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Where to Start with

Operational Intelligence (AI) in Manufacturing

The use cases that deliver results,
and what each one needs



Why AI Is Getting Attention in Manufacturing

> **“Use AI to improve the plant” isn’t a use case. “Reduce unplanned downtime on our most critical asset” is.**

That difference is at the heart of how manufacturers are approaching AI today. Plants are under pressure to improve throughput, quality, reliability, and responsiveness while managing labor constraints, supply chain volatility, and energy costs, and many of those challenges are harder to solve with manual analysis alone.

At the same time, manufacturers are collecting more data than ever from historians, SCADA, MES, quality systems, and connected assets. That combination is why operational intelligence (AI) is moving from a future-state conversation to a practical one. [1][2]

Why AI is back on the manufacturing agenda

1. **More data than ever.** But many teams still struggle to turn it into timely action.
2. **Doing more with less.** Labor constraints and skills gaps make manual analysis harder to rely on.
3. **Rising expectations.** Throughput, quality, uptime, and energy efficiency, all at the same time.
4. **Faster decisions.** When conditions change, teams need quicker ways to see what’s happening.
5. **From visibility to action.** Dashboards exist. The next question is how to improve outcomes.

For CEOs and plant leaders alike, the real question is not whether AI matters. It’s where AI can support measurable outcomes, and what needs to be in place before it can deliver value.

What AI Actually Looks Like in Industrial Operations

AI is most useful when it's applied to specific operational questions: recognizing patterns across large volumes of data, surfacing abnormal conditions earlier, or explaining why performance is changing. It doesn't replace plant knowledge. It helps scale it.

Common industrial AI use cases

Use case	What it can help solve	What it needs	Operational value
Predictive maintenance	Detect equipment degradation before an unplanned outage	Condition data from sensors or the historian, plus maintenance and failure history	Better reliability, less downtime, better maintenance planning
Quality improvement	Find the process and material drivers of scrap, defects, or inconsistent quality	Process data linked to quality or lab results, with batch and material context	Better first-pass quality, less waste
Anomaly detection	Flag abnormal conditions that alarms or manual review miss	Continuous time-series data and enough history to define what normal looks like	Faster detection, earlier intervention
Root cause analysis	Narrow the likely causes of performance shifts or unexpected events	Time-aligned process, maintenance, and quality data, plus event and downtime records	Faster troubleshooting, better problem-solving
Process optimization	Find the conditions tied to throughput, energy, yield, or efficiency	Setpoints and process conditions linked to throughput, energy, and yield results	More consistent performance

FROM THE FIELD

$34M+

in avoided costs

Predictive analytics flagged small step-changes in turbine vibration, nowhere near an alarm. They were the early stages of blade separation.

Source: AVEVA, "5 Kinds of Artificial Intelligence"

When AI isn't the right tool

AI earns its place in context-dependent patterns and in manual analysis that takes people hours or days. If a task follows clear, fixed rules, a rules-based solution is usually simpler, cheaper, and easier to trust.

The Operational Foundation AI Depends On

AI performance is tightly linked to the quality, structure, and context of the data behind it, and to the people who act on what it shows them. For most manufacturers, readiness starts with four questions. [1][3]

1	2	3	4
A clear use case	The right data	Data you can trust	People ready to act

1 Is there a clear operational use case?

AI is most effective when it's tied to a defined business problem with a measurable outcome, like reducing unplanned downtime on a critical asset or improving first-pass quality on a constrained line.

TURN A GOAL INTO A USE CASE

Reduce _____ problem _____ on _____ asset or line _____ from _____ baseline _____ to _____ target _____ by _____ date _____, owned by _____ one name _____.

If you can't fill in every blank, that's where to start.

Starting with a use case answers practical questions early: What data is needed? Who owns the outcome? What does success look like? How will recommendations be validated on the plant floor?

2 Do you have access to the right industrial data?

AI needs the operational data tied to the systems, assets, and processes that drive production. That may include:

- Historian and SCADA data
- MES or batch data
- Quality results
- Maintenance history
- Equipment and asset context
- Process states and production conditions

3 Can your teams trust the quality of that data?

AI, analytics, and reporting are only as strong as the data behind them. If the data is incomplete, inconsistent, poorly time-aligned, or missing context, confidence in the outputs breaks down quickly. Common issues include:

- Missing or inconsistent tags
- Poor timestamp synchronization
- Gaps during downtime or changeovers
- Inconsistent naming conventions
- Limited labeling of events and outcomes

FROM THE FIELD

The first weekend without a line break

Mon	Tue	Wed	Thu	Fri	Sat	Sun

A manufacturer's long, continuous line broke far more often on weekends than during the week. Using analytics on AVEVA Historian and AVEVA MES data, the team narrowed the cause to four or five setup parameters and had operators keep them within set limits. Progress was slow at first, but they kept refining until the plant had its first weekend ever without a line break.

Shared by Jeff Miller, Director of Smart Manufacturing at InSource, at InSource Innovate

4 Are your people ready to act on what AI shows them?



Insight doesn’t improve performance on its own. People acting on it does. A recommendation that no one owns, trusts, or has the authority to act on becomes another unused dashboard. Before investing, ask:

- Who owns the outcome we’re trying to improve?
- Can operators act on a recommendation without waiting for approval?
- Is there a process to validate, act, and sustain the change?

Where to Go Next

Manufacturers getting the most value from AI are not necessarily the ones with the most technology. They're the ones with the clearest connection between operational priorities, trusted data, and a practical path to action.

If you're ready to take the next step, these resources can help.

PODCAST

OI Podcast Ep. 1

Why Operational Intelligence (AI) Projects Stall in Manufacturing

Listen to Podcast

BLOG

Why the Technology Is the Easy Part

Rob Bansek and Devon Keane on getting ready for operational intelligence (AI).

Read the recap

PANEL

"I've Been Fooled by This Before"

Leaders from Bruce Power, Hydro One, and InSource on scaling industrial AI.

Read the blog

SOURCES

[1] Deloitte, 2025 Manufacturing Industry Outlook. Quality data, governance, and a broader AI and data strategy remain critical to successful implementation.

[2] NIST, The Rise of Artificial Intelligence in U.S. Manufacturing. Manufacturers still face barriers tied to readiness and data maturity.

[3] NIST, How to Find the Right Balance of Data for Your Industrial AI System. Industrial AI depends on the right data for the use case, not just more data.

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Ready to find your starting point?

Talk to our team about where AI can deliver in your operation, and what to put in place first.

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