

When Operational Knowledge Becomes a Single Point of Failure

CASE STUDY

A customer story for leaders in high-consequence industrial operations about turning decades of retiring operator judgment into governed, field-ready execution for new frontline teams.



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The situation

A leading energy producer faced a familiar but urgent problem: some of its most experienced field operators were approaching retirement, while newer operators were being asked to work in environments where the written procedures did not always cover the real operational decisions that needed to be made.

The risk was not simply that experienced people would leave. It was that decades of practical judgment would leave with them.

These operators knew how to spot the early signs of a gas leak before the situation escalated. They knew how to distinguish routine equipment vibration from a developing failure. They knew how a flooding event could create multiple hazards at once—and when a standard response needed immediate escalation.

Most of that judgment had been learned in the field, over years of observing conditions that no classroom exercise or policy manual could fully anticipate.

Newer operators had training. They had SOPs. They had access to formal documentation.

What they did not yet have was the pattern recognition that comes from having seen difficult conditions unfold.

For the operation, the effects were compounding: slower ramp-up, repeated questions for the same senior experts, uneven interpretation of procedures, and repeating incidents that exposed a gap between what training people had completed and what they could actually do under pressure.

This is a challenge for high-consequence industrial operations:

When a critical decision depends on one veteran's memory, the organization has a readiness risk. Addressing this threat is imperative in energy, process manufacturing, utilities, and other environments where safety, uptime, compliance, and operational continuity depend on people making sound decisions across shifts, sites, and contractor populations.



02 The issue behind the issue

Industrial operations rarely stay on the standard path.

Written procedures are essential. They define the standard path, but industrial operations rarely stay on the standard path.

Experienced operators hold the unwritten knowledge that matters when conditions become ambiguous: the combination of signals that warrants a second look, the exception that changes the response, the seemingly small detail that can precede a larger failure, or the point at which a supervisor needs to be involved.

That is the tacit-knowledge gap. SOPs can tell an operator what normally happens. They cannot always transfer the judgment needed when the situation in front of that operator does not look normal.

The gap becomes visible during shift handovers, abnormal operating conditions, permit-to-work decisions, simultaneous operations, emergency response, equipment maintenance, and the everyday coordination between control-room, field, maintenance, HSE, and contractor teams.

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The team's challenge was to preserve critical judgement before it disappeared, validate it against approved operating knowledge and make it usable where and when employees needed it.



03 The questions leadership needed answered

The team was not looking for another content library or a faster way to publish courses. In a live, high-consequence operation, that would not be enough.

The risk was not confined to onboarding. The solution needed to support sound judgment on night shifts, in handovers, during abnormal conditions, at the point of work, and in the small decisions that can determine whether a near miss becomes a shutdown, an incident, or a costly recovery effort. The team needed practical answers to a more demanding set of operational questions:

01 Where is the single-point-of-failure knowledge? Which roles, assets, procedures, control-room decisions, maintenance activities, and HSE scenarios depend on judgment concentrated in a small number of veteran employees?

02 What must be captured before veteran expertise leaves? Beyond task steps, what are the watchouts, failure modes, escalation triggers, decision rationale, recovery logic, local conditions, and common rookie errors that experienced people have learned over years on shift?

03 How will captured knowledge remain connected to the operating standard? Can it be tied to current SOPs, standards, permit-to-work requirements, lockout/tagout controls, simultaneous-operations procedures, emergency-shutdown protocols, asset context, and site conventions—and show which version was approved?

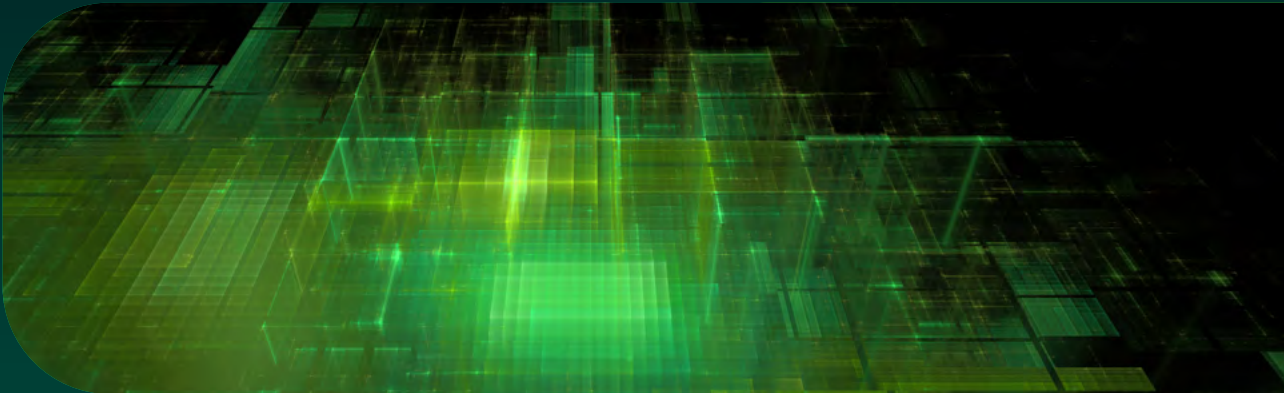


04 Who needs the knowledge, and in what form? An early-career operator may need scenario rehearsal. A maintenance technician may need point-of-need guidance. A supervisor may need coaching prompts. A contractor may require a controlled refresher before entering a work area. How can one approved source support each audience without creating conflicting versions?

05 Can the knowledge improve the next decision, not merely preserve the last one? Can it shorten the gap between formal training and independent performance, reduce repeated “tap-on-the-shoulder” interruptions to scarce experts, and give employees access to judgment cues earlier in their development?

06 Can the operation prove that readiness is improving? Completion data does not demonstrate competence under pressure. Can leaders see time to independent sign-off, first-time-right execution, safety and permit adherence, repeat-event or near-miss recurrence, SME interruptions, and realistic scenario performance?

07 Can the model scale without weakening governance? Can it work across shifts, sites, contractor populations, and changing operating conditions while retaining SME review, role-based access, source traceability, version control, and a human approval gate before knowledge is published or used downstream?



CGS Immersive worked with the team to turn knowledge retention into an operational readiness initiative.



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Capturing tacit judgment at the point of risk

The work began with the people closest to the risk.

Using **Cicero Interview**, the CGS Immersive team helped the client conduct structured knowledge-capture conversations with veteran operators across several high-consequence areas: gas-leak detection, emergency flood response, vibration monitoring, and multi-hazard management.

The interview process was designed to capture the knowledge veterans usually gain only after years on shift. It elicited the rationale behind decisions, early warning signs, judgment cues, rare-event and failure-mode experience, common mistakes, recovery logic, and the conditions that require escalation.

The conversations examined:

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What operators notice before a condition becomes critical

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Which thresholds trigger a different response

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Where less experienced employees are most likely to make the wrong assumption

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What changes when two hazards occur at the same time

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How experienced operators decide when to escalate

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Which incident lessons should influence future decisions

Cicero Interview's output was not simply an interview record. The knowledge was structured by role, task, procedure, step, risk control, source evidence, review state, and version—creating reusable records of critical knowledge that were ready for validation and controlled use.



05 From knowledge capture to action

Cicero Platform provided the foundation for the engagement. Within the platform, **Cicero Orchestrator** served as the governed intelligence layer that connected captured expertise to workforce execution.

Cicero Interview captured expert judgment. Cicero Orchestrator organized that knowledge alongside current SOPs, standards, policy documents, role and task context, site or asset conventions, legacy learning materials, and other validated operational sources.

That governed foundation mattered for a simple reason: a critical change should not have to pass through multiple disconnected teams, files, and production cycles before it reached the people who need it.

Before guidance, coaching prompts, scenarios, or learning assets were made available to the workforce, the relevant knowledge was reviewed and approved by accountable SMEs, operations, HSE, and learning stakeholders. Version control connected each update to the relevant SOP or standard, creating an auditable path from approved source material to workforce-facing output.

From that governed knowledge foundation, the team created workforce experiences suited to the work itself:

- 01 Scenario-based practice for decisions that are difficult or risky to learn on the job
- 02 Simulations that let operators rehearse responses before a live incident tests them
- 03 Point-of-need guidance and controlled refreshers for operations, maintenance, and contractor populations
- 04 Manager-coaching tools that make field expectations more consistent





05 Readiness checks that assess decision quality, not just recall of a policy

06 Searchable, governed knowledge resources for approved institutional know-how

07 Build-ready storyboards and learning assets that remain tied to the same approved source

The point was not to create every possible asset. It was to give each role the form of support most likely to improve performance, while maintaining one controlled foundation for the knowledge behind it.



06 What changed for the industrial operations team?

Old way: 12-week lag; expert burnout

Previously, an SOP update triggered a fragmented, multi-month game of telephone: update the PDF, queue up learning teams, schedule classroom briefings, and hope supervisors filled the gaps. The operational friction was costly:

- 01 The version drift:** Day shifts, night shifts, and third-party contractors operated off three different interpretations of the same control.
- 02 Death by 1,000 interruptions:** Senior operators spent up to 20% of their shifts answering the exact same “how-to” questions, acting as human patches for static documentation.
- 03 The illusion of safety:** E-learning platforms reported 100% completion, while field leaders had zero visibility into whether operators could handle a multi-hazard event under live pressure.

New way: Governed execution in days

After deploying the new operating model, the team replaced the handoff chain with a single governed workflow:

- 01 One edit, universal alignment:** A single central review automatically updates downstream field guides, scenario practice, manager coaching tools, and readiness checks.
- 02 SMEs reclaim operational time:** Senior experts validate judgment once rather than repeatedly re-explaining the same exceptions.
- 03 Verified field readiness:** Leaders track live decision accuracy under pressure, eliminating the gap between “training completed” and “safe execution”.

That is the core operational shift: replacing a high-risk, multi-month waiting game with a single governed pipeline. By connecting captured expert judgment directly to workforce execution, the team transformed fragile tribal memory into a scalable, controlled operating model.



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Business case: measure what matters

A serious operational initiative needs more than adoption reporting. It needs a business owner, a baseline, and an agreed cadence for reviewing the outcomes the work is intended to improve.

For this type of use case, plant or field operations should own the KPI cadence, with EHS, maintenance, HR, and L&D contributing the evidence and interventions required to improve it.

CGS Immersive aligns the evaluation to readiness indicators that matter in the operation.

These measures move the conversation from “Did people complete the training?” to “Did the organization become more capable of performing safely, consistently, and independently?”

Priority indicator	Operational question it answers	Example measurement approach
Time to competency	How quickly can a successor or early-career employee reach approved independent performance?	Median days from onboarding or role transition to certified readiness or independent sign-off
First-time-right execution	Are teams reducing rework, repeat failures, and corrective activity?	Rework, repeat-event, or corrective-work rate normalized for work volume or exposure
Safety and compliance evidence	Are critical procedures and controls being applied and evidenced consistently?	SOP and permit adherence, audit findings, near-miss recurrence, or control-verification results
SME interruptions	Has approved expertise become available on demand?	Hours spent on repeated explanations, shadowing, ad hoc support, or manual content review
Knowledge capture coverage	Which role-critical knowledge has been captured, reviewed, approved, and made reusable?	Percentage of prioritized critical roles, tasks, or risk scenarios covered by governed knowledge assets
Change activation cycle	How quickly do approved operational updates reach affected roles in usable forms?	Time from source approval to updated guidance, practice, and support availability



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Why does capturing expert knowledge in industrial settings matter now?

High-consequence industrial operations are managing a sharp convergence of pressures: aging field infrastructure, rapid workforce turnover, complex multi-hazard environments, and aggressive uptime targets.

In continuous-process industries, where ARC Advisory Group estimates human error drives 42% of abnormal operating events, formal documentation alone is no longer a sufficient risk control:

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The high cost of field misjudgments: In continuous processing and energy operations, an unplanned trip or safety incident driven by ambiguous decision-making costs between \$250,000 and \$500,000 per hour in lost production, emergency response, and cascade damage.

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The failure of static SOPs: Standard operating procedures define the baseline path, but ARC Advisory Group research shows facilities lose 3% to 8% of annual nameplate capacity to operational upsets where static procedures fail to cover real-world field conditions.

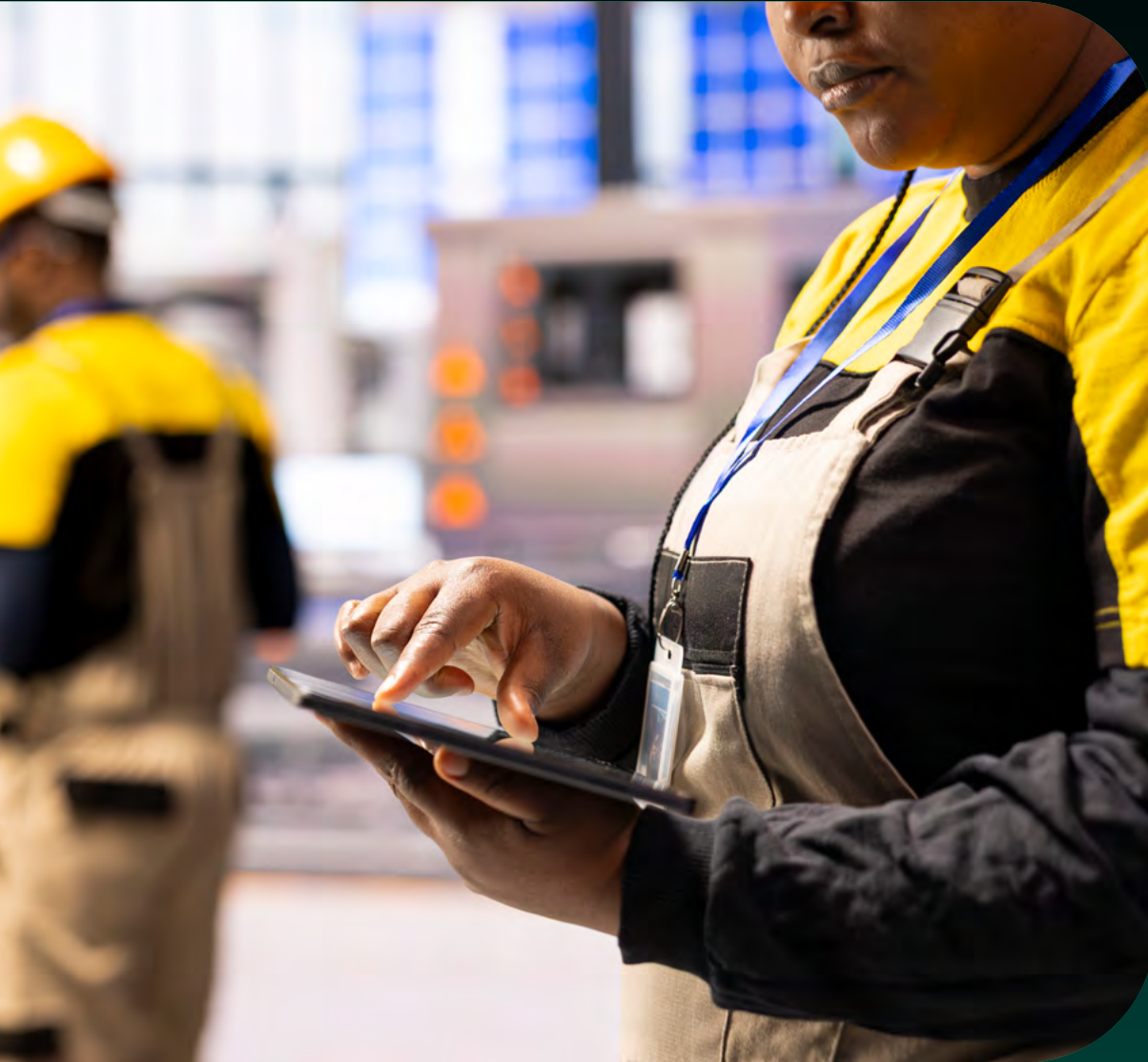
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The illusion of readiness: Relying on classroom completion or digital sign-offs leaves leaders with a dangerous blind spot: an operator can achieve 100% policy compliance on paper without possessing the pattern recognition needed to manage a live, multi-hazard event under pressure.

That distinction creates a direct operational mandate for plant and safety leaders.

If critical decision-making remains trapped in the heads of a few senior operators, the facility operates with an unmitigated single point of failure. If shift teams interpret safety controls differently across sites, operating risk compounds.





This customer story shows a practical approach to improving readiness in high-risk industrial environments: capture the judgment behind the work, connect it to approved operational knowledge, and make it available through the learning, practice, guidance, coaching, and performance-support experiences that improve real execution.



09 Where to start

The strongest starting point is one role-critical workflow where expertise is concentrated, the risk of inconsistent execution is clear, and the operational impact can be measured within a budgeting cycle.

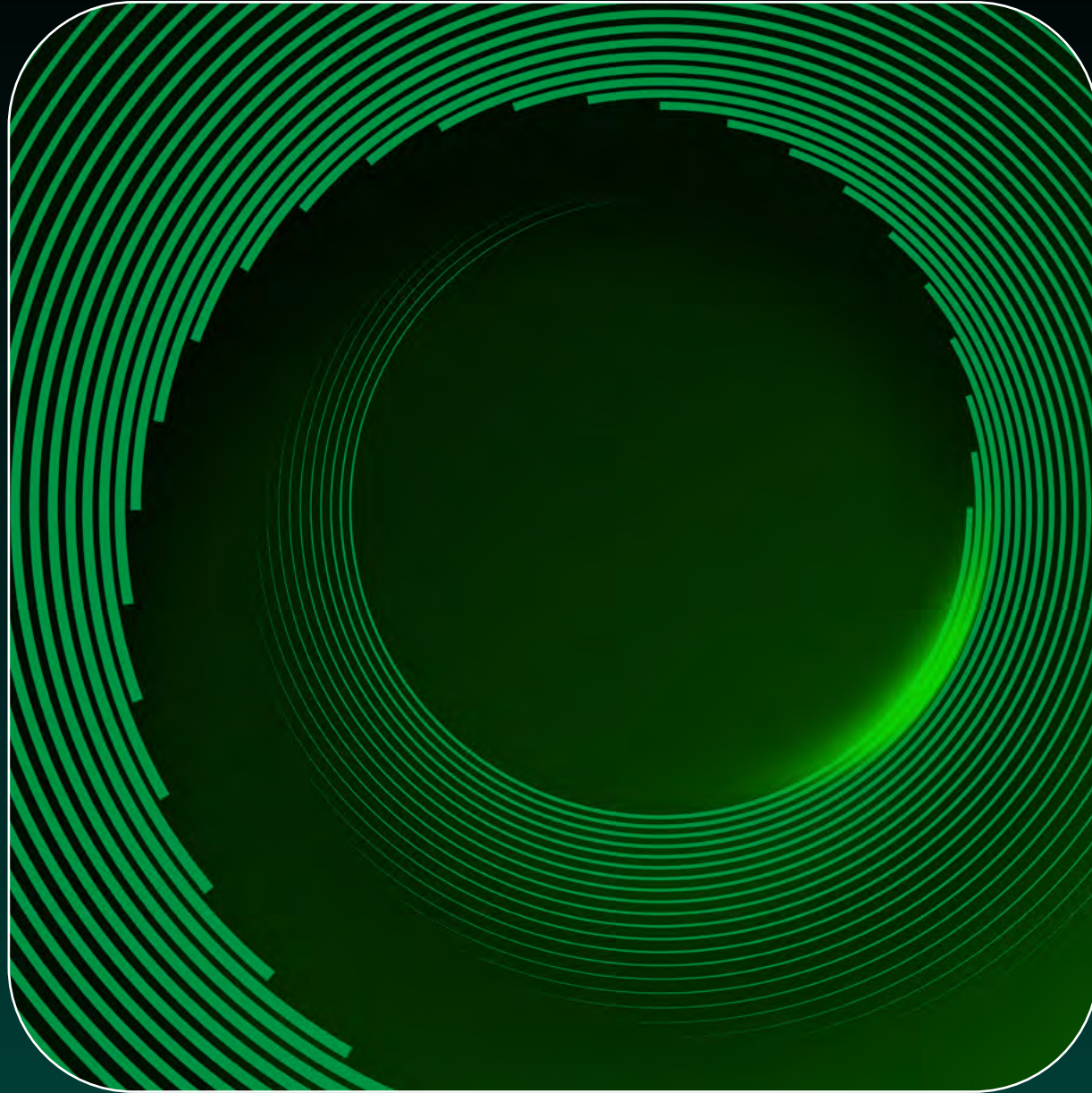
That may be a recurring safety event, an upcoming retirement wave, a new equipment rollout, a change to a regulated process, a persistent quality issue, a permit-to-work activity, or a service transition that depends on experienced judgment.

A focused pilot should establish:

- 01** One repeatable workflow with a clear beginning, end, and visible operating bottleneck
- 02** One accountable business owner and a committed user sponsor
- 03** Two or three measurable KPIs and a baseline that make the operational value visible
- 04** A governed set of SOPs, standards, and source materials
- 05** A defined SME review and human-approval process
- 06** A practical path to embed the approved knowledge in daily work and scale the model to adjacent roles, sites, or processes

CGS Immersive can help you use Cicero Platform to capture critical know-how, with Cicero Orchestrator providing the governed layer that connects that knowledge to workforce execution.





Start solving your readiness gap with a Cicero Orchestrator discovery session

Bring one live operational challenge. We'll demonstrate how **Cicero Orchestrator** connects your expert knowledge directly to frontline behavior—eliminating the multi-month delay between operational decisions and verified field execution, while cutting SME workload by up to 80%.

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