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Erasing boundaries
Effacer les frontières

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The process safety execution gap

Bridging the gap between safety intent and execution

Introduction

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Agenda

The Uncomfortable Truth

The Anatomy of the Risk

Making the Invisible Visible

Q&A

The Uncomfortable Truth

A decade of investment. Frameworks are mature. And yet.

49% of respondents see a disconnect between boardroom strategy and frontline reality

Sphera's 2025 Process Safety Report: A Decade of Insights

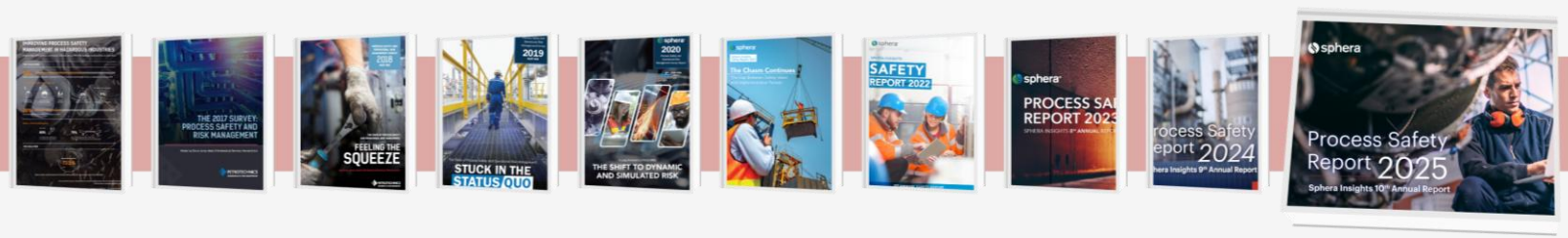
Progress, Pressures and the Path to Resilience

300
Respondents

6
Countries

7+
Industries

2016



2025

Investment and focus have increased, but the outcomes haven't followed

27%

"Very confident" in MAH risk awareness — lowest in 10 years (down from 35%)

49%

Say leadership policy does not align with frontline reality

54%

Report increased risk from workforce shortages — rising year on year

<100%

Safety-critical maintenance completion — the gap is chronic and normalized

Despite mature process safety frameworks, many organizations continue to experience serious risk at the frontline — not because policies are missing, but because execution breaks down during work.

What thirty years of incident investigations tell us

Same Mechanism. Every Time.

BP Texas City
2005 — Refinery explosion, 15 fatalities

DuPont La Porte
2014 — Toxic release, 4 fatalities

Chevron Richmond
2012 — Refinery fire, 15,000 hospitalised

Space Shuttle Challenger
1986 — O-ring normalization

Space Shuttle Columbia
2003 — Foam strike normalization

- **CSB analysis of 68 major incidents:** Normalization of deviance — a significant contributing factor alongside safeguard degradation, procedural deviation, and abnormal work conditions.
- **Baker Panel after Texas City:** The passing of time without a process accident is not necessarily an indication that all is well — it may contribute to a dangerous and growing sense of complacency.
- **CSB finding at Texas City:** The deviations were not actions committed by an incompetent crew — they were actions operators regularly took as part of established work practice.
- **DuPont La Porte:** Operators had normalized the alarms through weeks of routine troubleshooting — they no longer perceived them as signifying serious hazard.

The Anatomy of the Risk

How conditions accumulate at the frontline. Why nobody sees it. Why it keeps happening

How the risk builds: A story from a refinery

The fire main

Tested regularly. Records complete. Checklist signed off. **But tested at 80% of rated capacity because it leaks.**

> Noted and Fix the leak when the opportunity came.

The opportunity never came

> People who made that decision moved on. The 80% test became the standard.
> Memory of why it changed disappeared completely.
> Nobody stopped testing — they just stopped testing in a way that could reveal the problem.

The same mechanism

> **Permits:** compliance recorded, convergence invisible
> **LOTO:** local workaround repeated until it becomes the procedure
> **Safety-critical maintenance:** 92%, 88%, 83% becomes normal and Bowties still assumes full protection
> **STO plans:** built on assumptions but not always verified against current deviations and MoCs
> **Shift handovers:** task transferred, plant state context left behind

Where the gaps show up during real work execution

Missed Isolations

- LOTO applied against a procedure that doesn't reflect current equipment state.
- MoC changes not updated in the P&ID
- The wrong point is isolated

Unclear Handovers

- Shift change transfers task status but not plant state context.
- The incoming operator doesn't know a temporary bypass was put in place two hours ago.
- The full picture is in the head of the supervisor who just went home.

Simultaneous Operations

- Two permitted jobs active in adjacent units with overlapping hazard zones.
- Neither permit issuer has visibility into the other's work scope.
- STO planning built on a static snapshot, not a live picture.

Safety Critical Maintenance gaps

- The Safety critical maintenance gap is chronic, normalized, and invisible to the risk picture.
- The HazOp and Bowtie assumes full protection.
- The protection layer on paper is not the one in the field.

Complexity multipliers: When the environment makes the risk harder to see

Workforce Turnover & Knowledge Loss

- 54% cite increased risk from workforce shortages.
- Engineers who held the mental map of plant state are retiring.
- Tacit knowledge that connected the dots is not being replaced.
- Newer workers follow the written procedure but don't know the context

System Transitions ECC6 → S/4HANA

- Migrations create dangerous interim gaps where the old system is gone, the new one is not yet trusted, and whatever operational visibility existed has been temporarily broken.
- Risk builds fastest during transition.

M&A Integration

- Acquired sites bring their own normalized deviations, their own drift history
- Bu they're now operating under your license, with your name attached to the consequences.
- Due diligence rarely surfaces what has been quietly normalized over years.

Paper Permits & Disparate Systems

- Permits are on paper, isolation registers in spreadsheets, MoC records separate, and maintenance in yet another platform
- The coordination failure is the designed outcome of an architecture never built to show convergence.

Why nobody sees the accumulation: the organizational blind spot

Operations

Activity
Work orders, permits issued, shift logs completed

Technical Safety

Hazard Studies
PHAs, risk registers, bowties — last reviewed at the last scheduled interval

Maintenance

Equipment Status
Open work orders, inspection records, deferred items on a tracker

HSE

Actions & Incidents
Corrective action trackers, near-miss reports, audit findings, Lessons learned

NOBODY SEES HOW THESE CONDITIONS ARE STACKING TOGETHER — IN REAL TIME, IN A SPECIFIC UNIT, RIGHT NOW

Why scale turns a site problem into an enterprise problem

Every organizational force that drives decentralization, autonomy, and speed also drives fragmentation.

And fragmentation can make the risk invisible at scale

- **P&L in the Subsidiaries:** Subsidiaries can resist “change” in the form of standardization.
- “**We do it differently here**”: Every site has contextual reasons for local variation.
- **The concrete middle:** Middle management is where standardization reliably stalls, rational resistance from people whose roles are threatened by change.
- **Fragmented digital transformation:** System transitions, M&A integration, platform consolidation — each creates dangerous interim visibility gaps
- **M&A as hidden risk importer:** Acquired sites bring their drift history and normalized deviations — now under your license.

Making the Invisible Visible

The fix is not necessarily more policy and more training. It is the ability to see the cumulative risk while there's still time to prevent the consequences.

Reframing the solution: The right diagnosis leads to the right fix

Traditional response

> Update procedures
> Retrain workforce
> Additional controls
> Close corrective actions

Necessary, but insufficient
They address symptoms, not structural cause

What's really happening

Multi-dimensional convergence that no single system was ever designed to show

> Impacts to detection systems, long term isolations, deviations, MoCs, deferred safety-critical maintenance, and high-risk activities simultaneously.

What capability is needed

> The ability to detect drift from baseline hazard assumptions across multiple conditions simultaneously to intervene before the holes line up.

> And enable proactive decision-making to mitigate and reduce risk

Every organization that suffered a major event likely had the data that could have prevented it or further minimized its impact. What they lacked was a system to show what it meant, in real time, before the holes lined up.

Technology helps only when it connects fragmented risk signals

Adoption is rising but value comes from synthesis

42%
Using or planning AI

1 in 3
Lack in-house capability

64%
Say technology is already helping

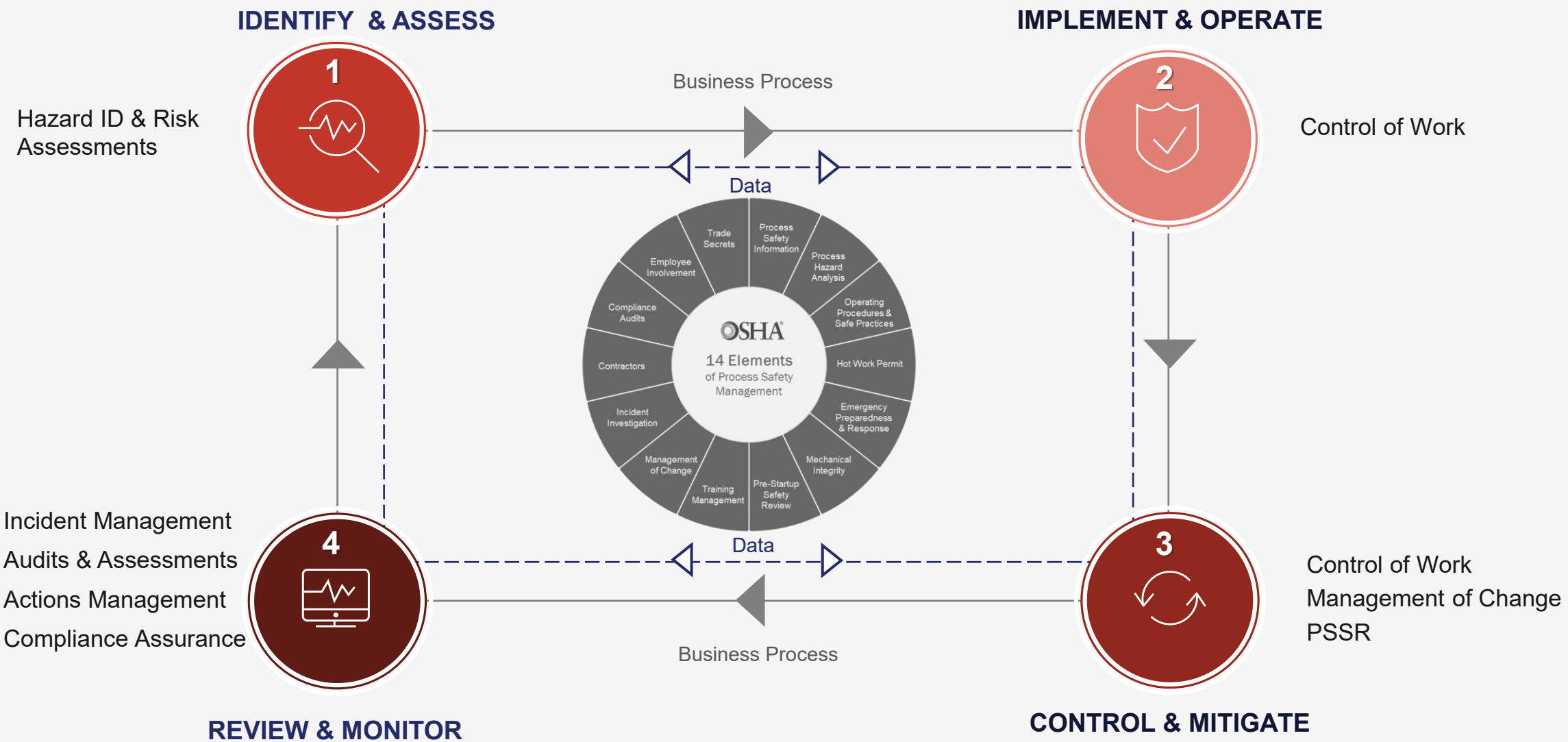
Where it genuinely changes the equation

- Connects fragmented operational data
- Detects drift early
- Reveals cross-system risk patterns

Where it makes the problem worse

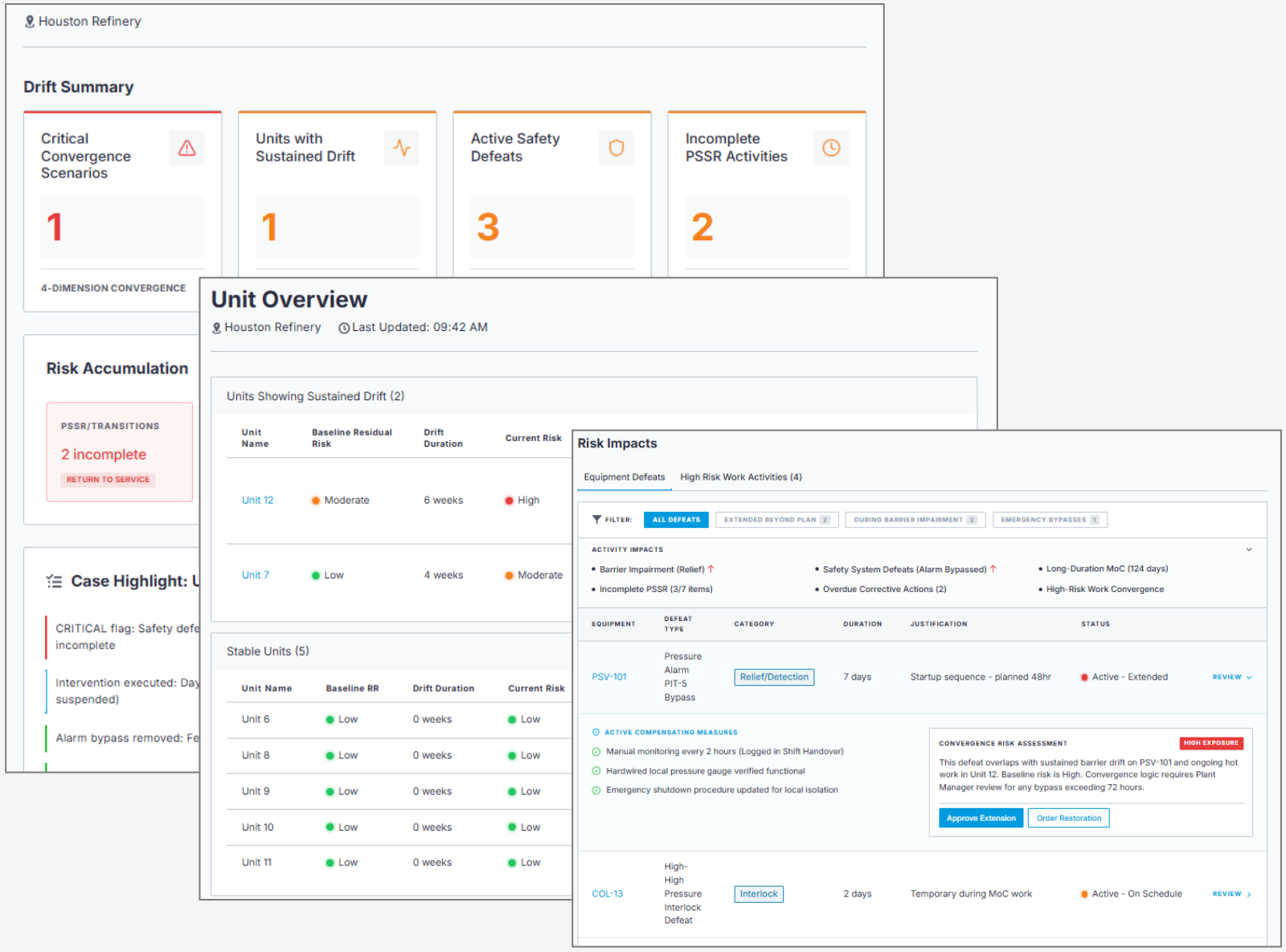
- Adds dashboards without synthesis
- Creates alerts without response readiness
- Replaces judgment in high-consequence decisions

The Pillars of Integrated Process Safety Management



Layering AI on top to make the invisible, visible

1. **Detect Drift from Baseline Assumptions**
2. **Surface Multi-Dimensional Convergence**
3. **Route Actionable Insight to the Right People**



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The leadership imperative: Owning the visibility problem, not just endorsing safety

Organizational execution	*Operational execution*
Connect the systems	**Track the cumulative risk, not just the items**
Preserve the memory of decisions	**Measure drift, not just incidents**
Capture knowledge before it retires	**Surface the picture at the point of work**
Close the leadership accountability loop	**Make simultaneous operations visible**

49% of organizations report a disconnect between boardroom strategy and frontline reality, a structural accountability gap, not a communication problem.

Q&A