixed gas detection and process-safety events.

Who uses it: Control-room operators, alarm management team, HSE.

DATA REQUIRED

- Alarm & event journal (priority, value, limit, ack, clear)
- Gas detector %LEL
- Plant state (running / shutdown) for suppression
- Safety event register

AVAILABLE IN THE APP

- KPIs: days without LTI, alarms/day, standing, acked ≤ 5 min, chattering, PSE count
- Alarms per day by priority, bad-actor chart
- Gas detector trend zoomed on the release
- Filterable journal (priority, text, active only)

KEY FIGURES / IMPROVEMENT

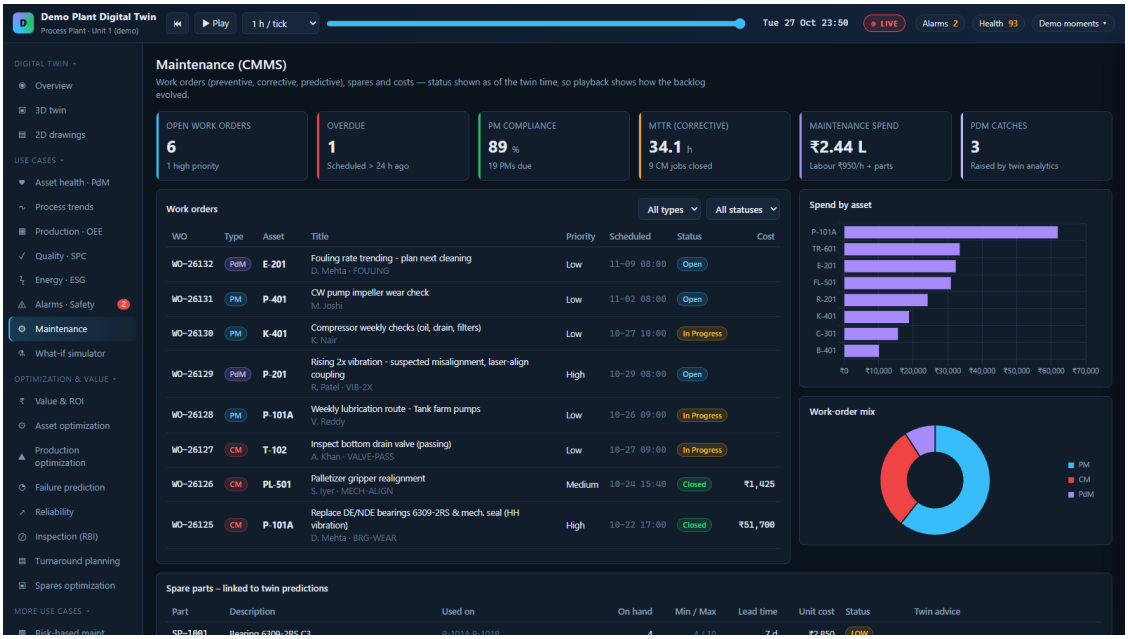
- 2.4–2.9 alarms/day vs ISA-18.2 ceiling of 150 per operator
- Bad actors listed (CT-401 CW supply chattering) for alarm rationalisation

TEST IT YOURSELF

#	Do this	You should see
1	Demo moments ▾ → "Gas leak & ESD trip", then open Alarms · Safety.	6 standing alarms incl. GD-202, P-101A; 2 process-safety events.
2	Look at Gas detectors %LEL.	Chart zoomed on Mon 19 Oct 10:30 with GD-202 peak ~28 %LEL.
3	Filter priority = High.	Journal shows only high-priority alarms.
4	Tick "Active only".	Only standing alarms remain.

10. Maintenance (CMMS) view

Where: Use cases → Maintenance **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

Work orders – preventive, corrective and predictive – with status as of the twin time, PM compliance, MTTR, spend and the number of predictive catches raised by the twin analytics.

Who uses it: Maintenance planner, maintenance manager.

DATA REQUIRED

- CMMS work orders (type, asset, priority, schedule, status, cost)
- Labour rate and parts cost

AVAILABLE IN THE APP

- KPIs: open, overdue, PM compliance, MTTR, spend, PdM catches
- Filters by type and status
- Backlog replays with the time slider

KEY FIGURES / IMPROVEMENT

- Live: 6 open (1 high), 1 overdue, PM compliance 89 %, MTTR 34.1 h, 3 PdM catches

TEST IT YOURSELF

#	Do this	You should see
1	Click Maintenance.	6 open WOs, 1 overdue, PM compliance 89 %.
2	Type filter → PdM.	Only predictive WOs, e.g. WO-26132 E-201 fouling.
3	Drag the time slider back two weeks.	Backlog and statuses change to that date.

11. What-if simulator

Where: Use cases → What-if simulator **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

A physics-based reduced-order model of the plant started from the current twin state: change rate, set-points, weather, fouling, leaks or shifts and see production, quality, energy, CO_2 and margin before touching the real plant.

Who uses it: Process engineer, production planner, plant manager.

DATA REQUIRED

- Current twin state (rate, temperatures, U-value, ambient)
- Model relationships (heat balance, viscosity sensitivity, packaging capacity, energy factors)

AVAILABLE IN THE APP

- 10 operating levers (sliders)
- 4 presets: Heatwave 42 °C, Push to 108 %, Skip E-201 cleaning, Energy best-practice
- Scenario vs baseline table and constraint warnings
- Reset to twin state

KEY FIGURES / IMPROVEMENT

- Push to 108 %: resin +18.1 t/d but packaging only +7.2 t/d → T-301 fills 16 t/d (bottleneck shown)
- Heatwave: CW supply +11.7 °C, E-201 outlet +7.7 °C

TEST IT YOURSELF

#	Do this	You should see
1	Click What-if simulator.	Levers start at the live state (rate 91 %, SP 85 °C).
2	Click "Heatwave 42 °C".	CW supply 24.6 → 36.3 °C, E-201 outlet 45.2 → 52.8 °C.
3	Click Reset, then "Push to 108 %".	Resin 90.7 → 108.9 t/d, packaging 85.4 → 92.7, T-301 accumulation +10.9 t/d.
4	Click Reset, then "Skip E-201 cleaning".	U-value 560, E-201 outlet +5.9 °C.

12. Value & ROI of the digital twin

Where: Optimization & value → Value & ROI **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

The business case: 18 plant KPIs before go-live (Apr-24 → Mar-25) vs after full roll-out (Nov-25 → Oct-26), the value realized, the pipeline still to capture, payback, NPV and ROI on the investment – with editable assumptions.

Who uses it: Plant manager, finance controller, digital programme sponsor.

DATA REQUIRED

- 36 months of monthly KPIs (throughput, OEE, downtime, maintenance cost, energy, inspection cost…)
- Investment: capex, opex, share of gains credited to the twin

AVAILABLE IN THE APP

- Tiles: value realized, pipeline, payback, 5-year NPV, ROI year 1, spares cash released
- Annual value by business case chart
- Editable capex / opex / attribution %
- KPI scorecard before vs after with trend sparklines

KEY FIGURES / IMPROVEMENT

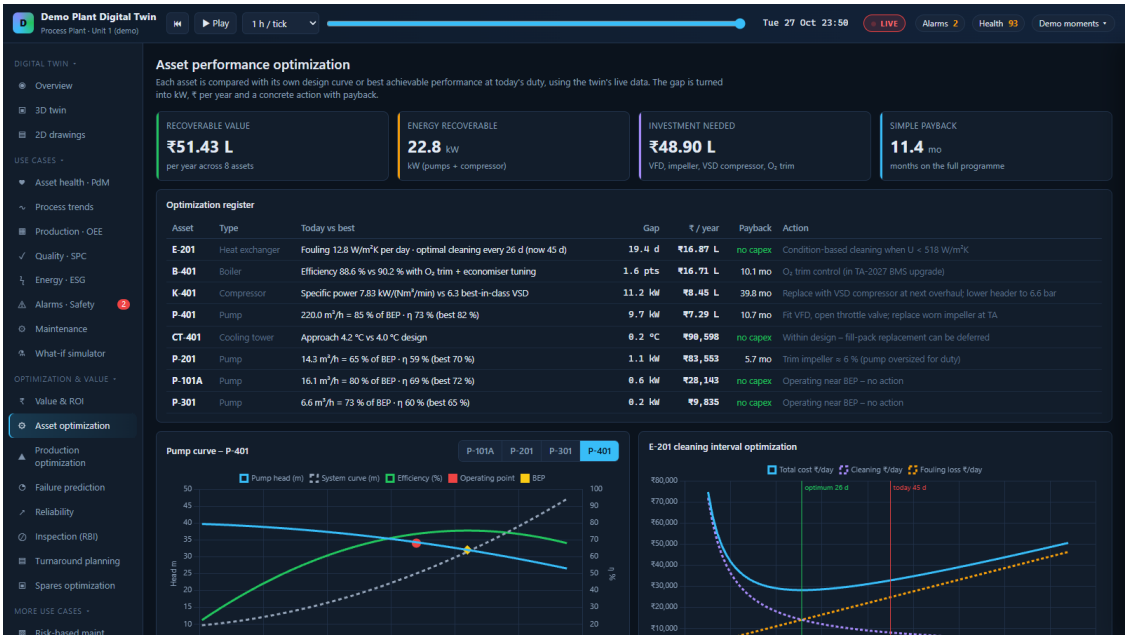
- ₹4.07 Cr/yr realized (50 % of measured gains), pipeline ₹1.86 Cr/yr
- Payback 15.6 months on ₹4.50 Cr; 5-year NPV ₹11.87 Cr; ROI 77 % in year 1

TEST IT YOURSELF

#	Do this	You should see
1	Click Value & ROI.	Value realized ₹4.07 Cr, payback 15.6 months, NPV ₹11.87 Cr.
2	Change "Share of KPI gains credited" from 50 to 30 and press Enter.	Value realized and ROI fall, payback lengthens.
3	Change it back to 50.	Original figures return.
4	Scroll to the KPI table.	18 KPIs with before, after and % change.

13. Asset performance optimization

Where: Optimization & value → Asset optimization **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

Each asset is compared with its own design curve or best achievable performance at today's duty. The gap is turned into kW, ₹ per year and a concrete action with payback.

Who uses it: Reliability / energy engineer, maintenance manager.

DATA REQUIRED

- Pump flow, head, power → efficiency vs pump curve (BEP)
- Exchanger U-value and fouling rate
- Boiler efficiency and flue O_2
- Compressor specific power

AVAILABLE IN THE APP

- Optimization register: today vs best, gap, ₹/yr, payback, action
- Pump curve chart per pump (P-101A, P-201, P-301, P-401)
- E-201 cleaning-interval optimisation curve

KEY FIGURES / IMPROVEMENT

- ₹51.4 L/yr recoverable across 8 assets, 22.8 kW, ₹48.9 L investment, payback 11.4 months
- E-201: clean every 26 d (now 45 d) worth ₹16.9 L/yr at no capex

TEST IT YOURSELF

#	Do this	You should see
1	Click Asset optimization.	Recoverable ₹51.43 L/yr, payback 11.4 mo.
2	Read the top register rows.	E-201 condition-based cleaning ₹16.87 L; B-401 O_2 trim ₹16.71 L.
3	Click the P-401 pump tab.	Pump curve: operating point at ~85 % of BEP, η 73 % vs 82 % best.

14. Production optimization

Where: Optimization & value → Production optimization **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

The process model searches rate, reactor set-point, filler speed and shift pattern for the highest margin that keeps every constraint (E-201 outlet, quality spec, cooling, packaging buffer, pump limits). It also finds the real bottleneck and the best-batch recipe.

Who uses it: Production manager, process engineer, planning.

DATA REQUIRED

- Live process state and constraints
- Margin per tonne, packaging capacity, quality model (viscosity 440–460 cP)

AVAILABLE IN THE APP

- Today vs optimized set-points vs debottlenecked packaging
- Stage capacity chart with the bottleneck
- Dynamic hourly rate set-point
- Golden-batch recipe

KEY FIGURES / IMPROVEMENT

- Optimized set-points: 91.7 → 94.8 t/d, ₹3.70 Cr/yr
- With a 3rd packing shift: 106.8 t/d, ₹17.97 Cr/yr; golden batch +0.15 % yield = ₹29.8 L/yr

TEST IT YOURSELF

#	Do this	You should see
1	Click Production optimization.	Today 91.7 t/d; optimized 94.8 t/d (rate 94 %, SP 84.5 °C).
2	Read the bottleneck note.	Packaging (2 shifts, 118 bpm) at 85.4 t/day is the bottleneck.
3	Scroll to the hourly set-point chart.	Rate plan by hour for 3 shifts.

15. Early failure prediction

Where: Optimization & value → Failure prediction **Demo time:** Bearing fault seen before the alarm (Sat 17 Oct 12:00)



WHAT IT IS AND HOW IT IS USED

Each asset has a physics or statistical model of how it should behave. The anomaly score measures how far the real asset has drifted from its model, so failures show up days or weeks before any alarm.

Who uses it: Reliability engineer, condition-monitoring team.

DATA REQUIRED

- Model residuals per asset (vibration, temperature, efficiency, power)
- Five-year failure history to measure recall and precision

AVAILABLE IN THE APP

- Anomaly heat-map: daily score per asset (30 days)
- Warning gained table: twin detected vs first alarm
- P-F curve and recall / precision / median warning KPIs

KEY FIGURES / IMPROVEMENT

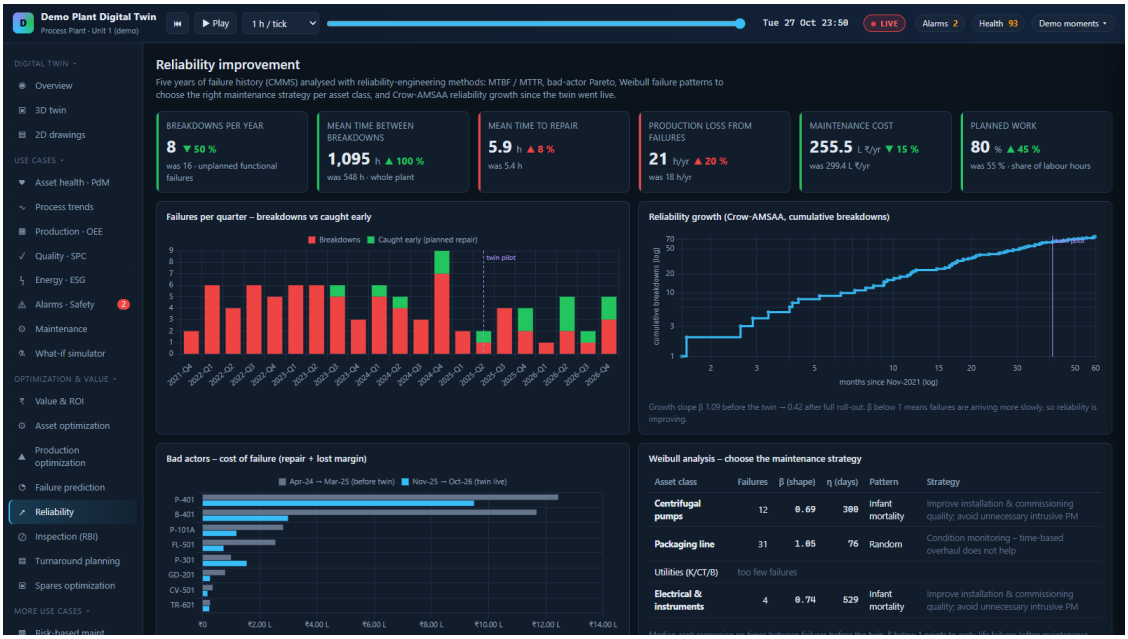
- 8 of 10 failures caught early (recall 80 %, precision 53 %), median warning 24 days
- ₹31.5 L repair + lost margin avoided; P-101A bearing seen 5.1 days before the alarm

TEST IT YOURSELF

#	Do this	You should see
1	Demo moments ▾ → "Bearing fault seen before the alarm".	Failure prediction at Sat 17 Oct 12:00; P-101A row hot on the heat-map.
2	Read "Warning gained this month".	P-101A bearing wear: detected 13 Oct, first alarm 18 Oct 01:51, 5.1 d gained.
3	Press LIVE.	Assets with anomaly now: P-201, E-201.

16. Reliability improvement

Where: Optimization & value → Reliability **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

Five years of failure history analysed with reliability methods: MTBF / MTTR, bad-actor Pareto, Weibull patterns to pick the right strategy per asset class, and Crow-AMSAA reliability growth since go-live.

Who uses it: Reliability engineer, maintenance manager.

DATA REQUIRED

- CMMS failure history (96 events, 5 years) with failure modes
- Labour hours planned vs unplanned, maintenance cost

AVAILABLE IN THE APP

- Before/after KPIs (breakdowns, MTBF, MTTR, loss, cost, planned work)
- Failures per quarter: breakdowns vs caught early
- Crow-AMSAA growth chart (β)
- Weibull per asset class and bad-actor Pareto

KEY FIGURES / IMPROVEMENT

- Breakdowns 16 → 8 per year (−50 %), MTBF 548 → 1,095 h, planned work 55 → 80 %
- Maintenance cost ₹299 L → ₹256 L/yr (−15 %); growth slope β 1.09 → 0.42

TEST IT YOURSELF

#	Do this	You should see
1	Click Reliability.	Breakdowns 8/yr ▼50 %, MTBF 1,095 h ▲100 %.
2	Look at the Crow-AMSAA chart.	Slope 1.09 before → 0.42 after roll-out.
3	Scroll to Weibull.	β per asset class suggests run-to-failure vs condition-based vs time-based.

17. Inspection optimization (RBI)

Where: Optimization & value → Inspection (RBI) **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

Thickness readings since 2016 give each item a measured corrosion rate and remaining life. Probability × consequence sets the risk and the risk sets the inspection interval (API 580/581 approach), instead of one fixed interval for everything – including PSV test intervals.

Who uses it: Inspection engineer, integrity manager, statutory authority.

DATA REQUIRED

- Thickness measurement locations (TML) history, t-min
- Damage mechanism and material per item
- Consequence (fluid, inventory, location)
- PSV test history (12 PSVs)

AVAILABLE IN THE APP

- Risk matrix and RBI register with interval change
- Thickness trend per item with remaining life
- PSV interval optimisation
- Cost before vs after

KEY FIGURES / IMPROVEMENT

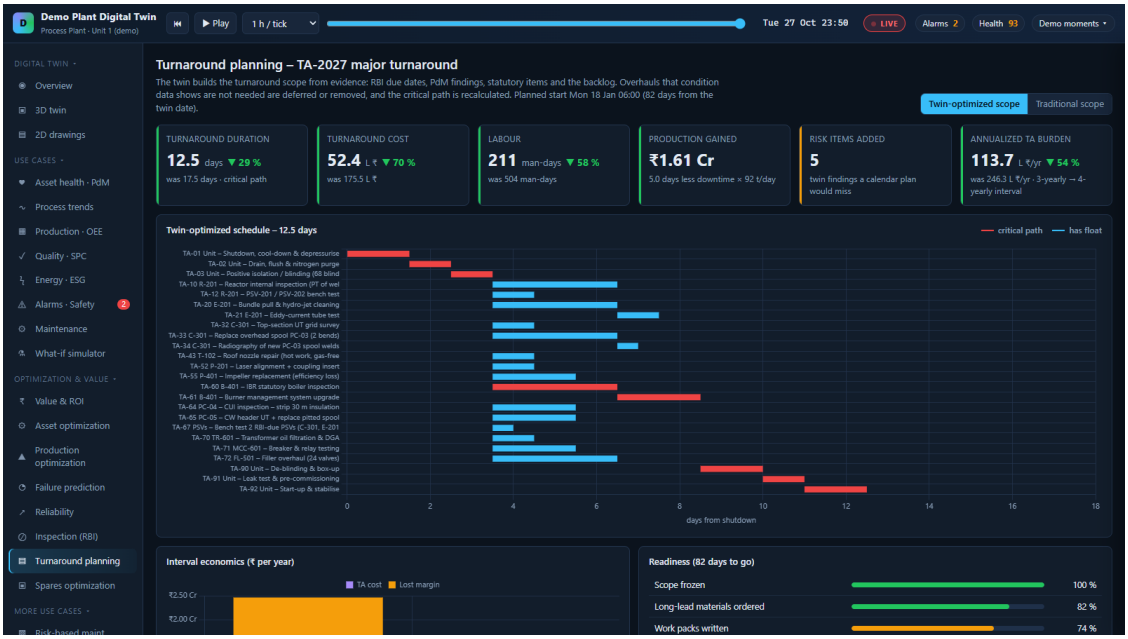
- Inspection cost ₹10.1 L → ₹5.7 L/yr (−43 %), inspections 14.2 → 8.7 per year
- 14 intervals extended, 1 brought forward; shortest life PC-03 overhead line 3.5 y

TEST IT YOURSELF

#	Do this	You should see
1	Click Inspection (RBI).	Cost 5.7 L ₹/yr ▼43 %, 5 high-risk items.
2	Read the thickness trend.	PC-03: 3.59 mm in 2026, 0.226 mm/y, t-min 2.8 mm → ~3.5 y.
3	Scroll to the register.	Each item: risk, old interval, new interval.

18. Turnaround planning (TA-2027)

Where: Optimization & value → Turnaround planning **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

The twin builds the turnaround scope from evidence – RBI due dates, PdM findings, statutory items and backlog – defers overhauls that condition data shows are not needed, recalculates the critical path (CPM) and checks SIMOPS clashes.

Who uses it: Turnaround manager, planners, inspection, operations.

DATA REQUIRED

- 38 candidate tasks with duration, crew, cost, predecessors, area and work type
- RBI remaining life, PdM health, statutory list
- SIMOPS rules (radiography exclusion, hot work near confined space, lifts over entries)

AVAILABLE IN THE APP

- Twin-optimized vs Traditional scope toggle
- Gantt with critical path and float
- Scope decisions with evidence
- Interval economics (3-yearly → 4-yearly), readiness, SIMOPS clash table

KEY FIGURES / IMPROVEMENT

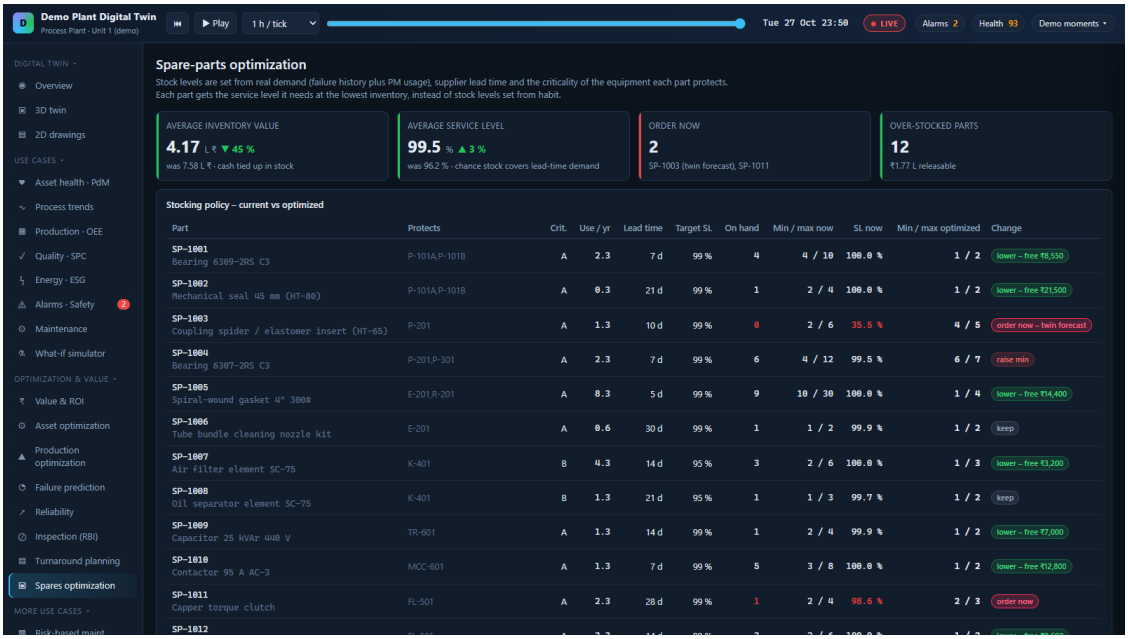
- Duration 17.5 → 12.5 days (−29 %), cost ₹175.5 L → ₹52.4 L (−70 %), labour 504 → 211 man-days
- ₹1.61 Cr production gained; 5 risk items added that a calendar plan would miss

TEST IT YOURSELF

#	Do this	You should see
1	Click Turnaround planning.	Twin-optimized: 12.5 days, ₹52.4 L, 211 man-days.
2	Click "Traditional scope".	Gantt switches to the 17.5-day traditional schedule.
3	Scroll to the scope table.	Each task: include / defer / remove with evidence.
4	Scroll to SIMOPS clashes.	E.g. radiography exclusion overlapping other work.

19. Spare-parts optimization

Where: Optimization & value → Spares optimization **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

Stock levels set from real demand (failure history + PM use + the twin's own failure forecast), supplier lead time and the criticality of the equipment each part protects.

Who uses it: Stores / materials manager, maintenance planner, finance.

DATA REQUIRED

- Part master: on hand, min/max, unit cost, lead time
- Usage history and the twin RUL forecast
- Criticality of the assets each part protects

AVAILABLE IN THE APP

- Stocking policy table current vs optimized
- Order-now alerts
- Inventory and service-level KPIs

KEY FIGURES / IMPROVEMENT

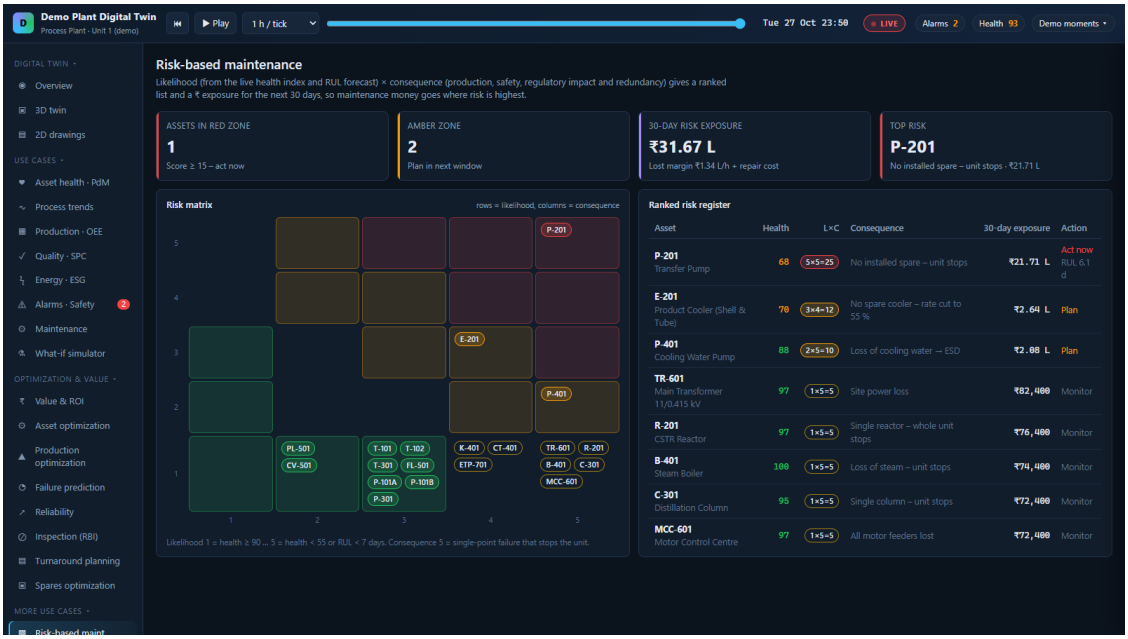
- Inventory ₹7.58 L → ₹4.17 L (−45 %) while service level rises 96.2 → 99.5 %
- Order now: SP-1003 coupling spider (twin forecast for P-201), SP-1011

TEST IT YOURSELF

#	Do this	You should see
1	Click Spares optimization.	Inventory 4.17 L ₹ ▼45 %, service 99.5 %.
2	Look at "Order now".	SP-1003 (twin forecast) and SP-1011.
3	Find SP-1003 in the table.	Coupling spider – 0 on hand, lead time 10 d, protects P-201.

20. Risk-based maintenance

Where: More use cases → Risk-based maint. **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

Likelihood (from live health and RUL) × consequence (production, safety, regulatory, redundancy) gives a ranked list and a ₹ exposure for the next 30 days, so maintenance money goes where risk is highest.

Who uses it: Maintenance manager, reliability engineer.

DATA REQUIRED

- Health index and RUL per asset
- Consequence scores and installed spares
- Margin per hour and repair cost

AVAILABLE IN THE APP

- 5×5 risk matrix
- Ranked risk register with ₹ exposure
- Red / amber counts

KEY FIGURES / IMPROVEMENT

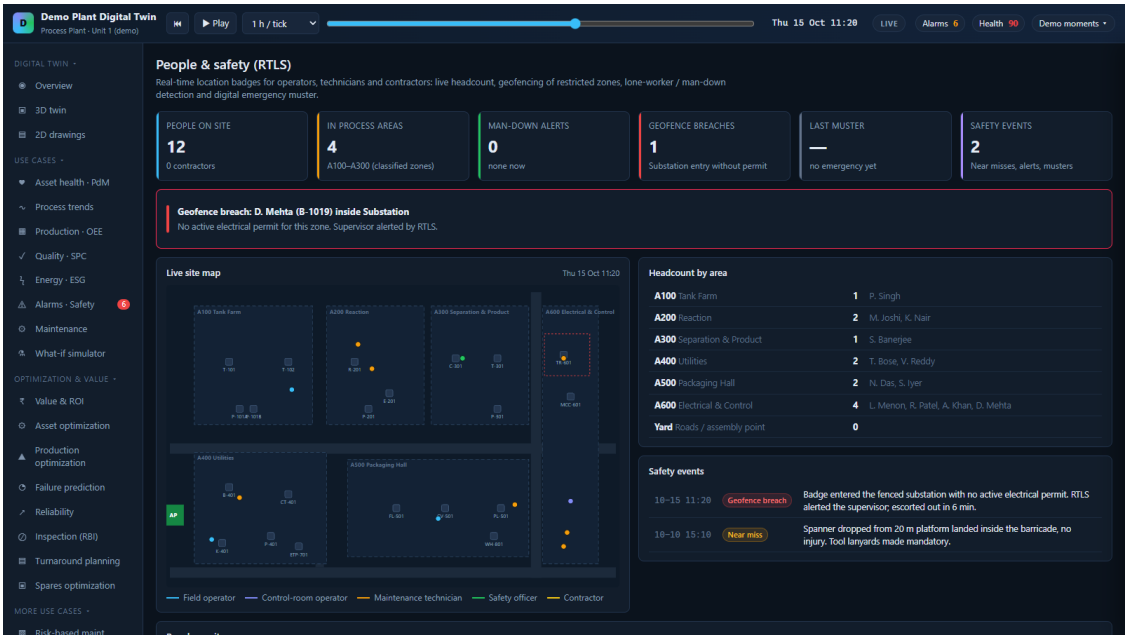
- 1 asset red (P-201, no installed spare – unit stops, ₹21.7 L)
- 30-day exposure ₹31.7 L

TEST IT YOURSELF

#	Do this	You should see
1	Click Risk-based maint.	Red zone 1, amber 2, exposure ₹31.67 L.
2	Look at the matrix.	P-201 at likelihood 5 in the top row.
3	Read the register.	P-201 first, then E-201 and P-401.

21. People & safety (RTLS)

Where: More use cases → People · RTLS **Demo time:** Emergency muster (Mon 19 Oct 10:40)



WHAT IT IS AND HOW IT IS USED

Real-time location badges for operators, technicians and contractors: live headcount, geofencing of restricted zones, lone-worker / man-down detection and digital emergency muster.

Who uses it: HSE, control room, emergency response team, security.

DATA REQUIRED

- RTLS badge positions (25 badges)
- Zone geometry (process areas, substation, assembly point)
- Permit register (who is allowed where)

AVAILABLE IN THE APP

- Live site map with people by role
- Man-down and geofence alerts
- Digital muster with accounted / missing and time
- Safety event list

KEY FIGURES / IMPROVEMENT

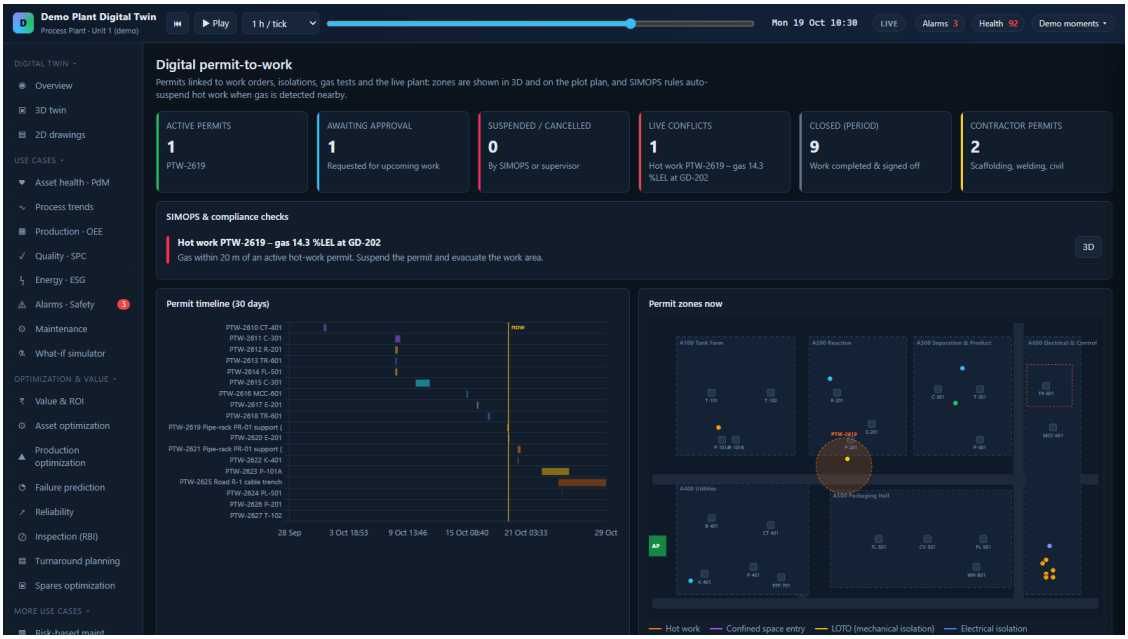
- Muster on 19 Oct: 12 accounted in 9.2 min, one contractor late (target 5 min)
- Man-down detected after 20 min motionless (24 Oct 03:30); substation entry without permit (15 Oct)

TEST IT YOURSELF

#	Do this	You should see
1	Demo moments ▾ → "Emergency muster".	People view at 19 Oct 10:40; people moving to the assembly point.
2	Move the slider to ~10:50.	In process areas 0; last muster 9.2 min, 12 accounted.
3	Demo moments → "Man-down alert".	MAN-DOWN: B. Verma motionless ≥ 20 min at T-101 stairs.
4	Demo moments → "Geofence breach".	D. Mehta inside the substation with no electrical permit.

22. Digital permit-to-work & SIMOPS

Where: More use cases → Permit to work **Demo time:** Hot work auto-suspended (Mon 19 Oct 10:30)



WHAT IT IS AND HOW IT IS USED

Permits linked to work orders, isolations, gas tests and the live plant: zones shown in 3D and on the plot plan, and SIMOPS rules that auto-suspend hot work when gas is detected nearby.

Who uses it: Permit issuer, area authority, HSE, contractors.

DATA REQUIRED

- Permit register (type, zone, times, status)
- Gas detector readings and positions
- Work orders and isolations

AVAILABLE IN THE APP

- Active / awaiting / suspended / conflict KPIs
- SIMOPS & compliance checks with 3D link
- Permit timeline (30 days) and zones

KEY FIGURES / IMPROVEMENT

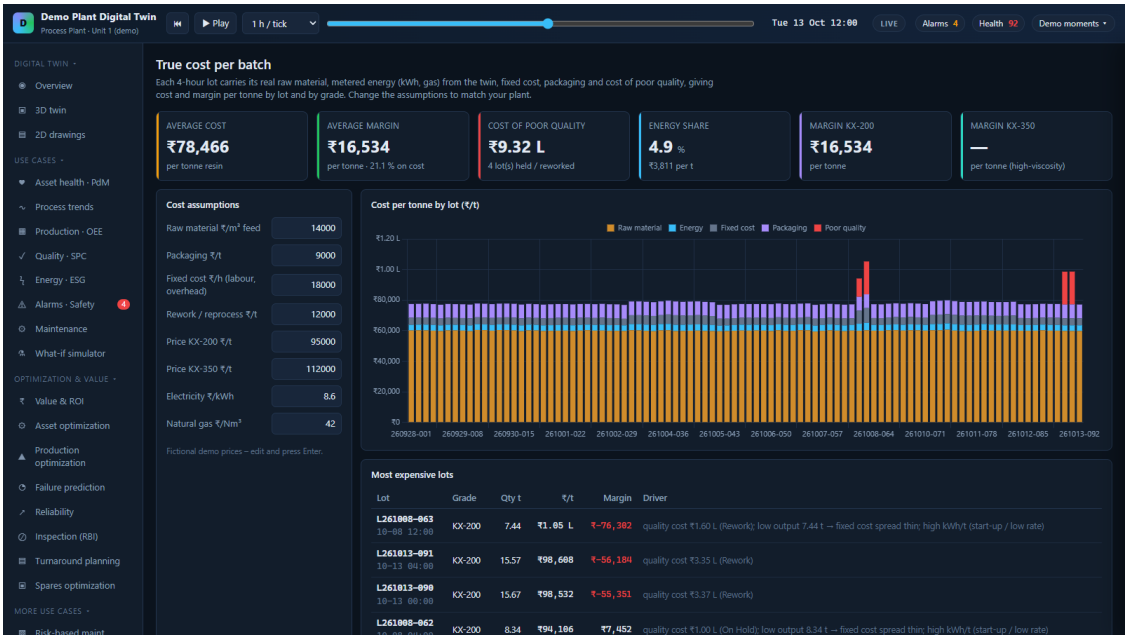
- Hot work PTW-2619 flagged at 14.3 %LEL on GD-202, 12 m away – suspend and evacuate
- Requests like hot work on an in-service tank (PTW-2627) are caught before approval

TEST IT YOURSELF

#	Do this	You should see
1	Demo moments ▾ → "Hot work auto-suspended".	Permits view at 19 Oct 10:30, 1 live conflict.
2	Read the conflict card.	Hot work PTW-2619 – gas 14.3 %LEL at GD-202; suspend the permit.
3	Click 3D on the card.	3D shows the permit zone and detector.
4	Press LIVE.	PTW-2627 hot work on T-102 while in service flagged.

23. True cost per batch

Where: More use cases → Cost per batch **Demo time:** Off-spec lots cost (Tue 13 Oct 12:00)



WHAT IT IS AND HOW IT IS USED

Each 4-hour lot carries its real raw material, metered energy from the twin, fixed cost, packaging and cost of poor quality, giving cost and margin per tonne by lot and by grade.

Who uses it: Plant controller, product manager, quality.

DATA REQUIRED

- Lot quantities and grade
- Raw material feed, kWh and gas per lot (from the twin)
- Prices and cost assumptions
- Hold / rework status

AVAILABLE IN THE APP

- Editable cost assumptions
- Cost per tonne by lot chart
- Most expensive lots table with drivers
- Margin by grade

KEY FIGURES / IMPROVEMENT

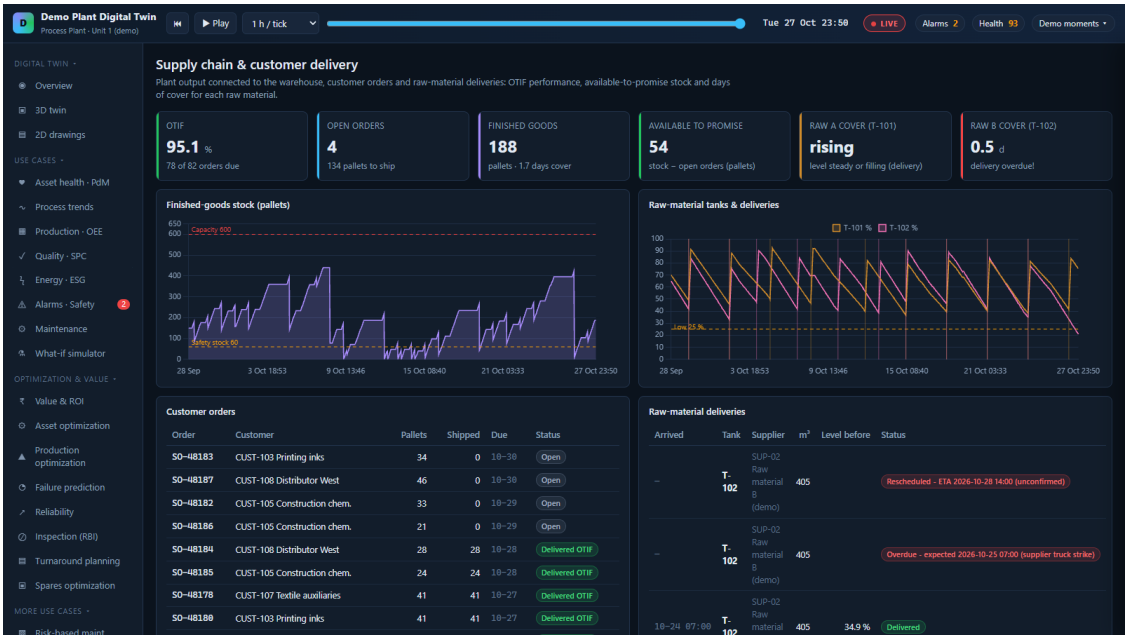
- Average ₹78,230/t cost, ₹17,994/t margin; cost of poor quality ₹11.8 L (5 lots)
- KX-350 margin ₹34,722/t vs KX-200 ₹16,696/t – a product-mix insight

TEST IT YOURSELF

#	Do this	You should see
1	Demo moments ▾ → "Off-spec lots cost".	Costing at 13 Oct 12:00; off-spec lots highest on the chart.
2	Change the Rework ₹/t assumption and press Enter.	Cost of poor quality and lot costs update.
3	Press LIVE.	KX-350 margin ~₹34.7k/t vs KX-200 ~₹16.7k/t.

24. Supply chain & customer delivery (OTIF)

Where: More use cases → Supply chain · OTIF **Demo time:** Export order empties warehouse (Mon 12 Oct 20:00)



WHAT IT IS AND HOW IT IS USED

Plant output connected to the warehouse, customer orders and raw-material deliveries: OTIF performance, available-to-promise stock and days of cover for each raw material.

Who uses it: Supply-chain planner, customer service, sales.

DATA REQUIRED

- Customer orders (due date, pallets, shipped)
- Warehouse stock
- Raw-material tank levels and delivery bookings

AVAILABLE IN THE APP

- OTIF, open orders, finished goods, ATP, raw cover tiles
- Finished-goods and raw-tank charts with deliveries
- Order and delivery tables

KEY FIGURES / IMPROVEMENT

- Export order on 12 Oct: ATP −193 pallets, 0.2 days cover – 4 domestic orders at risk
- Live: raw B cover 0.5 d with the delivery overdue; OTIF 95.1 %

TEST IT YOURSELF

#	Do this	You should see
1	Demo moments ▾ → "Export order empties warehouse".	ATP −193 pallets, FG 34 pallets (0.2 d).
2	Look at Customer orders.	Open domestic orders due 13–15 Oct with nothing shipped.
3	Press LIVE.	Raw B cover 0.5 d – "delivery overdue!"; OTIF 95.1 %.

25. Environmental compliance (CEMS & effluent)

Where: More use cases → Environment **Demo time:** Effluent pH excursion (Mon 19 Oct 12:00)



WHAT IT IS AND HOW IT IS USED

Continuous emission monitoring (stack NOx / CO) and effluent quality (pH, COD, TSS) against consent-to-operate limits, with an exceedance log and the monthly report for the pollution control board.

Who uses it: Environment officer, plant manager, regulator.

DATA REQUIRED

- CEMS stack analysers
- ETP outlet pH, COD, TSS, flow
- Consent limits

AVAILABLE IN THE APP

- Compliance % per parameter
- Stack and effluent charts with limits
- Exceedance log with root cause
- Monthly report CSV (local copy)

KEY FIGURES / IMPROVEMENT

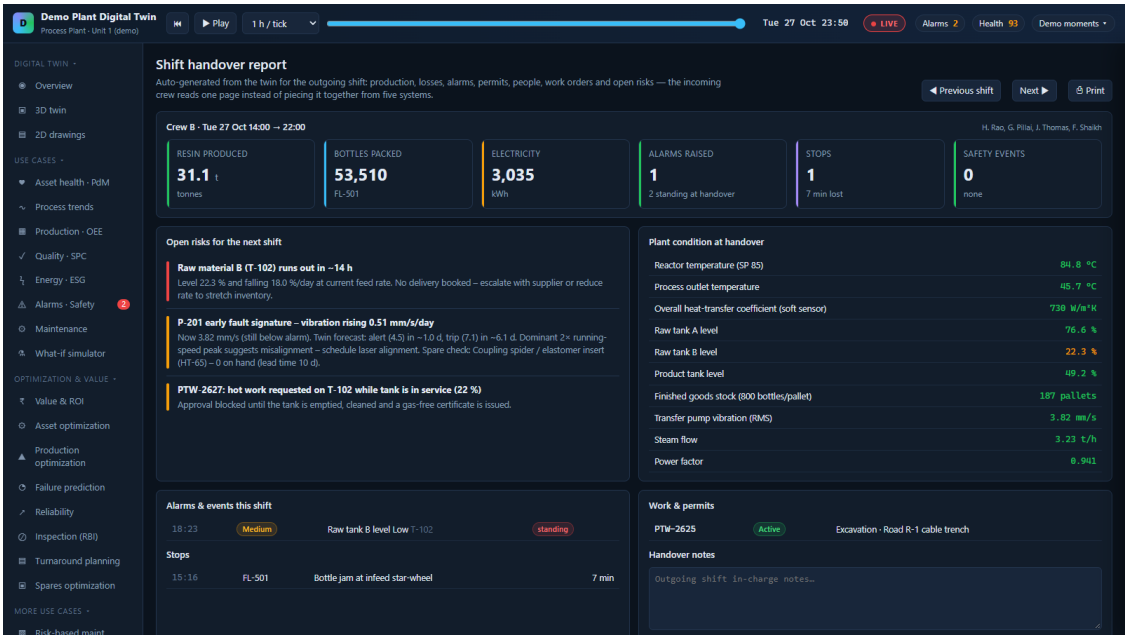
- pH 5.36 vs limit 6.0 after the leak wash-down – logged with cause and action
- NOx 95.1 %, CO 99.97 %, COD 99.68 %, TSS 100 % compliant

TEST IT YOURSELF

#	Do this	You should see
1	Demo moments ▾ → "Effluent pH excursion".	Environment at 19 Oct 12:00, effluent pH 5.36 (red).
2	Read the exceedance log.	10-19 11:30 Treated effluent pH Low with root cause.
3	Check the stack tiles.	NOx 86 mg/Nm³ (≤ 130), CO 42 (≤ 150).

26. Shift handover report

Where: More use cases → Shift handover **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

Auto-generated from the twin for the outgoing shift: production, losses, alarms, permits, people, work orders and open risks – one page instead of piecing it together from five systems.

Who uses it: Shift supervisors, incoming crew, plant manager.

DATA REQUIRED

- Everything the twin already has for the shift window
- Crew roster

AVAILABLE IN THE APP

- Previous / Next shift navigation
- KPI tiles per shift
- Open risks for the next shift (from the insights engine)
- Print (local copy)

KEY FIGURES / IMPROVEMENT

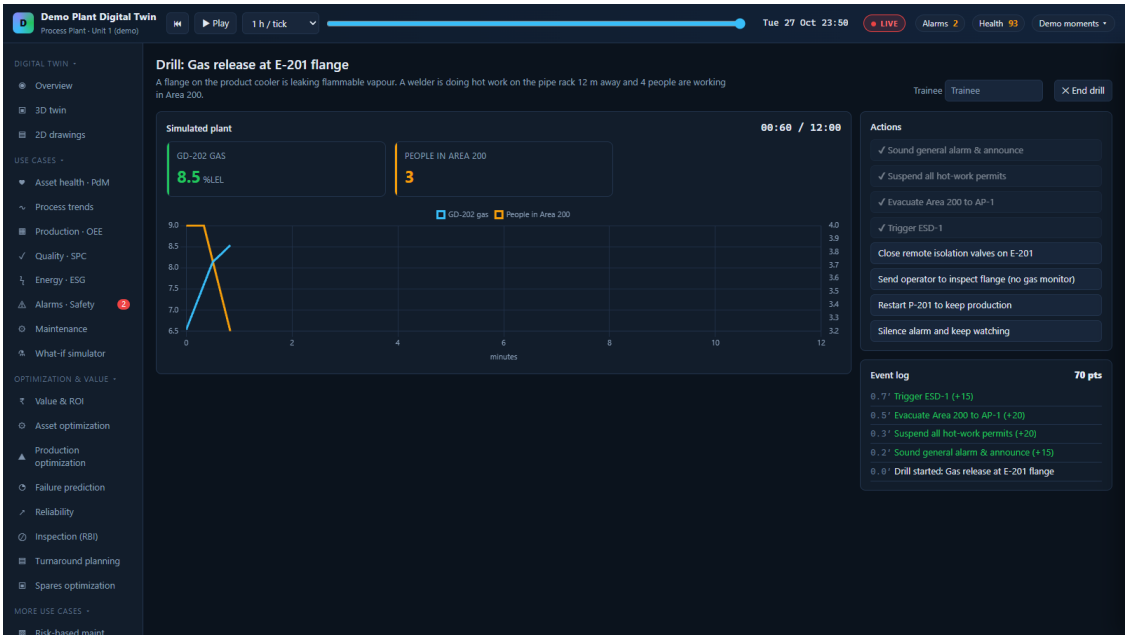
- Crew B 27 Oct 14:00–22:00: 31.1 t, 53,510 bottles, 1 stop (7 min), 0 safety events
- Risks carried forward automatically (T-102 cover, P-201 fault, PTW-2627)

TEST IT YOURSELF

#	Do this	You should see
1	Click Shift handover.	Crew C, Tue 27 Oct 22:00 → 06:00, in progress.
2	Click ◀ Previous shift.	Crew B 14:00–22:00: 31.1 t resin, 53,510 bottles.
3	Read "Open risks".	T-102 runs out in ~14 h; P-201 alert in ~1 d, trip ~6 d.

27. Operator training simulator

Where: More use cases → Training simulator **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

Practise abnormal and emergency situations on the twin's process model without touching the real plant. The trainee acts against a clock; the twin scores decisions, sequence and time, and gives a debrief.

Who uses it: Operators, new joiners, emergency response teams, trainers.

DATA REQUIRED

- Process model and scenario scripts
- Training records (stored in this browser)

AVAILABLE IN THE APP

- 3 drills: Gas release at E-201 (emergency), P-101A bearing failing (abnormal), CW pump trip (upset)
- Simulated clock, live values, action buttons including wrong choices
- Score, event log and debrief

KEY FIGURES / IMPROVEMENT

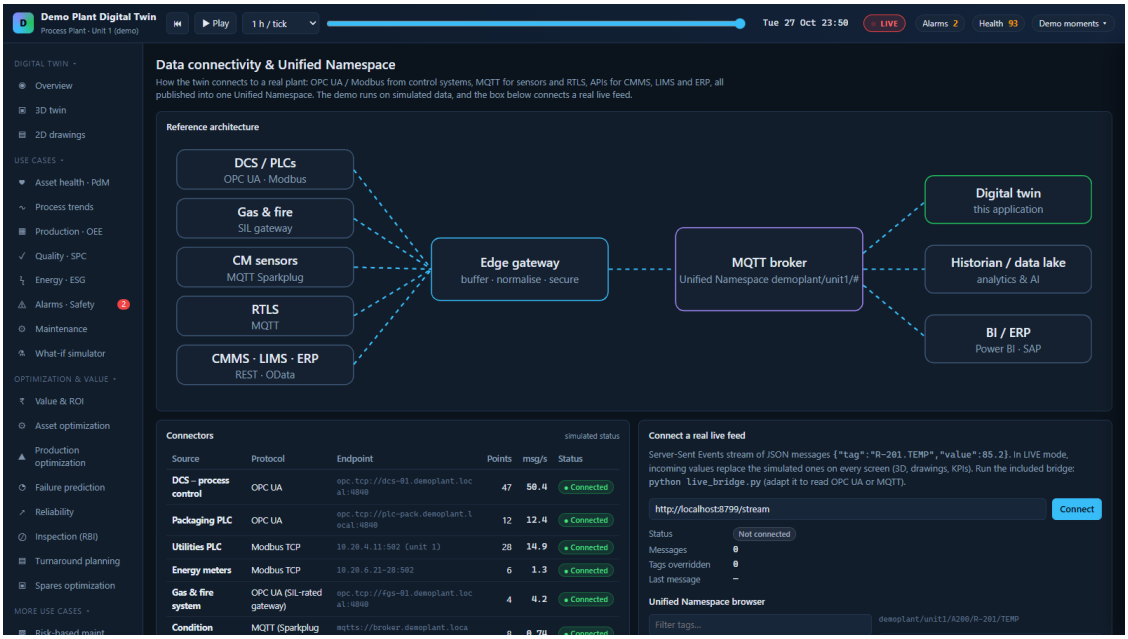
- Safe practice of rare events; repeatable assessment for competence records

TEST IT YOURSELF

#	Do this	You should see
1	Click Training simulator → ▶ Start drill on "Gas release at E-201 flange".	Drill starts: GD-202 gas, 4 people in Area 200, clock 00:00 / 12:00.
2	Click: Sound general alarm → Suspend hot-work permits → Evacuate Area 200 → Trigger ESD-1 → Close remote isolation valves.	Each action is logged with points; gas falls after isolation.
3	Click ✕ End drill.	Debrief with score, time and missed / wrong actions.
4	Run it again choosing "Send operator to inspect flange (no gas monitor)".	Penalty and safety comment in the debrief.

28. Data connectivity & Unified Namespace

Where: More use cases → Data connectivity **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

How the twin connects to a real plant: OPC UA / Modbus from control systems, MQTT for sensors and RTLS, APIs for CMMS, LIMS and ERP, all published into one Unified Namespace – plus a box to connect a real live feed.

Who uses it: OT / IT architects, integrators, data engineers.

DATA REQUIRED

- Connector list and endpoints
- Optional live feed: Server-Sent Events from live_bridge.py (127.0.0.1:8799)

AVAILABLE IN THE APP

- Reference architecture diagram
- Connector status table (protocol, endpoint, points, msg/s)
- Unified Namespace browser with search
- Connect a live feed by URL

KEY FIGURES / IMPROVEMENT

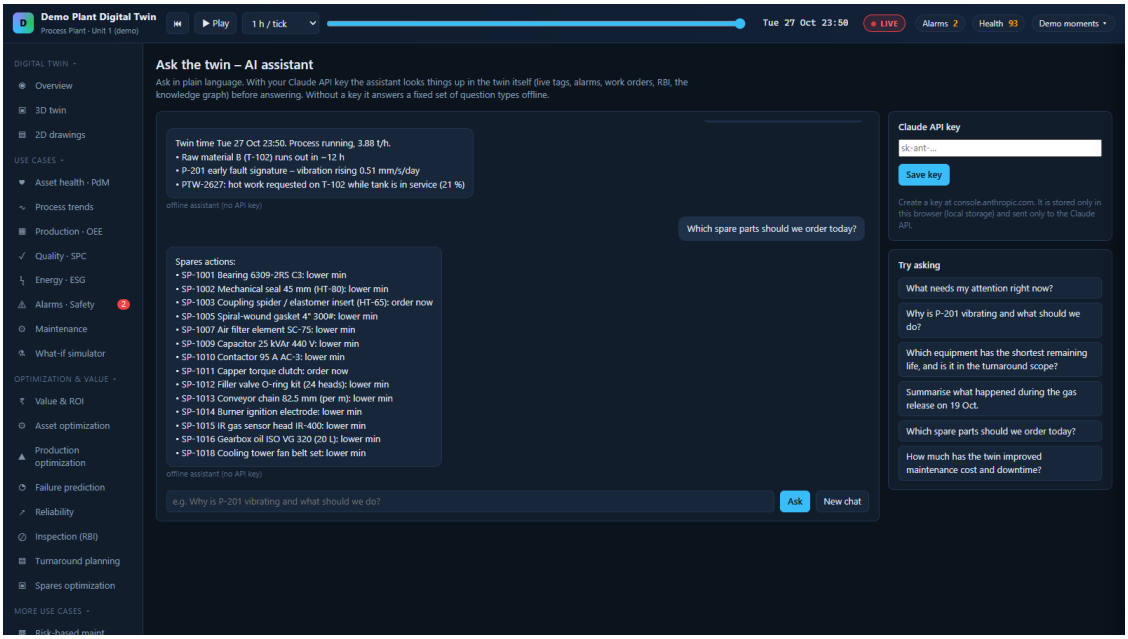
- Shows the integration path from demo data to real plant data

TEST IT YOURSELF

#	Do this	You should see
1	Click Data connectivity.	Architecture: DCS/PLC, gas & fire, CM sensors, RTLS, CMMS/LIMS/ERP → edge → MQTT → twin.
2	Search the UNS for "P-201".	Matching topics under demoplant/unit1/… (area / asset / tag) with live values.
3	Optional: run "python live_bridge.py" in D:\DigitalTwin, then press Connect.	Status turns connected and tag values start to move live.

29. Ask the twin – AI assistant (Claude)

Where: AI & data → Ask the twin (AI) **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

Ask questions in plain language. With your own Claude API key the assistant looks things up in the twin itself – live tags, alarms, work orders, RBI, spares and the knowledge graph – through 7 tools before answering. Without a key a built-in offline assistant answers a fixed set of question types.

Who uses it: Anyone: managers, operators, engineers, new joiners.

DATA REQUIRED

- Everything in the twin, reached through tools: get_plant_status, get_asset, get_tag_history, search_twin, list_records, get_business_case, get_knowledge_graph
- Your Claude API key (stored only in this browser)

AVAILABLE IN THE APP

- Chat with example questions
- Model choice (Opus 5.5 default, Sonnet 5.5, Haiku 5.5) and effort level
- Shows which twin tools were called
- Offline fallback with no key; New chat; Remove key

KEY FIGURES / IMPROVEMENT

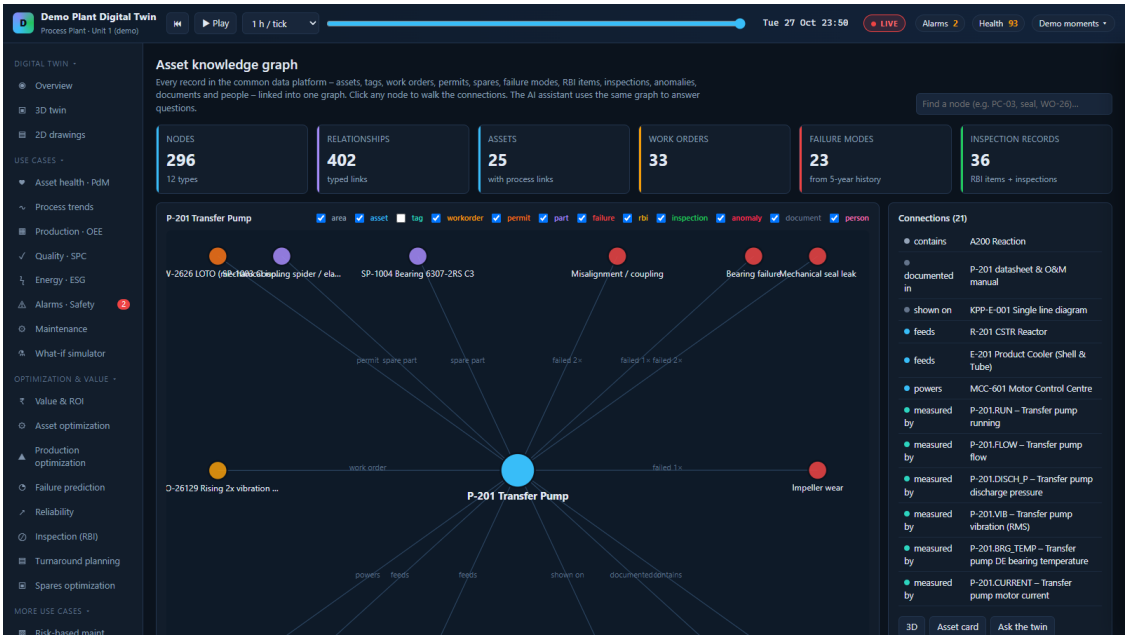
- Answers cite live twin data at the current twin time – no copy-paste between systems
- Offline answer to "What needs my attention" lists T-102 cover, P-201 fault and PTW-2627

TEST IT YOURSELF

#	Do this	You should see
1	Click Ask the twin (AI). Without a key, click "What needs my attention right now?".	Offline answer: T-102 runs out in ~12 h; P-201 vibration rising 0.51 mm/s/day; PTW-2627 hot work on in-service T-102.
2	Click "Which spare parts should we order today?".	List incl. SP-1003 coupling spider: order now; SP-1011: order now.
3	Optional (your own key, billed to you): paste the key from console.anthropic.com → Save key, ask "Why is P-201 vibrating and what should we do?".	Claude calls get_asset / get_tag_history, explains 2× running-speed peak → misalignment, laser alignment, spare status.
4	Click Remove key when finished.	Key deleted from this browser.

30. Asset knowledge graph

Where: AI & data → Knowledge graph **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

Every record in the common data platform – assets, tags, work orders, permits, spares, failure modes, RBI items, inspections, anomalies, documents and people – linked into one graph. Click any node to walk the connections. The AI assistant uses the same graph.

Who uses it: Engineers, data team, AI assistant, auditors.

DATA REQUIRED

- Asset register, tag list, CMMS, permits, parts, failure history, RBI, inspections, documents, people

AVAILABLE IN THE APP

- Interactive graph centred on a selected node
- Type filters (12 node types) and search
- Buttons: 3D, Asset card, Ask the twin

KEY FIGURES / IMPROVEMENT

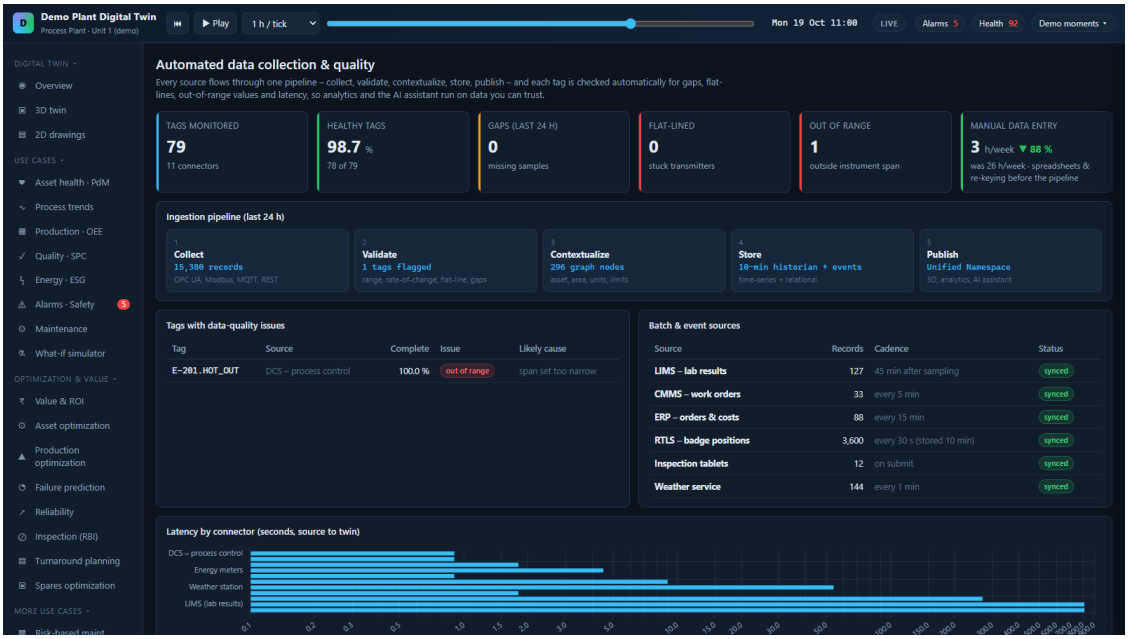
- 296 nodes, 402 typed relationships, 23 failure modes from 5-year history
- One click from an asset to its parts, failures, permits and documents

TEST IT YOURSELF

#	Do this	You should see
1	Click Knowledge graph.	P-201 Transfer Pump in the centre with area, tags, WOs, parts, failures.
2	Type "PC-03" in the search box and press Enter.	Graph re-centres on the overhead line and its links (RBI item, inspections, corrosion probe).
3	Untick "tag".	Tag nodes are hidden; structure is easier to read.

31. Automated data collection & quality

Where: AI & data → Data quality **Demo time:** During the gas release (Mon 19 Oct 11:00)



WHAT IT IS AND HOW IT IS USED

Every source flows through one pipeline – collect, validate, contextualize, store, publish – and each tag is checked automatically for gaps, flat-lines, out-of-range values and latency, so analytics and the AI run on data you can trust.

Who uses it: Data engineers, instrument technicians, analytics team.

DATA REQUIRED

- All tag streams with instrument ranges
- Connector latency
- Batch sources (LIMS, CMMS, ERP, RTLS) sync status

AVAILABLE IN THE APP

- Pipeline stages with record counts
- Per-tag checks: gaps, flat-line, out-of-range
- Latency by connector
- Batch & event source table

KEY FIGURES / IMPROVEMENT

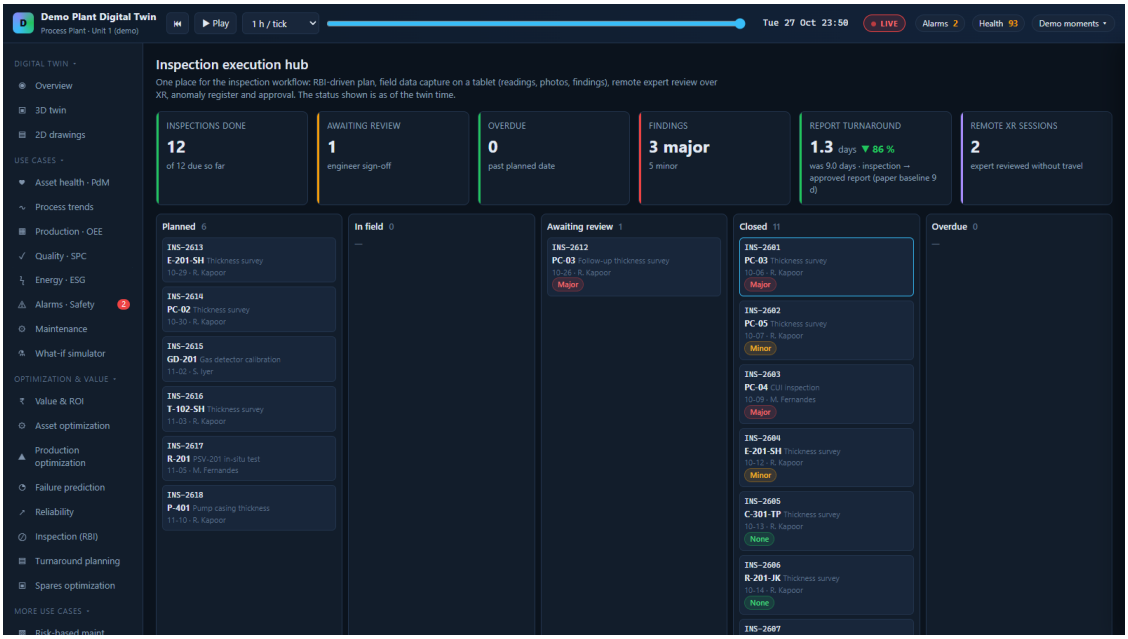
- Manual data entry 26 → 3 h/week (−88 %)
- During the release 1 of 79 tags flagged out of range – the gas detector

TEST IT YOURSELF

#	Do this	You should see
1	Move the time slider to Mon 19 Oct 11:00, open Data quality.	Healthy tags 98.7 % (78 of 79), out of range 1.
2	Scroll to the tag table.	The flagged tag and the rule it broke.
3	Press LIVE.	100 % healthy, 0 gaps, 0 flat-lined.

32. Inspection execution hub (field capture + remote XR)

Where: M&R and HSE → Inspection hub **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

One place for the inspection workflow: RBI-driven plan as a kanban, field data capture on a tablet (readings, photo, finding), remote expert review over XR with pins on the 3D model, anomaly register and approval.

Who uses it: Inspectors, inspection engineer, remote experts, integrity manager.

DATA REQUIRED

- RBI plan and inspection tasks (18)
- Field readings, photos, findings
- Anomaly register (ANM-31…35)
- XR annotation pins

AVAILABLE IN THE APP

- Kanban of inspections by status (planned → done → reviewed)
- Tablet capture form: reading, severity, note, photo, Submit for review
- Readings vs predicted thickness
- Remote XR pins shown in 3D

KEY FIGURES / IMPROVEMENT

- Report turnaround 9.0 → 1.3 days (−86 %); 2 remote XR sessions without travel
- 12 of 12 due inspections done, 3 major / 5 minor findings

TEST IT YOURSELF

#	Do this	You should see
1	Click Inspection hub.	Done 12 of 12, awaiting review 1, report turnaround 1.3 days.
2	Click a card in the kanban, enter a reading (e.g. 4.21 mm), severity Minor, a finding and optionally a photo, then Submit for review.	"Draft saved" with the time appears; the draft stays in this browser for review.
3	Click a card marked XR, then ▣ Open remote XR view in 3D.	3D opens with purple pins carrying the remote expert's comments on the equipment.

33. Corrosion monitoring system

Where: M&R and HSE → Corrosion monitoring **Demo time:** Inhibitor pump trip (Thu 22 Oct 06:00)



WHAT IT IS AND HOW IT IS USED

Online ER and LPR probes give the corrosion rate in hours instead of the years between thickness surveys. They are linked to chemical dosing and to RBI remaining life, so a dosing failure shows up as lost equipment life while it is happening.

Who uses it: Corrosion engineer, inspection engineer, chemical-treatment vendor.

DATA REQUIRED

- Corrosion probes: column overhead, CW header, E-201 shell, condensate return
- Inhibitor and biocide dosing flow
- RBI wall thickness and t-min

AVAILABLE IN THE APP

- Rate vs target tiles with 7-day average
- Overhead rate vs inhibitor dosing chart
- Cooling-water corrosion vs biocide
- Probe register linked to RBI items

KEY FIGURES / IMPROVEMENT

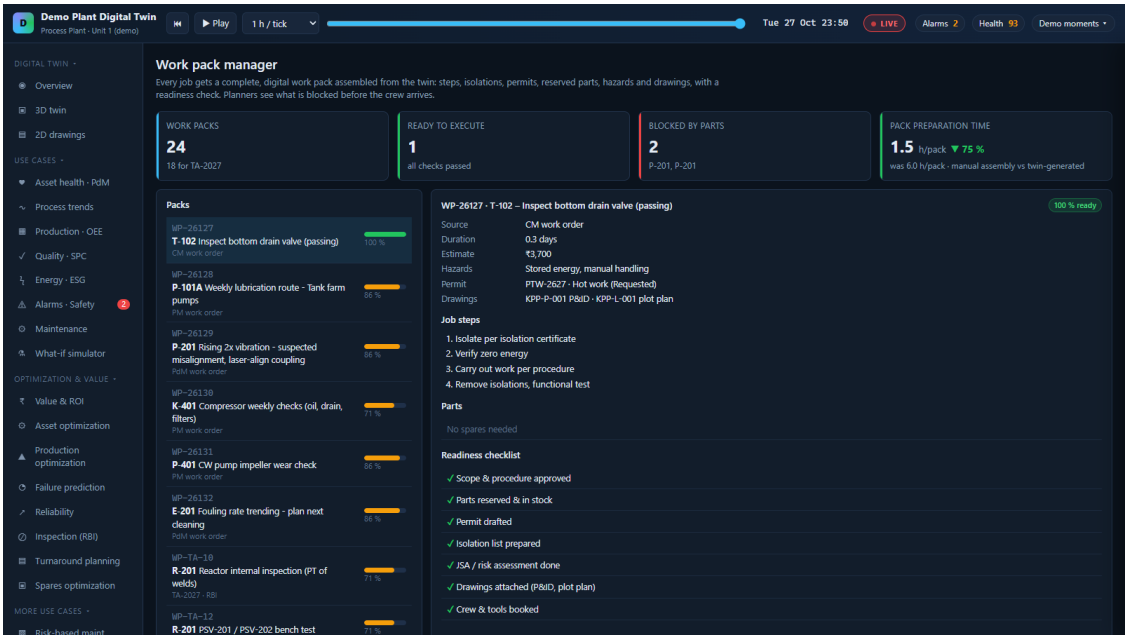
- Inhibitor trip 21–23 Oct: overhead rate 0.62 mm/y vs target 0.25 – caught within hours
- Extra wall loss quantified (µm on PC-03) and inhibitor availability tracked (92.6 %)

TEST IT YOURSELF

#	Do this	You should see
1	Demo moments ▾ → "Inhibitor pump trip".	Corrosion at Thu 22 Oct 06:00: column overhead 0.620 mm/y (red).
2	Look at the overhead chart.	Inhibitor flow drops to zero; corrosion rate climbs at the same time.
3	Press LIVE.	Rate back to ~0.20 mm/y; life consumed by the upset ~3 µm.

34. Work pack manager

Where: M&R and HSE → Work packs **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

Every job gets a complete digital work pack assembled from the twin – steps, isolations, permits, reserved parts, hazards and drawings – with a readiness check, so planners see what is blocked before the crew arrives.

Who uses it: Maintenance planner, supervisor, turnaround planners, crews.

DATA REQUIRED

- Open WOs and TA tasks
- Isolation lists, permits, parts reservations, hazards, drawings

AVAILABLE IN THE APP

- Pack list with readiness %
- Pack detail: steps, isolations, permits, parts, hazards, drawings
- Readiness checklist

KEY FIGURES / IMPROVEMENT

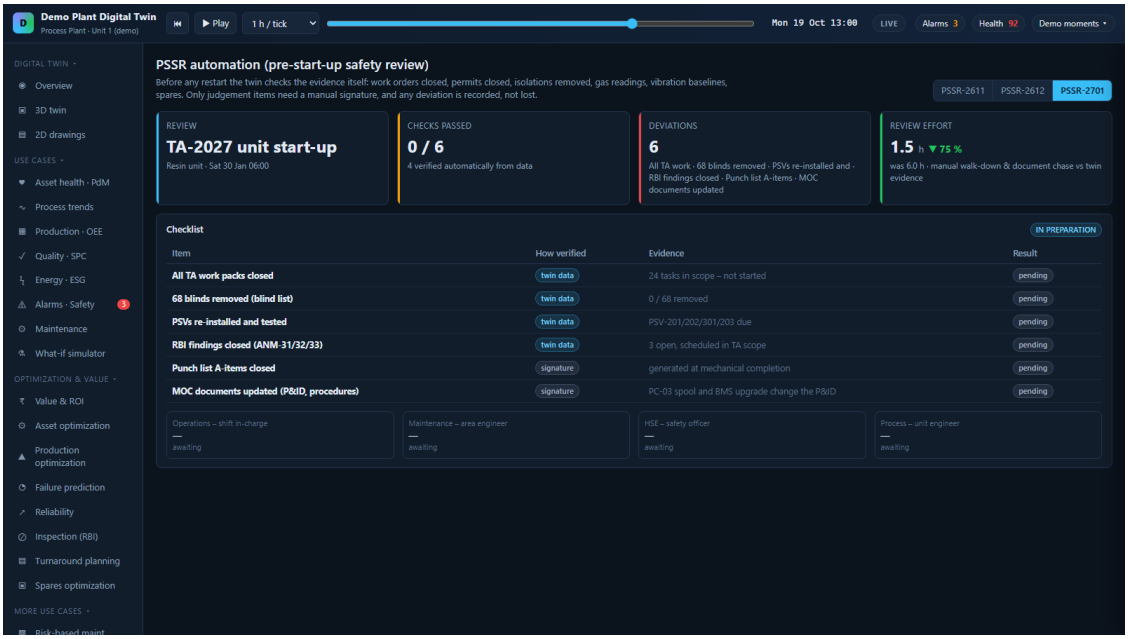
- Pack preparation 6.0 → 1.5 h per pack (−75 %)
- 24 packs (18 for TA-2027); 2 blocked by parts (P-201)

TEST IT YOURSELF

#	Do this	You should see
1	Click Work packs.	24 packs, 1 ready, 2 blocked by parts.
2	Click WP-26129 P-201 laser-align coupling.	Readiness < 100 % – coupling spider not in stock.
3	Click WP-26127 T-102 drain valve.	100 % ready with all checks passed.

35. PSSR automation (pre-start-up safety review)

Where: M&R and HSE → PSSR automation **Demo time:** PSSR before restart (Mon 19 Oct 13:00)



WHAT IT IS AND HOW IT IS USED

Before any restart the twin checks the evidence itself – work orders closed, permits closed, isolations removed, gas readings, vibration baselines, spares. Only judgement items need a signature, and any deviation is recorded, not lost.

Who uses it: Operations manager, HSE, maintenance, start-up team.

DATA REQUIRED

- WO and permit status
- Gas detector readings, vibration and temperature
- Spares stock, blind list, PSV status, punch list

AVAILABLE IN THE APP

- 3 reviews: PSSR-2611 restart after ESD, PSSR-2612 P-101A return, PSSR-2701 TA-2027 start-up
- Checklist with how verified (twin data / signature), evidence and result
- Deviations recorded with approval

KEY FIGURES / IMPROVEMENT

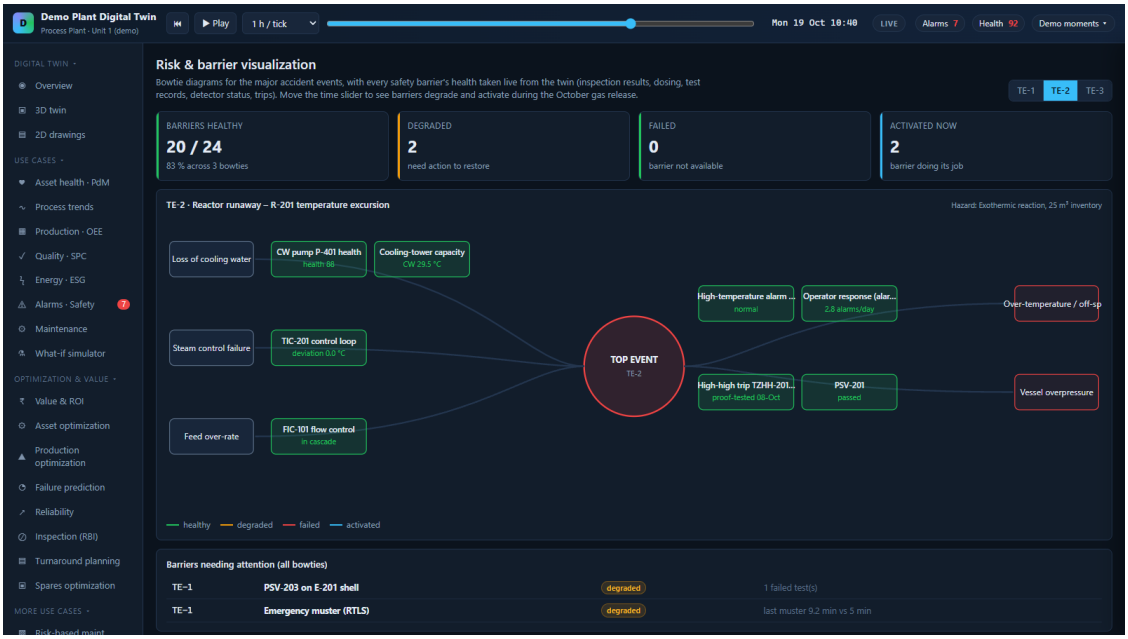
- Review effort 6.0 → 1.5 h (−75 %)
- PSSR-2611: 7/8 checks passed, 5 verified from data, 1 approved deviation

TEST IT YOURSELF

#	Do this	You should see
1	Demo moments ▾ → "PSSR before restart".	PSSR-2611 restart after ESD-1: 7/8 passed, 1 deviation.
2	Click PSSR-2612.	P-101A return to service: 5/6 passed; deviation – seal stock 1 (min 2).
3	Click PSSR-2701.	TA-2027 start-up in preparation: 0/68 blinds removed, PSVs due.

36. Risk & barrier visualization (bowtie)

Where: M&R and HSE → Risk & barriers **Demo time:** Barriers during gas release (Mon 19 Oct 10:40)



WHAT IT IS AND HOW IT IS USED

Bowtie diagrams for the major accident events with every safety barrier's health taken live from the twin – inspection results, dosing, test records, detector status, trips. Move the time slider to see barriers degrade and activate.

Who uses it: Process-safety engineer, HSE manager, operations leadership.

DATA REQUIRED

- Barrier register per bowtie
- Live sources: RBI, inhibitor dosing, proof tests, detectors, ESD status, alarm rate, muster

AVAILABLE IN THE APP

- 3 bowties: TE-1 loss of containment, TE-2 reactor runaway, TE-3
- Barrier colours healthy / degraded / failed / activated
- Barriers needing attention list

KEY FIGURES / IMPROVEMENT

- During the release: detection and ESD activated, muster degraded – visible on one diagram
- Live: 22 of 24 barriers healthy on TE-2

TEST IT YOURSELF

#	Do this	You should see
1	Demo moments ▾ → "Barriers during gas release".	TE-1 bowtie: 20/24 healthy, 2 degraded, 2 activated.
2	Click TE-2.	Reactor runaway bowtie: TZHH-201 proof-tested, PSV-201 passed.
3	Drag the slider to 18 Oct.	Activated barriers return to healthy.

37. Asset & process twin unification

Where: Operations & planning → Process twin **Demo time:** Compressed-air leak period (Sat 10 Oct 03:00)



WHAT IT IS AND HOW IT IS USED

The process model (heat and mass balance) runs every hour on the measured conditions and is compared with what the instruments read. Where model and plant disagree, an asset problem is hiding – fouling, leaks, wear.

Who uses it: Process engineer, performance engineer.

DATA REQUIRED

- Measured boundary conditions (rate, temperatures, ambient, U-value)
- Measured outputs: E-201 outlet, CW supply, column top, steam, boiler efficiency, compressor power

AVAILABLE IN THE APP

- 6 variables: plant – model deviation and fit error
- Plant vs model chart (30 days)
- Unified asset + process view

KEY FIGURES / IMPROVEMENT

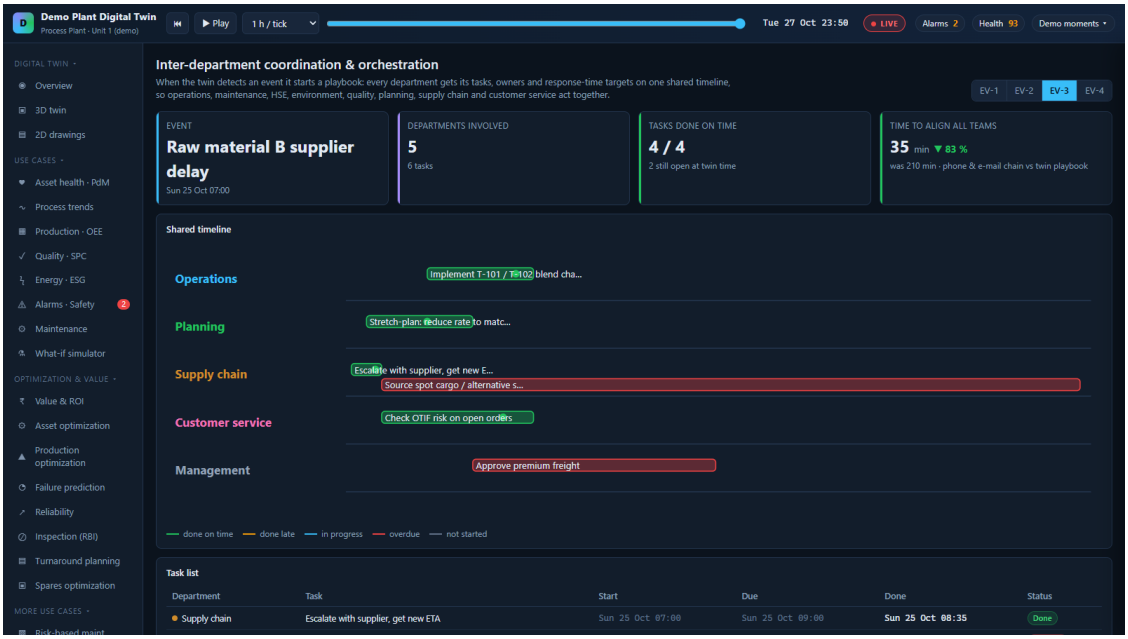
- Compressor power +10 kW above the model from 3–20 Oct = the air leak
- Model fit within ~0.5 % on temperatures – instrument faults stand out

TEST IT YOURSELF

#	Do this	You should see
1	Move the slider to Sat 10 Oct 03:00 and open Process twin.	Six deviation tiles.
2	Click "Compressor power".	Plant ~10 kW above model 3–20 Oct; agrees again after the repair.
3	Click "E-201 outlet".	Model tracks the plant closely (uses measured U-value).

38. Inter-department coordination

Where: Operations & planning → Coordination **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

When the twin detects an event it starts a playbook: every department gets its tasks, owners and response-time targets on one shared timeline, so operations, maintenance, HSE, environment, quality, planning, supply chain and customer service act together.

Who uses it: All departments; plant manager.

DATA REQUIRED

- Event detection from the twin
- Playbook templates with owners and target times
- Task completion times

AVAILABLE IN THE APP

- 4 events: EV-1 gas release, EV-2 P-101A HH vibration, EV-3 supplier delay, EV-4 export order
- Shared timeline by department
- Task list with on-time status

KEY FIGURES / IMPROVEMENT

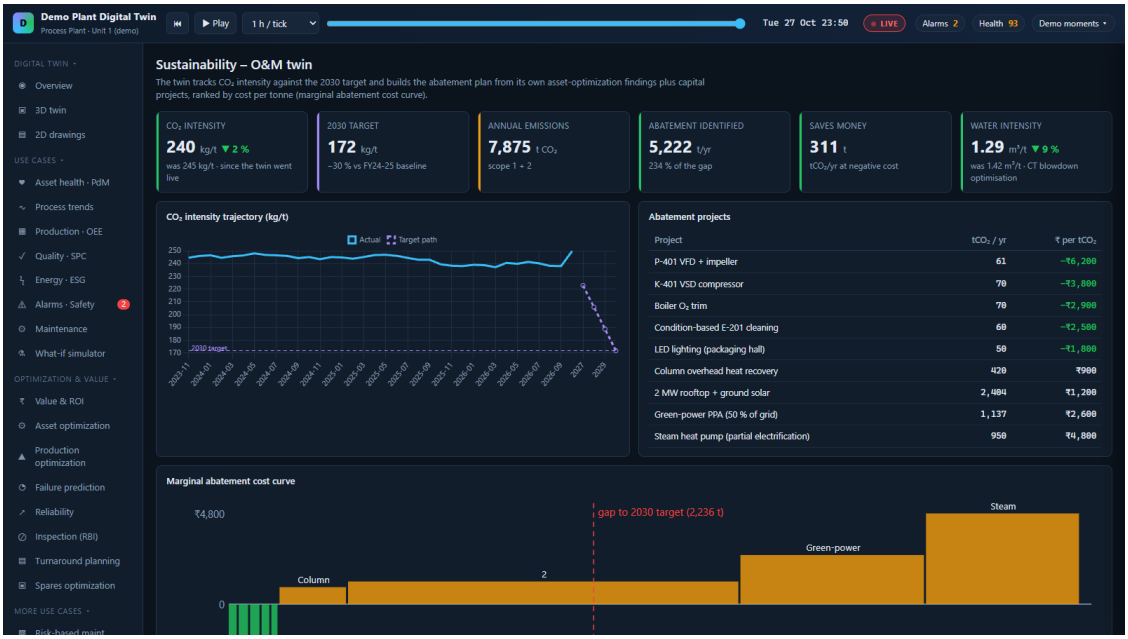
- Time to align all teams 210 → 35 min (−83 %)
- EV-1: 8 departments, 11 tasks, 11/11 on time

TEST IT YOURSELF

#	Do this	You should see
1	Click Coordination.	EV-1 gas release: 8 departments, 11 tasks, 11/11 on time.
2	Click EV-2.	P-101A vibration: change duty to P-101B, LOTO permit, re-order seal.
3	Click EV-3.	Supplier delay: escalate, stretch plan, premium freight approval.

39. Sustainability – O&M twin

Where: Operations & planning → Sustainability **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

Tracks CO_2 intensity against the 2030 target and builds the abatement plan from the twin's own asset-optimization findings plus capital projects, ranked by cost per tonne (marginal abatement cost curve).

Who uses it: Sustainability lead, plant manager, finance.

DATA REQUIRED

- Scope 1 + 2 emissions from metered energy
- Abatement options with tCO_2/yr and ₹/tCO_2

AVAILABLE IN THE APP

- Intensity trajectory to 2030
- Marginal abatement cost curve
- Project table

KEY FIGURES / IMPROVEMENT

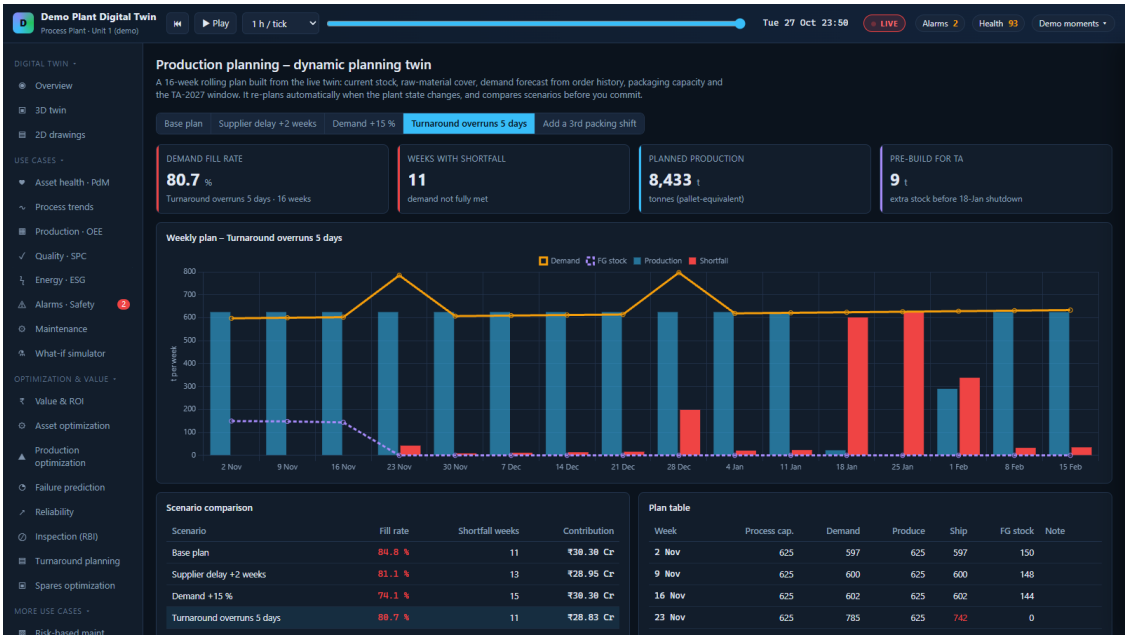
- 240 kg CO_2/t (−2 % since go-live) vs 2030 target 172 kg/t
- 5,222 tCO_2/yr identified (234 % of the gap); 311 t/yr saves money; water 1.42 → 1.29 m^3/t

TEST IT YOURSELF

#	Do this	You should see
1	Click Sustainability.	Intensity 240 kg/t, target 172 kg/t.
2	Look at the MACC.	Negative-cost projects on the left (P-401 VFD, K-401 VSD, O_2 trim).
3	Read the project table.	tCO_2/yr and ₹ per tCO_2 for each.

40. Production planning – dynamic planning twin

Where: Operations & planning → Production planning **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

A 16-week rolling plan from the live twin – current stock, raw-material cover, demand forecast from order history, packaging capacity and the TA-2027 window – that re-plans when the plant changes and compares scenarios before you commit.

Who uses it: Production planner, supply chain, sales & operations planning.

DATA REQUIRED

- Warehouse stock, order history, raw-material supply
- Process and packaging capacity
- Turnaround dates

AVAILABLE IN THE APP

- 5 scenarios: base, supplier delay, demand +15 %, TA overrun 5 days, 3rd packing shift
- Weekly plan chart and plan table
- Scenario comparison (fill rate, short weeks, contribution)

KEY FIGURES / IMPROVEMENT

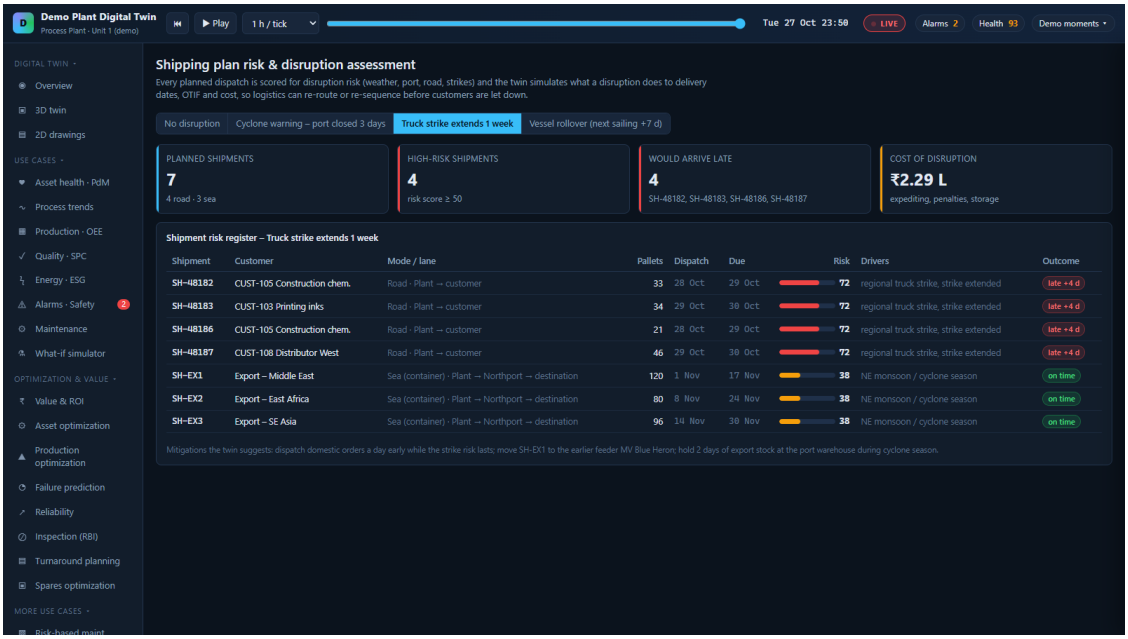
- Base 84.8 % fill with 11 short weeks – packaging is the limit
- 3rd packing shift: 88.0 %, only 3 short weeks (the TA), contribution ₹30.3 → ₹31.4 Cr

TEST IT YOURSELF

#	Do this	You should see
1	Click Production planning.	Base plan: fill 84.8 %, 11 weeks with shortfall.
2	Click "Add a 3rd packing shift".	Fill 88.0 %, 3 short weeks (TA weeks).
3	Click "Turnaround overruns 5 days".	Fill drops to 80.7 %, contribution ₹28.8 Cr.
4	Read the scenario comparison table.	All five scenarios side by side.

41. Shipping plan risk & disruption

Where: Operations & planning → Shipping risk **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

Every planned dispatch is scored for disruption risk (weather, port, road, strikes) and the twin simulates what a disruption does to delivery dates, OTIF and cost, so logistics can re-route or re-sequence before customers are let down.

Who uses it: Logistics, customer service, export desk.

DATA REQUIRED

- Shipment plan (road and sea)
- Risk drivers: season, port status, strikes
- Penalty, storage and expediting costs

AVAILABLE IN THE APP

- 4 scenarios: none, cyclone (port closed 3 d), truck strike +1 week, vessel rollover +7 d
- Risk register with score, drivers and outcome
- Cost of disruption

KEY FIGURES / IMPROVEMENT

- Cyclone: SH-EX1 export late +3 d, cost ₹3.10 L
- Truck strike: 4 road shipments late +4 d, cost ₹2.29 L

TEST IT YOURSELF

#	Do this	You should see
1	Click Shipping risk.	7 planned shipments, 1 would arrive late, cost ₹45,160.
2	Click "Cyclone warning – port closed 3 days".	High-risk 1, late 2 (SH-48186, SH-EX1), cost ₹3.10 L.
3	Click "Truck strike extends 1 week".	Late 4 road shipments, cost ₹2.29 L.

42. Production impact from terminal operations

Where: Operations & planning → Terminal impact **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

The marine terminal brings in raw material and ships product out. The twin links jetty availability to raw-material tank cover and warehouse space, so a terminal closure becomes a dated production impact – when to cut rate, by how much, and what it costs.

Who uses it: Planning, terminal operations, plant manager.

DATA REQUIRED

- T-102 level and draw rate
- Import vessel schedule (one every ~5 days)
- Warehouse stock and dispatch

AVAILABLE IN THE APP

- Sliders: import jetty closed (days), export stopped (days)
- Rate-cut day, production lost, margin at risk, raw B cover
- 14-day projection chart and mitigations

KEY FIGURES / IMPROVEMENT

- Default 4-day closure: rate cut from day 1, 230 t lost, ₹80.5 L margin at risk
- No closure: no rate cut; 8-day closure: 506 t, ₹1.77 Cr

TEST IT YOURSELF

#	Do this	You should see
1	Click Terminal impact.	Closure 4 d: rate cut day 1, 230 t lost, ₹80.50 L at risk, raw B cover 1.2 d.
2	Move "Import jetty closed" to 0.	Rate cut: none – stock and cover are enough.
3	Move it to 8.	506 t lost, ₹1.77 Cr at risk.

43. Coke drum digital twin + gen-AI cycle report

Where: Oil & gas → Coke drums (gen-AI) **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

Delayed-coker drums D-1101A/B cycle every 36 hours between filling at 495 °C and water quench. Skin thermocouples give the thermal gradient each cycle, which drives low-cycle fatigue. The gen-AI report turns the cycle data into a shift-ready summary with recommendations.

Who uses it: Coker operations, integrity engineer, shift supervisor.

DATA REQUIRED

- Drum state and skin temperatures (top / bottom) hourly
- Cycle records: quench rate, ΔT, fatigue damage (39 cycles)
- Claude API key for the AI report (optional)

AVAILABLE IN THE APP

- Drum animation with cycle step
- Skin temperatures last 72 h
- Fatigue used and life left per drum
- Cycle report: offline template or Claude-written

KEY FIGURES / IMPROVEMENT

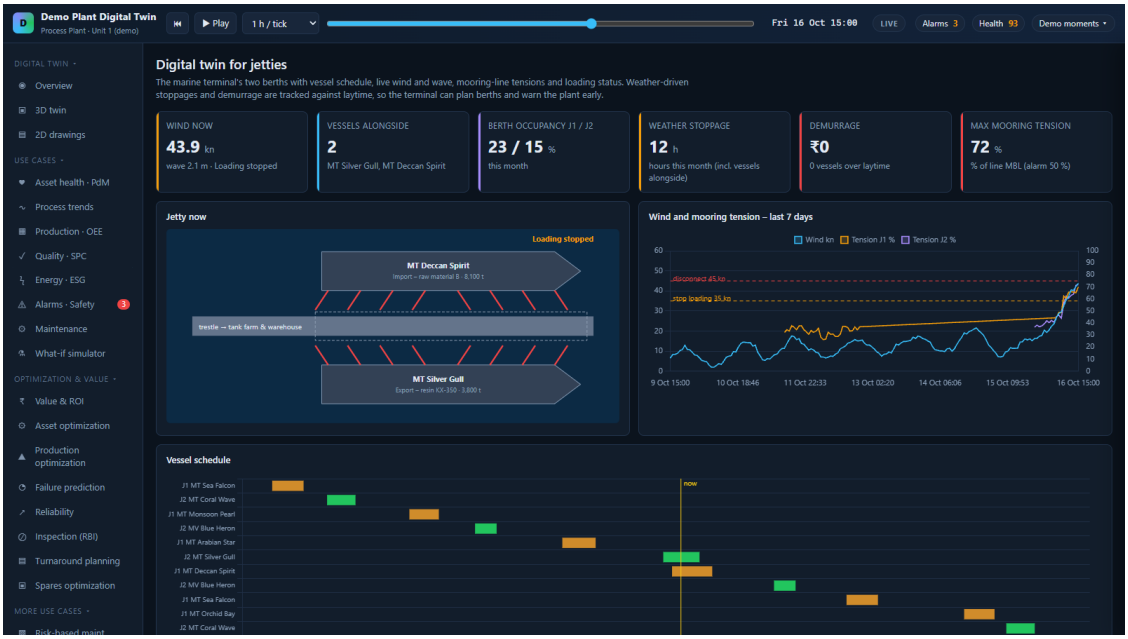
- Drum B: 8 fast-quench cycles since 10 Oct → life left 3.7 y vs drum A 59.3 y
- Fixing quench practice on B is worth decades of drum life

TEST IT YOURSELF

#	Do this	You should see
1	Click Coke drums (gen-AI).	D-1101B fatigue 45.09 %, 0.060 %/cycle, life left 3.7 y.
2	Click ✦ Generate (offline).	Report per drum: cycles, ΔT, damage and recommendation.
3	Optional with a key: Generate with Claude.	Claude writes the shift report from the same data.

44. Digital twin for jetties

Where: Oil & gas → Jetty twin **Demo time:** Jetty storm stoppage (Fri 16 Oct 15:00)



WHAT IT IS AND HOW IT IS USED

Two berths with vessel schedule, live wind and wave, mooring-line tensions and loading status. Weather stoppages and demurrage are tracked against laytime, so the terminal can plan berths and warn the plant early.

Who uses it: Terminal manager, marine operations, commercial (demurrage).

DATA REQUIRED

- Wind and wave hourly
- Mooring-line tensions per berth
- Vessel calls: ETA, berthed, departed, laytime, demurrage

AVAILABLE IN THE APP

- Jetty schematic with vessels and line tensions
- Loading permitted / stopped / disconnect arms by wind limits
- Wind and tension chart
- Vessel call table

KEY FIGURES / IMPROVEMENT

- Storm on 16 Oct: 43.9 kn, loading stopped, mooring tension 72 % MBL (alarm 50 %)
- Month: 22 h weather stoppage, ₹12.75 L demurrage (2 vessels over laytime)

TEST IT YOURSELF

#	Do this	You should see
1	Demo moments ▾ → "Jetty storm stoppage".	Wind 43.9 kn, "Loading stopped", 2 vessels alongside.
2	Hover a mooring line.	Tooltip with % MBL; red lines above 50 %.
3	Press LIVE.	Weather stoppage 22 h, demurrage ₹12.75 L.

45. Flow assurance modelling

Where: Oil & gas → Flow assurance **Demo time:** Hydrate margin squeeze (Sun 18 Oct 03:00)



WHAT IT IS AND HOW IT IS USED

A 28 km wet-gas flowline from the wellhead platform to the gas plant. The model tracks pressure and temperature along the line against the hydrate formation curve, and optimizes MEG (hydrate inhibitor) injection to hold a 3 °C margin without over-injecting.

Who uses it: Flow-assurance engineer, production operations.

DATA REQUIRED

- Arrival pressure and temperature, gas rate
- MEG injection rate
- Line profile (elevation) and hydrate curve

AVAILABLE IN THE APP

- Line profile: elevation, pressure, temperature
- Hydrate curve vs operating point (with current MEG)
- 30-day arrival vs hydrate temperature with MEG

KEY FIGURES / IMPROVEMENT

- Turndown on 18 Oct squeezed the margin to 3.7 °C before MEG was raised
- Average over-injection ~13 m³/d → ~₹34–36 Cr/yr MEG + regeneration

TEST IT YOURSELF

#	Do this	You should see
1	Demo moments ▾ → "Hydrate margin squeeze".	Margin now 3.7 °C (arrival 18.8 °C vs hydrate 15.1 °C).
2	Look at the 30-day chart.	MEG raised from ~43 to ~67 m³/d at 08:00, margin back to ~6 °C.
3	Press LIVE.	Margin 6.3 °C; MEG over-injection ~13.7 m³/d.

46. Subsurface-to-surface constraints optimization

Where: Oil & gas → Subsurface to surface **Demo time:** Live (Tue 27 Oct 23:50)



WHAT IT IS AND HOW IT IS USED

Six wells (reservoir pressure, productivity, water cut, GOR) feed one processing facility limited by oil, gas-compression and water-handling capacity. The optimizer sets each well's choke for the highest value within every surface constraint.

Who uses it: Production engineer, reservoir engineer, asset manager.

DATA REQUIRED

- Well tests: reservoir pressure, PI, water cut, GOR, choke
- Facility limits: oil 26,000 bpd, gas 20.5 MMscfd, water 9,000 bpd
- Prices: oil $72/bbl, gas $7.5/Mscf, water handling $1.8/bbl

AVAILABLE IN THE APP

- Current vs optimized oil, gas, water and value
- Oil by well chart and facility utilization
- Well register with choke now → optimal and the reason

KEY FIGURES / IMPROVEMENT

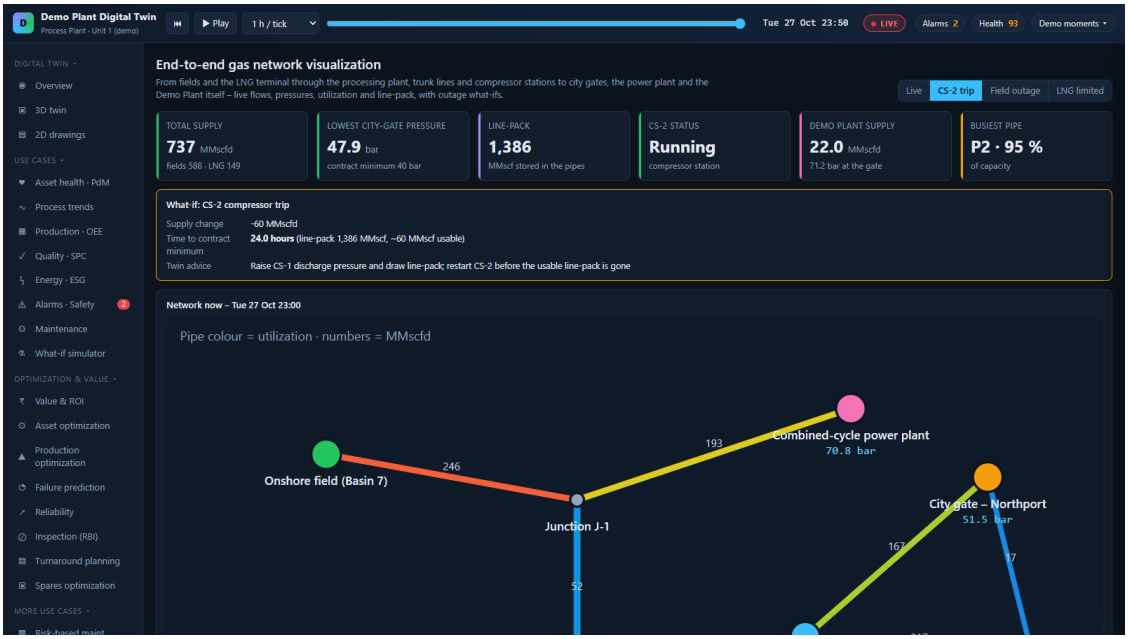
- Oil 23,635 → 25,974 bpd (+10 %), water −42 %, same wells and facility
- Uplift $64.2 M/yr; binding constraint becomes oil capacity

TEST IT YOURSELF

#	Do this	You should see
1	Click Subsurface to surface.	Oil ▲10 % to 25,974 bpd, water ▼42 %, uplift $64.2 M.
2	Read the well register.	Low water-cut wells (W-03, W-06) opened to 100 %; W-02/W-04/W-05 cut back.
3	Look at facility utilization.	Oil at ~100 % after optimization (binding).

47. End-to-end gas network visualization

Where: Oil & gas → Gas network **Demo time:** Gas network CS-2 trip (Wed 14 Oct 09:00)



WHAT IT IS AND HOW IT IS USED

From fields and the LNG terminal through processing, trunk lines and compressor stations to city gates, the power plant and the Demo Plant itself – live flows, pressures, utilization and line-pack, with outage what-ifs.

Who uses it: Gas network control centre, commercial, Demo Plant energy manager.

DATA REQUIRED

- Supplies (2 fields, LNG), demands (3 city gates, industry, power plant)
- Node pressures, compressor status, line-pack (hourly)
- Pipe capacities

AVAILABLE IN THE APP

- Network schematic with flows and pressures
- What-ifs: CS-2 trip, field outage, LNG limited
- Time to contract minimum from usable line-pack, twin advice

KEY FIGURES / IMPROVEMENT

- CS-2 trip on 14 Oct: lowest city-gate 33.1 bar vs contract minimum 40 bar
- What-if LNG limited (−74 MMscfd): ~19.5 h before the contract minimum

TEST IT YOURSELF

#	Do this	You should see
1	Demo moments ▾ → "Gas network CS-2 trip".	CS-2 Tripped; lowest city-gate 33.1 bar (min 40).
2	Press LIVE, then click "CS-2 trip".	What-if: −60 MMscfd, 24 h to contract minimum, advice: raise CS-1, draw line-pack.
3	Click "LNG limited".	−74 MMscfd, ~19.5 h; balance with Basin 7 swing gas.