The Power of Data Integration and Visualization for Safer, Reliable Operations

From fragmented integrity data to risk-ranked decisions and action

October 22, 2026

Mark Susich
Group Leader, Mechanical Integrity
AcuTech Group, Inc.

The goal is not a better dashboard.

The goal is a better integrity decision, made sooner, with evidence that it reduced risk.

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The Power of Data Integration and Visualization for Safer, Reliable Operations

Enhancing Decision-Making Through Integrated Data Analysis

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Mark Susich
MI Group Lead

Mr. Susich has over 30 years of integrity engineering experience. He is recognized as a thought leader and fixed equipment asset integrity subject matter expert for the Upstream oil and gas industry. He has led teams in the development and implementation of pipeline, fixed and equipment, and subsea structural integrity programs.

Mr. Susich has experienced and facilitated the development and deployment of integrity practices, procedures, and guides to support integrity/inspection programs. He is knowledgeable in the current commercially available off-the-shelf IDMS offerings to support pre-operations integrity management builds (greenfield), as well as brownfield operations.

Mr. Susich has been involved in shaping regional and global integrity master service agreement contracting strategies and commercial tenders. His expertise encompasses various critical aspects, including defining technical requirements, leading technical evaluations, and providing valuable support to the supply chain organization in commercial assessments.



Jarrod White
Sr. MI Consultant

Mr. White is a Senior Associate Consultant with AcuTech, with over a decade of expertise in mechanical integrity and reliability program implementation and auditing across a wide array of industries, encompassing refining, petrochemicals, mining, and more. His core strengths lie in the development, execution, and auditing of comprehensive mechanical integrity programs, encompassing predictive, preventative, and corrective maintenance initiatives, with a primary focus on data collection and risk analysis.

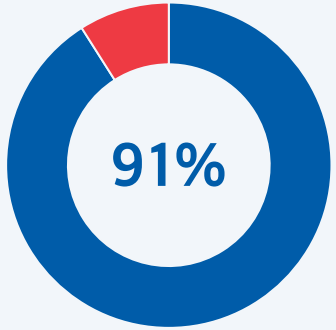
Prior to his current role, Mr. White served as a corrosion engineer at Pinnacle Reliability, where he led Damage Mechanism Reviews (DMRs) and failure analysis based on API 571, spearheaded API 580/581 Risk Based Inspection (RBI) programs, semi-quantitative risk assessments, Integrity Operating Windows (IOWs), and Corrosion Control Documents (CCDs). Notably, he contributed to the advancement of state-of-the-art predictive data analytics software tools, engaging in cross-domain collaboration throughout the Software Development Life Cycle (SDLC) and crafting tailored KPIs for diverse user groups.



The data existed.

Richmond, California, August 2012: a crude unit 4-sidecut line ruptured from sulfidation corrosion. Chevron's own specialists had recommended 100 percent component inspection or a metallurgy upgrade for that piping. The CSB found those recommendations were never carried out.

Most sites already hold the data that would flag their next failure. The gap is connection.



of causes in the 100 largest hydrocarbon losses were long-recognized failure modes.

Only 9% were new or emerging.

Chevron was not an outlier.

Source: U.S. CSB, Chevron Richmond Refinery Pipe Rupture and Fire, Final Investigation Report No. 2012-03-I-CA (January 2015)

Source: Marsh, 100 Largest Losses in the Hydrocarbon Industry 1974–2025, 29th ed. (2026)

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Five Systems That Rarely Talk to Each Other

PHA software	IDMS	CMMS	Historian	MOC log
Scenarios, safeguards, risk ranks	Thickness, CMLs, damage mechanisms	ITPM tasks, work orders, deferrals	Temperatures, pressures, IOW excursions	Changes, deferrals, extensions, approvals
OWNER	OWNER	OWNER	OWNER	OWNER
Process Safety	**Inspection**	**Maintenance**	**Operations**	**Engineering**

Each system is accurate on its own. None can answer "which safeguard is weakest right now?"

Marsh, 100 largest losses: where recurring barrier failures sit

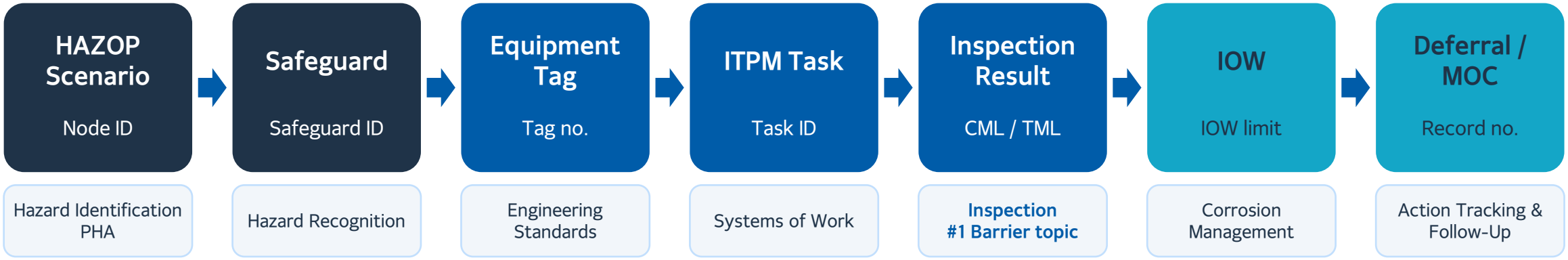


~70% of 5,000+ Marsh risk recommendations target management systems

Source: Marsh, 100 Largest Losses in the Hydrocarbon Industry 1974–2025, 29th ed. (2026), pp. 40–43. Approximate shares, all sectors combined.

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The Digital Thread: One Chain from Hazard to Action



Small text = the join key for each step. Light boxes = Marsh's recurring barrier topics and themes.

Paper thesis

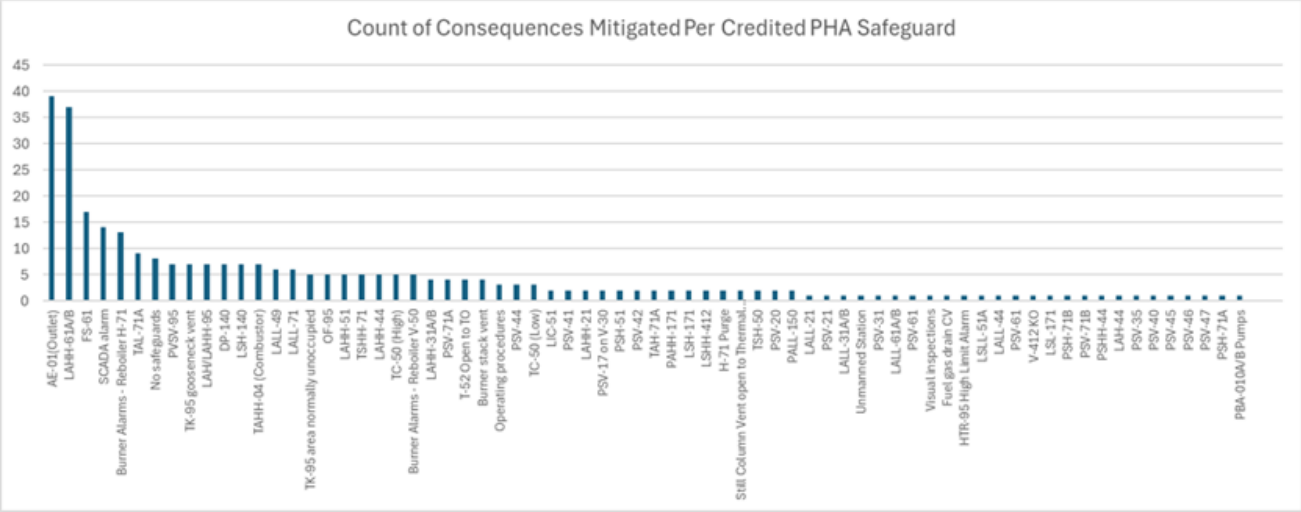
PHA risk should set ITPM priority and govern deferral decisions.

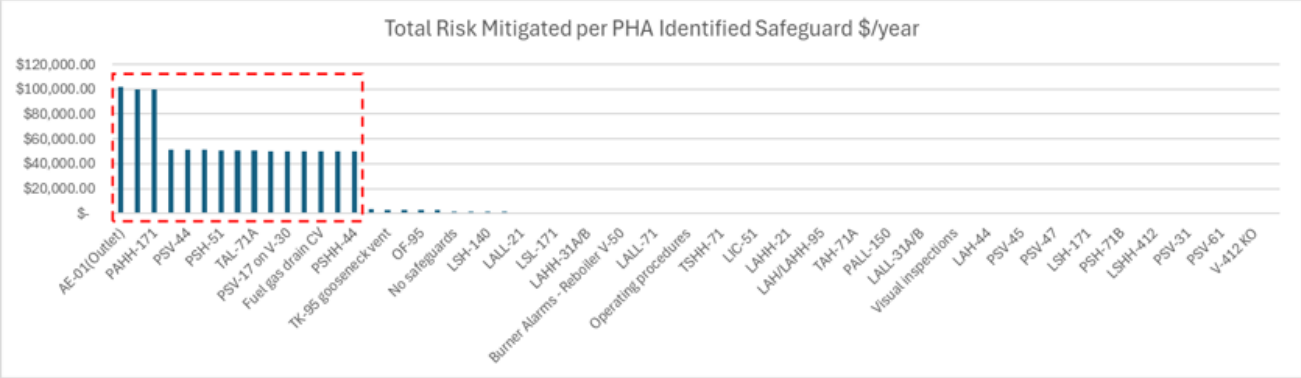
Calendar habit and task counts should not. Results from inspections and IOWs feed back to re-rank the risk.

Source: Marsh, 100 Largest Losses in the Hydrocarbon Industry 1974–2025, 29th ed. (2026), Figs. 16–17 (downstream and midstream).

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Use Case 1: Rank Safeguards by Risk Removed





Screening View: Credit Count

How often is it credited? Good for ranking attention; blind to consequence and condition.

Decision View: Review Factors

- Scenario consequence
- Demand / exposure
- Credited risk reduction
- Availability / impairment
- Dependency / common cause

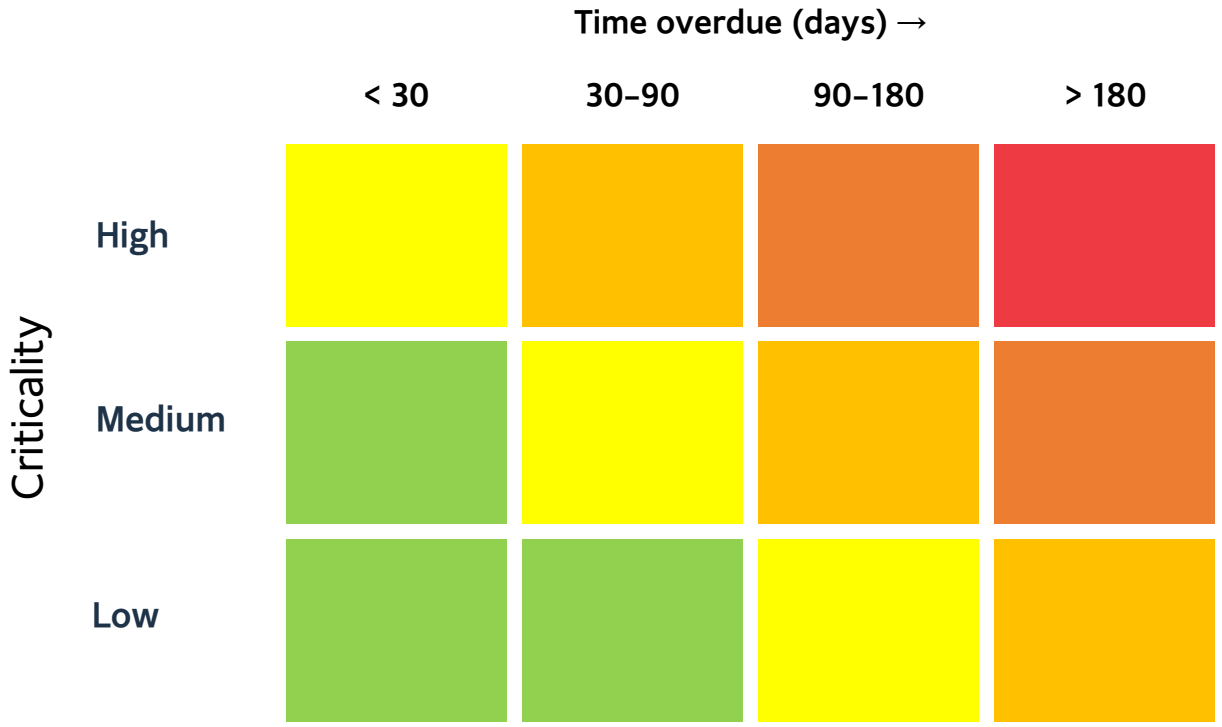
Then ask: is the barrier healthy today?

$1M × 96% = $40K

A safeguard mitigating $1M/yr of risk at 96% reliability still leaves $40K/yr of residual risk.

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Use Case 2: Treat Deferrals as Risk-Weighted Debt



MARSH, 100 LARGEST LOSSES

Deferring maintenance is a problematic strategy.
Ask whether yours is driven by risk and degradation mechanisms, or by cost and backlog pressure.

1. **A deferral count is a vanity metric.**
   Weight each one by the risk its safeguard carries.

2. **Watch for repeated extensions.**
   The second deferral on the same task is an early warning. Is an approval escalation process in place?

3. **Tie it to 1910.119(j)(5)**
   Deficiencies corrected before further use, or in a safe and timely manner.

Source: Marsh, 100 Largest Losses in the Hydrocarbon Industry 1974–2025, 29th ed. (2026) (paraphrased).

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Use Case 3: Operating Data Drives Inspection

IOW Excursion

Historian flags a critical or standard limit breach

(Duration and severity are key variables)

Damage Mechanism Check

Mapped to API 571 mechanisms and the unit CCD (API 970)

Inspection Rigger

IDMS raises a targeted inspection on affected circuits

Plan Updated

Circuit, CML and interval revised; result fed back

Digital Circuitization

Circuits defined by damage mechanism and operating envelope, not drawing boundaries.

Installed Wireless UT

Continuous wall-loss trends where time-based spot readings can't keep up.

Connected 3D Context

Risk, inspection, findings and deferrals on the asset itself (next: digital twins).

AI in Mechanical Integrity: Accelerate, Don't Replace

Strong Use Cases: Human in the Loop

01	**Extract**	Thickness, nameplate and findings from legacy PDFs, NDE reports and U-1As
02	**Normalize**	Link PHA safeguards to equipment tags
03	**Retrieve**	Retrieve requirements from approved standards and inspection records
04	**Triage**	Identify data gaps or inconsistencies that require an engineer first

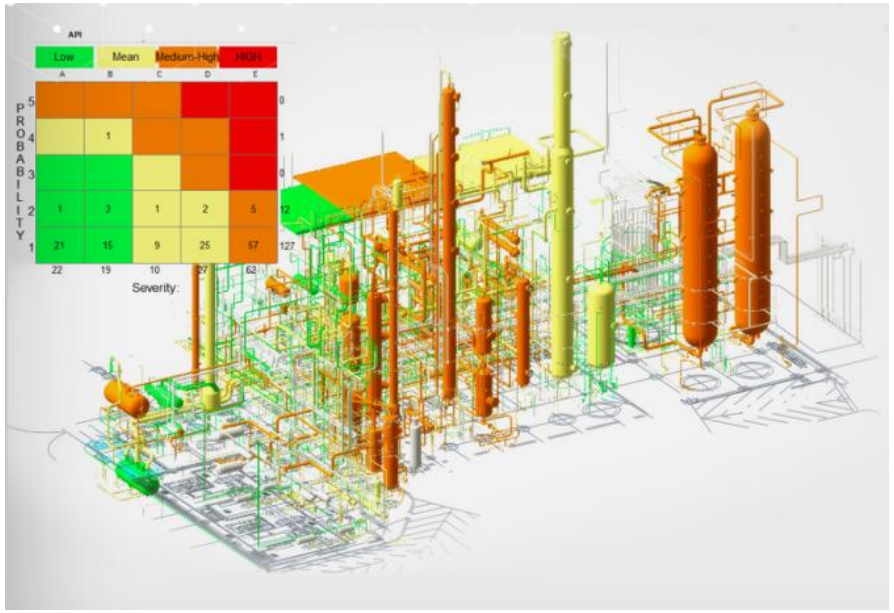
Engineering Authority Stays Human

!	**Damage Mechanisms**	AI can suggest; engineering determines credibility.
!	**Deferrals**	AI can summarize; authorized roles accept the risk.
!	**Acceptance Criteria**	AI can retrieve; standards define pass/fail.
!	**Fitness-for-Service**	Models assist; qualified engineers own conclusions.

Guardrails: traceable to source · reviewed by a qualified person · bounded by RAGAGEP

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3D models and Digital Twins: Context, Not Eye Candy



"Click the defect, not the spreadsheet."

3D / GIS / LiDAR	Where is it?
Asset Hierarchy & Tag	What is it?
Condition Monitoring / Sensors	What condition is it in?
DMR / IOW / Criteria	What can damage it?
PHA / SCE / Consequence	Why does it matter?
Work / MOC / Deferral	What happens next?

A beautiful twin with no hierarchy, acceptance criteria or work-process integration is still just a beautiful picture.

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KPIs That Show Whether Risk Is Changing

Keep execution metrics, and add indicators of current exposure, impairment and unresolved exceptions.

What we Often Measure

- Total backlog
- PM compliance
- Number of inspections
- Overdue task count
- Defect count
- MTBF / failure count

Useful, but often weakly connected to current process-safety exposure.

Risk-Aware Leading Indicators

- **Risk-weighted overdue SCE exposure**
- **Barrier impairment hours**
- **Repeat deferrals on critical equipment**
- **IOW excursions tied to active damage mechanisms**
- **Acceptance-criteria exceptions awaiting disposition**
- **% critical assets with complete decision-grade data**

Industry context: API RP 754, 4th ed. (August 2026) retains four tiers of process-safety indicators; Tiers 3–4 are intended for internal facility use.

Takeaways: Asset Integrity Is a Decision System

The tools matter. The information model, governance and closed-loop execution matter more.

1. Start with the decision, not the technology.
2. Connect hazards to assets, and assets to work.
3. Make risk and uncertainty visible.
4. Use AI to accelerate engineering, not replace it.
5. **Close the loop: verify the work actually reduced risk.**

Know what can fail.

Know why it matters.

Know what to do next.

Know whether it worked.

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Questions?

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