

ICHNOS

MANUFACTURING & INDUSTRIAL OPERATIONS

Know which machines are consuming capacity, energy or resilience before the line becomes the problem.

Ichnos turns existing machine and process telemetry into a continuous evidence picture of individual condition, efficiency, operational relationships, hidden compensation and post-maintenance recovery.

It works with the data your machines already produce through PLC, SCADA, historian or Industry 4.0 infrastructure, rather than requiring another sensor layer.



CONDITION

What is changing relative to this machine's own supported behaviour

EFFICIENCY

Whether more effort, energy or time is being required for the same useful output

RESILIENCE

Whether another machine, utility or buffer is compensating

RECOVERY

Whether maintenance actually restored the behaviour

Are the machines still delivering the required output efficiently, and where is deterioration, inefficiency or hidden compensation beginning to consume that position?

Industrial equipment does not need to stop producing before something becomes operationally important. A machine can continue meeting its target while consuming more current or energy, running hotter, taking longer to complete the same cycle, producing less response for the same input, operating differently from its own established behaviour, or forcing another machine, utility or buffer to compensate.

Production dashboards show output. PLC and SCADA alarms show configured thresholds. Maintenance systems show jobs. Ichnos connects those views by continuously assessing what is changing, whether the change is supported, how the machine is responding to its inputs and whether the wider operation is compensating.

THE REQUIREMENT YOU DEFINE

Meet the production plan at the required rate and quality while retaining enough efficiency, buffer and spare capacity to absorb equipment deterioration or loss.

WHAT YOU GAIN

01

Machine-specific condition

Assess each compressor, motor, drive, pump, oven, line or production cell against its own supported behaviour, rather than assuming identical machines behave identically.

02

Effort versus useful output

See when power, current, pressure, speed, heat, cycle time or another input increases without a proportional useful response.

03

Relationship change

Establish supported operational relationships and identify when they stop behaving as they previously did.

04

Bottleneck & compensation

See when another machine, utility or buffer is absorbing the lost efficiency or capacity.

05

Maintenance effectiveness

Determine whether the affected behaviour recovered, remained displaced, shifted elsewhere or continued to deteriorate.

SUPPORTED RELATIONSHIPS

motor current → output · flow → pressure response · speed → temperature response · input effort → useful work

HOW THE EVIDENCE IS BUILT

1

Understand each asset

Establish supported individual behaviour.

2

Understand how it operates

Map operating modes, context, engineering semantics and machine relationships.

3

Follow change through time

Separate transient movement from accumulating, persistent, unstable or recovering behaviour.

4

Connect it to the operation

Show the effect on efficiency, capacity, resilience and maintenance decisions.

A live evidence map of machines, conditions, relationships and operational consequences

Ichnos does not reduce the machine to one anomaly score. It preserves the evidence chain from the individual measurement, through the subsystem and machine, into the relationships between signals and assets, and finally into the operational requirement you need to maintain.

WHAT YOU CAN SEE

CURRENT CONDITION

Near its reference, displaced, developing, worsening, unstable or recovering.

EFFICIENCY

Whether the machine is requiring more effort, energy, pressure, current, time or temperature for the same useful response.

WHY IT CHANGED

Whether operating mode, load, demand, environment or another qualified context explains the movement.

RELATIONSHIPS

Whether established relationships between inputs, effort, response and useful output are holding, weakening, breaking or recovering.

WHERE IT IS HAPPENING

The measurement family, subsystem or component carrying the change.

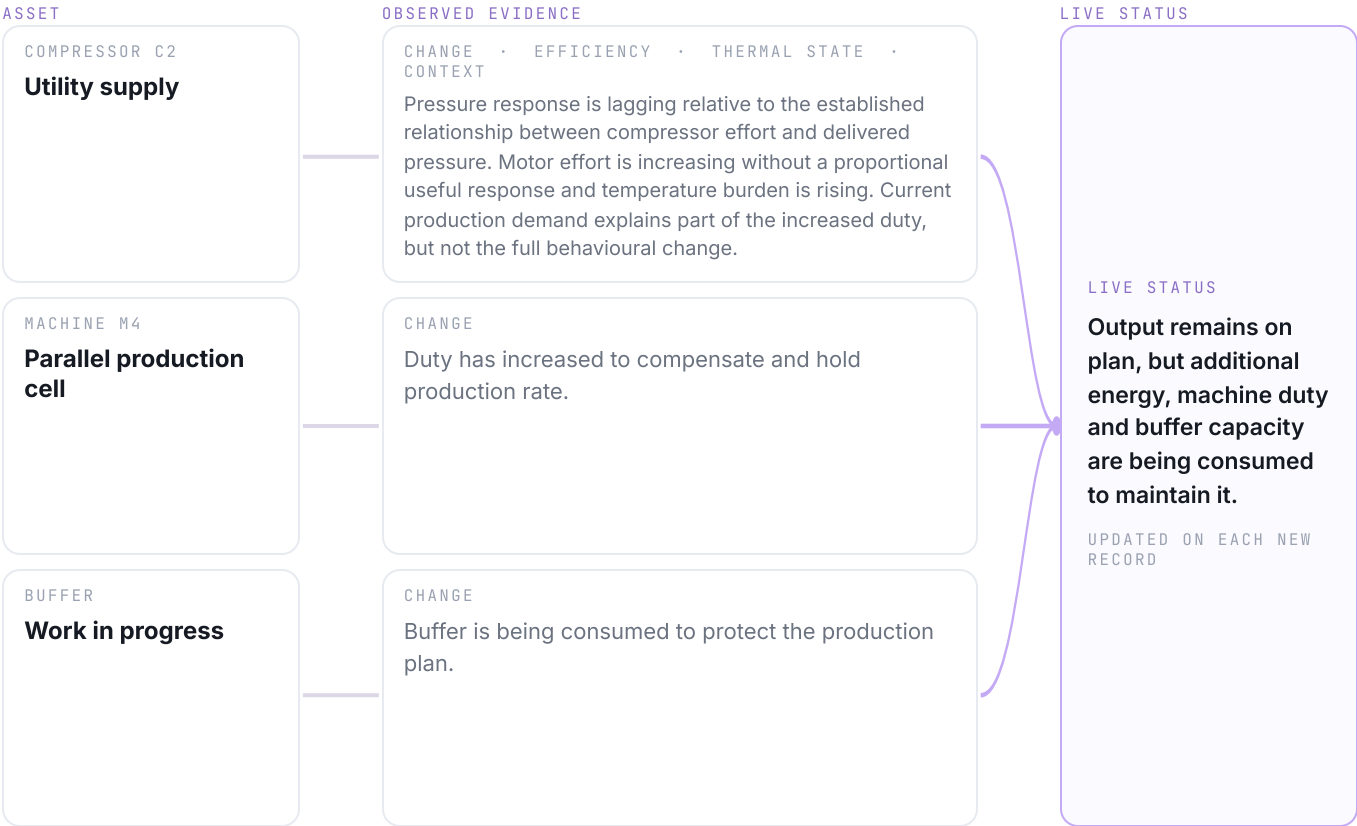
DATA / SENSOR CONFIDENCE

Whether the evidence looks like a genuine process change, a measurement concern or is insufficiently supported.

WHAT HAPPENED NEXT

Persistence, progression, instability, recovery, recurrence and response following maintenance.

ILLUSTRATIVE LIVE THREAD



A visible change does not automatically become another alert. Ichnos retains the evidence and governs attention according to support, progression, context, semantic meaning and episode history.

Illustrative production thread: output is maintained by hidden inefficiency and compensation

REQUIREMENT · WHAT MUST BE MAINTAINED

Meet the production plan at the required rate and quality while maintaining acceptable energy consumption, cycle performance and enough spare capacity to absorb one equipment loss.

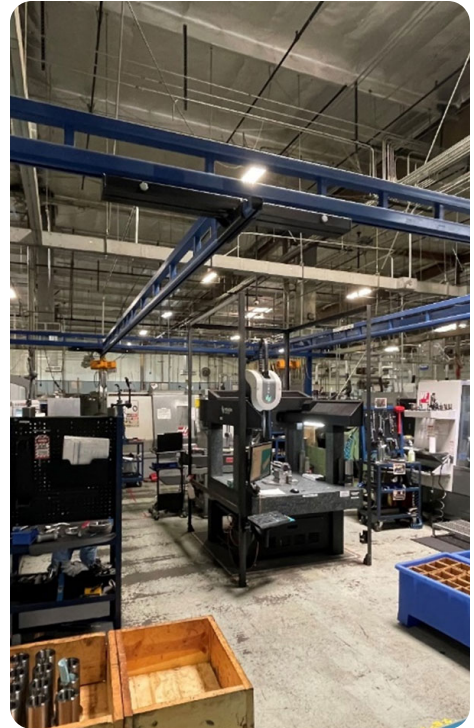
EVIDENCE · WHAT IS HAPPENING NOW

The line remains on target because a second machine and the production buffer are compensating. The primary machine is still operating, but motor effort has increased, useful pressure response has weakened, cycle time is rising, thermal burden is increasing, the parallel machine is operating harder and reserve capacity is being consumed.

Individually, several measurements may still remain inside traditional alarm limits.

DECISION · WHAT CHANGES OPERATIONALLY

Intervene during the next planned stop, protect remaining reserve capacity and verify whether machine efficiency, pressure response, cycle time and thermal behaviour return to their supported state.



The concern comes from how the machine has changed relative to itself and how its normal operational relationships are changing together.

ENGINEERING CONTEXT

MACHINE'S OWN REFERENCE

What this individual asset normally does.

MANUFACTURER SPECIFICATION

Rated, recommended or maximum operating envelope.

COMPARABLE FLEET

How equivalent machines are behaving.

Customer or manufacturer engineering information can be shown alongside the machine's own evidence. It provides operator context but does not overwrite the machine's own frozen Ichnos reference or automatically change its score.

HOW THE OUTCOME IS FORMED

01

Physical evidence

What changed and in which direction.

02

Operational relationships

Whether effort, input, response and output are still behaving together normally.

03

Operating explanation

Whether mode, load, weather, recipe, shift or demand explains the movement.

04

Evidence journey

Whether the change is transient, accumulating, persistent, unstable or recovering.

05

Service requirement

The output, rate, quality, capacity and reserve that must be maintained.

06

Verified response

Whether intervention actually restored the behaviour.

From machine change to operational and commercial consequence

Ichnos measures supported physical and behavioural change and connects it to the production or service requirement you define. You can then add your own output values, energy tariffs, cycle costs, downtime rates, labour costs, quality and scrap exposure, late-delivery costs, service credits, contractual deductions and maintenance costs. Ichnos combines supported evidence with those values without inventing the price or claiming that an asset event automatically caused a commercial consequence.

CURRENT EVIDENCE

Production remains on target, but the primary machine is requiring more effort for the same useful response. A second machine and the line buffer are compensating.

DECISION SUPPORTED

Protect the remaining production margin and investigate the affected machine during the next planned intervention.

THEN VERIFY WHETHER

Efficiency recovered; the relationship between effort and output returned; temperature and cycle time normalised; compensating equipment returned to normal duty.

WHAT CAN BE MEASURED

Throughput

Whether the production requirement remains genuinely supported.

Machine efficiency

Whether each unit of useful output is requiring more energy, current, pressure, time or thermal burden.

Hidden compensation

Which machine, utility or buffer is carrying the burden.

Capacity & resilience

How much genuine reserve remains.

Repair effectiveness

Whether the machine actually recovered or the problem merely moved.

ILLUSTRATIVE PRODUCTION EXPOSURE

YOUR OPERATING AND COST FACTORS

Output at risk	40 units/hour
Contribution per unit	£12
Expected disruption	8 hours
Reactive labour	6 hours × £55

Add customer-specific energy, scrap, overtime, premium freight, restart and contractual exposure.

CALCULATION

$$(40 \times £12 \times 8) + (6 \times £55)$$

£4,170 illustrative production and labour exposure

CONTRACTUAL CUSTOMER EXPOSURE

Add your own:

line-stop charges · late-delivery credits · scrap
premium freight · restart · overtime · lost margin

There is no universal public SLA rate.

SAFETY & ENVIRONMENT BOUNDARY

Where equipment failure contributes to an offence, health-and-safety fines and Environment Agency penalties can be unlimited.

This is not an automatic consequence of ordinary downtime.

UK regulatory boundary. Sources: HSE enforcement guidance; Environment Agency civil-sanctions policy. Contractual line-stop and delivery charges remain customer-specific.

What Ichnos adds to the machine data you already collect

CURRENT LAYER

WHAT IT ANSWERS

PLC / SCADA alarms	Has a configured value or rule crossed a threshold?
Production dashboards / OEE	Are rate, yield and availability on target?
Historian / Industry 4.0 platform	What data are machines producing over time?
CMMS / asset management	What work has been performed?
Predictive-maintenance models	Can historical examples be used to estimate known failure patterns?
Ichnos	Has this individual machine changed from itself, has its efficiency changed, are its established operational relationships still holding, can context explain the change, and did intervention restore it?

THE DIFFERENCE IN PRACTICE

A CONVENTIONAL ALARM MAY SAY

Motor temperature exceeded 80°C.

ICHNOS IS DESIGNED TO ANSWER A DIFFERENT QUESTION

This machine normally operates between its own supported behavioural range. Temperature has moved materially, motor effort has increased, the expected effort-to-output response has weakened and the change has persisted under operating conditions that do not fully explain it.

The manufacturer operating limit may still be displayed alongside this evidence for context.

EVIDENCE BEHIND THE CAPABILITY

COMPRESSOR EVIDENCE

All four published MetroPT events were preceded by progressive-adverse journeys, 35.5–159 hours ahead.

CLAIM BOUNDARY

Published benchmark; not a live manufacturing deployment.

ENGINE SEVERITY TRANSFER

Diesel-engine testing preserved an ordered healthy-to-fault severity pattern.

CLAIM BOUNDARY

Benchmark structure; not a live production-line deployment.

SHARED-PATH VERIFICATION

CMASS execution parity was verified across 19,631 rows.

CLAIM BOUNDARY

Simulated rotating machinery; mathematical verification.

CURRENT EVIDENCE BOUNDARY

Operating modes, recipes, control sequences, engineering relationships and consequence factors must be supported by the customer data and setup contract. Ichnos does not invent named faults or claim causal relationships where the supplied evidence does not support them.

Start with one machine type, constrained production cell or utility train

Where machine telemetry is already being collected through PLC, SCADA, historian or Industry 4.0 infrastructure, Ichnos can begin from that existing data. A first proof can be performed retrospectively without changing the machine control system.

01 DEFINE

Select the machine type or operational thread.
Confirm machine identity, telemetry available, operating modes, engineering meaning and adverse direction, production requirement and known maintenance or event history.

02 REPLAY

Run historical telemetry through Ichnos with failure, maintenance and outcome records withheld from reference formation. Establish what the system can support from the data alone.

03 REVIEW

Assess which machines changed, whether efficiency changed before output fell, whether expected relationships weakened, whether operating context explained the movement, whether an adjacent machine or buffer compensated, how early meaningful evidence developed and what happened after maintenance.

04 SCALE

Where the evidence is useful, deploy the same architecture across additional machines while maintaining a separate individual reference for every asset.

The same model of machine can be compared operationally across the fleet, while Ichnos still respects how each individual installation actually behaves.

Particularly relevant to manufacturers with connected machines deployed across multiple customer sites.

WHAT YOU PROVIDE

- Machine telemetry and stable asset identity
- Operating modes, recipes, duty/load and environmental context
- Manufacturer engineering specifications where useful
- Maintenance, failure and intervention timestamps
- Output, energy, quality and downtime factors
- Known machine/process dependencies
- Production/service requirements

WHAT THE PROOF SHOULD ANSWER

- Did Ichnos identify meaningful machine-specific change before the existing operational consequence?
- Did it identify inefficiency before outright failure?
- Could it distinguish normal operating context from asset-specific deterioration?
- Did established machine relationships change?
- Was another machine or buffer compensating?
- Did maintenance restore the behaviour?
- Could the supported evidence improve a real maintenance, capacity or production decision?

ICHNOS MEANS "TRACE"

Follow the evidence from machine behaviour, through efficiency and relationships, to operational consequence and verified recovery.

PATRICK SONGORE · FOUNDER

patrick@gangoai.tech

BRENDON · ASSOCIATE

brendon@gangoai.tech

gangoai.tech