PIDX SPRING CONFERENCE 2026

Standards + Data + AI

Field Evidence on Closing the EAM Data Quality Gap That Has Plagued Energy Operations for Decades

> *The central question: We have PIDX. We have ISO 14224. We have SAP and Maximo and decades of ERP investment. Why is EAM data quality still broken — and what does AI change?*

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1. The Paradox
2. Root Causes
3. What Changed
4. Field Evidence
5. What To Do

We Have the Standards. Why Is the Data Still Broken?

What the Industry Has Built

- **PIDX**
  Global standards for energy industry data exchange
- **ISO 14224**
  Reliability & maintenance data collection framework
- **UNSPSC**
  Universal classification for materials & services
- **SAP / Maximo / HxGN EAM**
  Enterprise-grade asset management systems
- **SOTA Industry 4.0/ IoT setup**
  Cloud/ Analytics solutions for real-time and predictive maintenance

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What We Find in the Field

- **Equipment masters: incomplete**
  Missing characteristics, wrong specs, orphaned records
- **BOMs: not in the CMMS**
  Buried in O&M manuals — PDFs nobody reads
- **PM strategies: tribal knowledge**
  In the technician's head, not the system
- **UNSPSC: partially applied**
  Materials cleansed; asset data ignored
- **ISO 14224: classification only**
  80% of the standard left unused

The Funding Asymmetry: Why Materials Gets Fixed and EAM Doesn't

MATERIALS DATA ✓ Gets Fixed

UNSPSC · PIDX · Vendor Master · MRO

- Finance owns procurement — savings are CFO-visible
- Duplicate elimination = immediate inventory $$ recovery
- PO accuracy measured every quarter
- "We saved $4M removing 47,000 duplicates" — this gets funded

VS

EAM DATA ✗ Gets Deferred

Equipment Master · BOM · PM Strategy · FLOC

- Operations owns it — technicians work around gaps daily
- Tribal knowledge masks the problem for decades
- "The plant runs" — nobody measures what it costs
- Until: S/4HANA migration hits a wall. Digital Twin fails. Workforce retires.

Key insight: The problem isn't a lack of standards awareness. It's a structural funding asymmetry that makes EAM data quality invisible until a crisis.

ISO 14224: The Industry is Using 20% of a Powerful Standard

80%

of ISO 14224
left unused

in most enterprise
EAM implementations

by field observation

What Most Use (≈20%)

Equipment Classification

Equipment types, classes, subclasses

Key Characteristics

A handful of attributes per asset class

UNSPSC for Materials

Often incomplete, often only for procurement

What Gets Missed (≈80%)

FLOC Hierarchy Design

Structured functional location trees — the backbone of any CMMS setup

Failure Mode Taxonomy

FM / Mechanism / Cause / Effect — the foundation of RCM & PdM

Activity Codes

Standardized work order coding that enables pattern analysis

Reliability Data Framework

The collection structure that turns work orders into intelligence

A Real Example.

An O&G operator had 8 years of work order history in SAP PM.

Thousands of corrective maintenance records for rotating equipment — pumps, compressors, gas turbines.

The problem: every technician described the failure differently. "Bearing worn." "Brg fail." "Bearing replacement." "Mech. failure — see attached." No ISO 14224 failure codes. No standardized cause taxonomy. 8 years of data — and the reliability team could extract **zero** systemic patterns.

When those work orders were mapped to ISO 14224 failure taxonomy codes:

- 34% of corrective maintenance on centrifugal pumps traced to a single failure mechanism — seal degradation — across 6 different sites
- PM strategy had no seal inspection task. OEM manual had one. It was in a PDF nobody had read in 4 years.
- Estimated cost of unplanned downtime attributable to this gap: recoverable through a single PM task addition

The data was there. The framework to read it wasn't.

Why It Was Always Deferred — and Why That Excuse Is Gone

The 3 Barriers That Made It Intractable

01

Perceived Cost

Cleaning 500K EAM records was a $2–5M consulting engagement. CFO wouldn't approve it. It got deferred — project after project, acquisition after acquisition.

02

Perceived Time

18–24 month timeline to do it properly. By the time it was done, a new ERP migration would reset the clock. Teams lost faith it was worth starting.

03

Perceived Complexity

Standards alignment (ISO 14224, UNSPSC, PIDX) required specialists. Tribal knowledge meant only senior consultants could validate outputs. Not scalable.

AI has collapsed all three barriers.

Cost: 83% reduction vs. traditional consulting. Time: weeks, not months. Complexity: AI handles pattern recognition at scale — specialists validate, not transcribe.

AI Without Standards Is Faster Garbage.

AI with standards-aligned reference libraries is a force multiplier.

AI Alone — No Standards Foundation

- Classifies materials inconsistently — no reference taxonomy
- Generates FLOC hierarchies with no industry-standard structure
- Extracts failure descriptions with no FM/Mechanism/Cause mapping
- Output is faster and cheaper — but still non-standard and non-interoperable
- Every implementation reinvents the wheel. GIGO at scale.

AI + PIDX / ISO 14224 Foundation

- UNSPSC codes assigned consistently — against the published taxonomy
- FLOC hierarchies built to ISO 14224 structure — interoperable across sites
- Failure data mapped to FM / Mechanism / Cause / Effect codes
- Output is standards-aligned, auditable, and migration-ready
- Each implementation builds on shared industry ground truth

Implication for this room: PIDX and ISO 14224 are no longer just documentation frameworks. They are the prerequisite infrastructure that makes industrial AI reliable. Standards adoption = AI adoption.

The Standards + Data + AI Approach: What We Actually Did

1 INGEST

Documents as input

P&IDs · O&M Manuals
SPIRs · Datasheets
Legacy ERP/CMMS records

2 EXTRACT

AI reads the truth

FLOC hierarchies from P&IDs
BOMs from O&M manuals
PM tasks from mfr. docs
Failure data from work orders

3 STANDARDIZE

Standards as reference

ISO 14224 — asset & failure
UNSPSC — materials
PIDX — data exchange
Custom industry extensions

4 RECONCILE

Compare & validate

ERP/CMMS vs. P&ID ground truth
Ghost assets identified
Discrepancies flagged
Migration-ready output

Golden Asset Register | **Golden BOM** | **Defensible PM Strategy** | **Failure Intelligence**

What We Found: The Gap Between Standards Intent and Enterprise Reality

Oil & Gas

- Equipment masters: characteristics <40% complete on average
- UNSPSC codes assigned to materials: <55% coverage
- P&IDs not reconciled to CMMS in any recent project — ghost assets present at every site
- ISO 14224 failure taxonomy: used in less than 10% of work order coding
- PM strategies: 60%+ sourced from 'engineer's judgment', not OEM documentation

Utilities (Power & Water)

- GIS and CMMS asset records: significant mismatch at every operator assessed
- Substation SLDs in PDF vaults — equipment hierarchies in CMMS not reflecting drawings
- MRO materials: duplicate rate typically 8–15% unrecognized across sites
- PM schedules for critical generation equipment: largely tribal knowledge
- ISO 14224 failure codes: not used in work order design at any utility assessed

Mining

- BOMs for major rotating equipment (SAG mills, crushers): not in CMMS — in PDFs
- Spare parts interchangeability across sites: unrecognized — same part, 15+ descriptions
- TAM (Turnaround Maintenance) prep: manual BOM reconciliation taking weeks
- FLOC hierarchy: typically 2–3 levels deep vs. ISO 14224 recommended 5–7 levels
- Asset data quality consistently the #1 risk in S/4HANA migration assessments

What AI Extracted From Documents Nobody Had Read in Years

	BEFORE	AFTER · STANDARDS-ALIGNED
From P&IDs	CMMS had 3 functional locations for a gas compression unit. Attributes: tag number only.	AI extracted 47 assets with full parent-child FLOC hierarchy to ISO 14224 Level 5. Characteristics, measuring points, and tag numbers populated from drawing data blocks.
From O&M Manuals	PM strategy: "Service per manufacturer recommendation" — a single line in SAP. BOM: not in CMMS.	AI extracted 23 PM tasks with frequencies, craft assignments, and safety steps. Spare parts list: 34 line items mapped to material masters with UNSPSC codes.
From Work Order History	8 years of corrective maintenance records. Failure descriptions: free text, no coding. Zero pattern extractable.	AI mapped records to ISO 14224 FM/Mechanism/Cause taxonomy. Revealed top 3 failure modes per equipment class — enabling first data-driven PM optimization.

What the Standards + Data + AI Formula Delivers.

83%

Cost Reduction

vs. traditional consulting
$3 → $0.50 per record

10×

Speed Increase

Consultant: 4–8 hrs/record
AI: 5–10 mins/record

500K+

Records Processed

Across O&G, Utilities
and Mining operations

98%

Classification Accuracy

Standards-aligned output
SME-validated

47K+

Duplicates Found

9.4% duplicate rate
recovered from inventory

Weeks

Not Months

What took 18 months
now takes 4–8 weeks

Industries: Oil & Gas · Power Utilities · Water/Wastewater · Mining · Pharma/Life Sciences · Manufacturing

Two Clocks Are Running. Neither Is Slowing Down.

CLOCK 1 · THE WORKFORCE

The average maintenance technician in heavy industry is over 50.

When that cohort retires, everything they know — equipment quirks, failure patterns, workarounds, undocumented modifications — goes with them.

This is the knowledge that has masked the EAM data gap for decades. It is not in the CMMS. It is in people's heads.

ISO 14224, properly implemented — with failure taxonomy, activity codes, and structured work order design — is the exact instrument designed to capture this knowledge before it walks out the door.

The window is closing.

CLOCK 2 · INDUSTRY 4.0 ROI

Every digital investment built on top of dirty EAM data is underperforming right now.

Digital Twin projects require a complete, accurate asset register — reconciled to engineering source. Without it, the twin reflects the digital shadow, not the physical asset.

Predictive Maintenance models require clean equipment hierarchy, correct measuring point assignments, and failure history mapped to standard codes. Without it, the model trains on noise.

AI Industrial Copilots require structured, standards-aligned EAM data as context. Without it, they hallucinate.

The CAPEX is already approved. The ROI clock started. The data foundation is not there.

What the Standards Community Can Do Differently

The standards are right. The implementation guidance needs to go deeper.

01

EAM-Layer Implementation Guidance

PIDX and ISO 14224 adoption guidance largely addresses materials and procurement. The EAM layer — FLOC design patterns, equipment hierarchy depth, failure taxonomy adoption in CMMS work order design — needs the same level of implementation guidance. Practitioners don't know how to apply the full standard.

02

Work Order Coding as a Standards Frontier

The next decade of reliability value lives in structured work order data. Standardized failure code frameworks — aligned to ISO 14224 FM/Mechanism/Cause taxonomy — need to become a PIDX-level conversation. The data is being generated. It's just not being captured in a form that's analyzable.

03

AI Readiness as a Standards Adoption KPI

As AI programs proliferate in the energy sector, standards alignment becomes measurable in a new way: does your asset data make AI reliable or unreliable? PIDX could drive a "AI-ready data" certification or self-assessment framework — giving operators a concrete, business-case-able reason to pursue standards adoption beyond compliance.

Three Things You Can Act On Today.

1

Audit your ISO 14224 adoption depth

Ask your team: are we using the standard for classification only — or are we using FLOC hierarchy design, failure taxonomy, and activity codes? If the answer is 'classification only', you have a concrete, actionable gap to close. The remaining 80% of the standard is where your reliability intelligence lives.

Action: Pull one equipment class. Check if failure modes are coded in work orders. That tells you everything.

2

Reframe EAM data quality as an AI readiness problem

If your organization has approved Digital Twin, PdM, or AI copilot capex, you now have a business case for EAM data quality that Finance will fund. The question is no longer 'should we clean our asset data' — it's 'do we want our AI investment to work or to hallucinate'.

Action: Find the next AI/Industry 4.0 initiative in your capital plan. Map it to its EAM data dependencies. That's your funding conversation.

3

Treat retiring workforce as a data capture deadline

Identify your top 10 most experienced maintenance technicians. Ask how much of what they know is in the CMMS. The gap you find is a structured knowledge capture program — one that ISO 14224 failure taxonomy and AI-assisted work order coding can address at scale, before the knowledge walks out the door.

Action: One pilot equipment class. Structure failure history. Quantify what you learn. Build the business case from evidence.

Standards + Data + AI

The formula is proven. The cost and time barriers are gone.

STANDARDS

PIDX · ISO 14224 · UNSPSC

The ground truth that makes AI reliable.
Not a documentation exercise — the enabling infrastructure for every AI program in your portfolio.

DATA

P&IDs · O&Ms · ERP · Work Orders

The unstructured engineering reality buried in documents.
AI can now read it. The question is whether you're ready to act on what it finds.

AI

Extract · Standardize · Reconcile

The force multiplier that makes the whole approach viable.
10× faster. 83% cheaper. But only reliable when standards are the foundation.

Promantus is actively working with operators and partners on this.
If this resonates — let's continue the conversation.

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Key Terms & Acronyms — A Shared Language

FLOC — *Functional Location*

The hierarchical structure in a CMMS representing physical assets — site > unit > system > equipment > component. ISO 14224 defines the recommended hierarchy levels for different industry types.

FM / Mech / Cause — *Failure Mode / Mechanism / Cause*

The ISO 14224 three-tier failure taxonomy. Failure Mode = how it fails (leak, vibration, fracture). Mechanism = the process causing failure (corrosion, fatigue, wear). Cause = the root origin (poor maintenance, design flaw, operating error).

BOM — *Bill of Materials*

Structured spare parts list per equipment item. In a properly governed CMMS, each asset tag has a BOM linking it to the required materials in the materials master. Most operators' BOMs exist only in O&M PDFs.

UNSPSC — *United Nations Standard Products & Services Code*

The global classification taxonomy for materials and services. A prerequisite for MRO catalog management, procurement analytics, and cross-site interchangeability. Widely applied to materials; rarely applied to services.

EAM — *Enterprise Asset Management*

The discipline (and system category) covering the full lifecycle of physical assets — from creation and maintenance through decommissioning. SAP PM, IBM Maximo, and HxGN EAM are leading platforms.

Ghost Asset — *Ghost / Phantom Asset*

An asset that exists on an engineering drawing (P&ID) but not in the CMMS — or vice versa. Ghost assets are a safety risk (invalid LOTO procedures) and a migration risk (data integrity failures in S/4HANA transitions).

RCM — *Reliability Centered Maintenance*

A structured methodology for determining what maintenance is required to ensure physical assets continue to perform their intended functions. Requires clean equipment hierarchy, BOM, and failure history data as inputs.

PIDX — *Petroleum Industry Data Exchange*

The industry standards organization (this room) for electronic business data exchange in the energy sector. PIDX standards govern material data, procurement, invoicing, and digital business process interoperability.