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2025 Trend Report:

AI and the Future of Maintenance Operations

What to Expect

Several converging forces are shaping the 2025 US manufacturing landscape:

Ongoing investments.

Elevated costs.

An uncertain economic climate.

Swift advancements in artificial intelligence (AI).

While manufacturers face lingering supply chain complexities and talent pressures, they're also beginning to see new possibilities for efficiency and resilience through AI-driven strategies.

Explore These 10 Key Trends

Supported by recent data and industry analysis, this report investigates 10 trends in maintenance and asset management:

01. Real-time asset management taking center stage

02. Bridging the workforce knowledge gap

03. Predictive and preventive maintenance

04. Seamless integration as table stakes

05. Operational excellence through learning feedback loops

06. Data silos being eliminated

07. Safety and compliance as top priorities

08. ROI-driven maintenance solutions

09. Empowering field teams with mobile solutions

10. AI's role in proactive decision-making

Want to learn more about how organizations like yours can capitalize on innovations in AI to stay ahead of the competition? Keep reading.

01.

The Real MVP: Real-Time Asset Management

Real-time data is now an essential component for optimizing asset performance and minimizing unplanned downtime. Real-Time Asset Management describes technology solutions that assist workers in completing their time-critical jobs with the entire body of knowledge they need at their fingertips, with a focus on speed, accuracy, and precision. With economic pressures and labor challenges mounting for manufacturers, adopting this emerging technology is imperative.

Key Stats & Drivers:

High cost of downtime:

Unplanned downtime costs manufacturer's $50,000 per hour on average. In many cases, it is much more. [2]

Potential savings:

Cutting downtime by just 10% could save $2.6 million annually for a plant with 520 hours of downtime. (the average manufacturer sees upwards of 800 hours of unplanned downtime per year) [3].

Rising AI adoption:

Over two-fifths (40%+) of industrial product manufacturers plan to increase AI and ML investments in the next three years [4].

02.

Workforce Knowledge Is Power

Even as labor markets loosen slightly, skilled maintenance technicians remain in short supply. A 2024 Deloitte/Manufacturing Institute study warns that nearly 1.9 million manufacturing roles could go unfilled over the next decade [5]. This gap arises as seasoned workers retire, leaving newer technicians with insufficient hands-on experience.

What's Driving This Trend:

Persistent talent shortage:

Up to 1.9 million unfilled manufacturing jobs by 2032 [5].

Rising compensation:

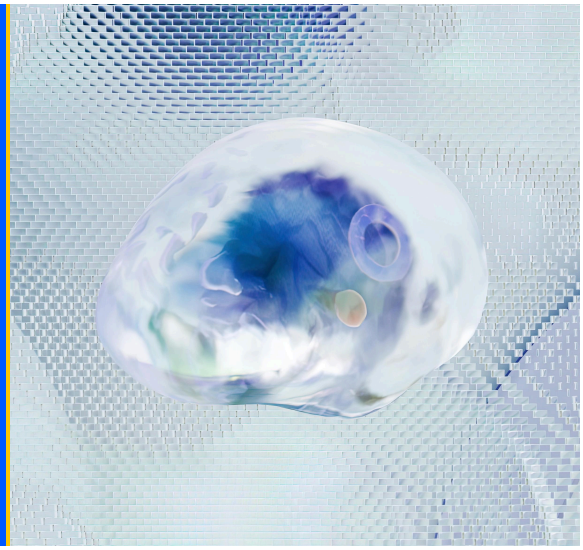
Total compensation in manufacturing has climbed 3.8% year-over-year [6], adding to cost pressures.

Time-consuming diagnosis:

Up to 80% of Mean Time to Repair (MTTR) is spent diagnosing issues [7], making quick knowledge access crucial.

Harness Tribal Knowledge with AI

By capturing and automatically surfacing critical know-how ('tribal knowledge'), AI can accelerate skill-building for new technicians, reduce troubleshooting times, and preserve institutional expertise.



03.

Predictive and Preventive Maintenance Mean Potential

Predictive maintenance continues to offer clear ROI potential - but simply getting alerts is only half the battle. By leveraging a condition-based monitoring (CBM) enrichment tool that pulls in contextualized data from multiple sources, you can arm your technicians to know exactly what to do given an alert - fast and accurate every time.

Use a CBM Enrichment Agent to unlock:

- **Up to 50% increase in MTBF.**

  Plants enriching their CBM systems have shown a 40-50% increase in mean time between failures on critical assets by pinpointing root causes faster.

- **Longer asset lifespans.**

  The wrong fixes can damage equipment and shorten the asset's lifespan. Targeted, preemptive repairs ensure you're getting the most of your machines

- **Smoother cash flow.**

  Fewer emergency repairs and more predictable maintenance schedules strengthen operational budgets.

A real-world example:

A facility that discovered every time their CBM system gave an alert, they were using the wrong lubricant on a critical bearing. Once an AI enrichment agent flagged the discrepancy in documentation and work orders, it helped the plant swiftly correct the mistake—avoiding dozens of hours of costly future downtime.

04.

Seamless Integration Across Platforms

Widespread adoption of AI hinges on smooth integration with existing systems, from enterprise asset management (EAM) to supply chain applications.

Manufacturers are increasingly turning to ‘agent’ architectures that complement rather than replace current workflows.

Why Smooth Integration Should Matter To You:

Minimized Disruption. Maximized Efficiency.

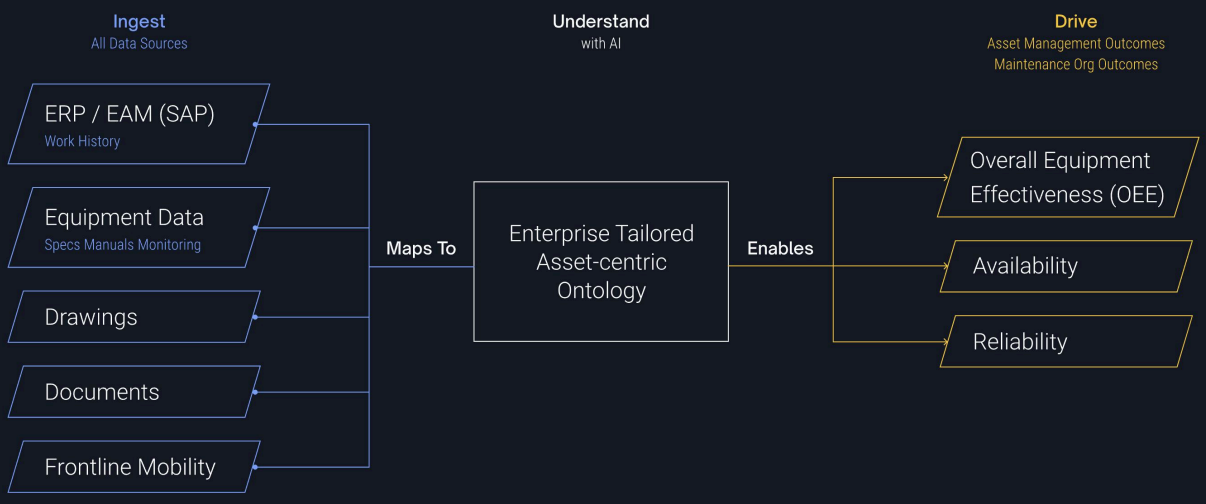
Flexible deployments allow teams to adopt AI without major overhauls to established processes.

Faster Time-to-Value. Fast-Track To ROI.

Leveraging existing data and platforms helps new AI solutions demonstrate ROI quickly.

Slicker, Quicker Collaboration.

Unified data streams enable cross-functional teams to share insights, improving decision-making.



05.

Learning Feedback Loops Leads To Operational Excellence

With greater demands for accuracy come greater demands from AI solutions. Technology applications that continuously refine their models over time are more necessary to invest in than ever before. These feedback loops use real-world data—repair logs, parts usage, technician notes—as well as SME-in-the-loop flows to enhance the accuracy and relevancy of AI outputs.

Prioritize Learning Feedback Loops To Achieve:

Ongoing Precision. Constant Improvement.

AI predictions and guidance become more accurate with every interaction or data point.

Higher Confidence. Better Results.

Field technicians gain trust in AI as they see more successful outcomes and clearer insights.

Compounding ROI. Up to 10x Returns.

Some organizations report up to 9–10x returns as AI-powered maintenance workflows get progressively better.

06.

Data Silos: A Disappearing Act

Although supply chain lead times have improved—average raw material delivery dropped to 81 days by October 2024—many manufacturers still struggle with fragmented data.

AI tools that unify work history, manuals, and inventory records can drive substantial efficiency gains.

Break Data Boundaries For:

Faster Troubleshooting.

In certain scenarios, technicians have seen a

90%

improvement in task efficiency by avoiding manual information hunts.

Cross-Department Visibility.

Centralized data reduces communication lags and fosters more agile responses to equipment issues

Strengthened Data Governance.

In one Deloitte survey,

70%

of respondents reported increased investment in data management to support AI strategies.

07.

Time to Prioritize Safety and Compliance

As policy changes loom following global and US elections, regulatory requirements could expand or shift significantly.

AI-based field support tools deliver real-time safety guidelines and compliance standards, reducing risk and potential fines.

Key Things You Should Know About:

Potential Policy Shifts Impacting Costs.

Changes to trade policy or revisions to the Inflation Reduction Act could affect manufacturers' cost structures.

AI Integrated Safety Protocols.

Gen AI can push relevant bulletins on safety and operational standards directly to technicians' devices.

Reduced Human Error.

Automated checkpoints and alerts help prevent oversights that lead to accidents or violations.

08.

ROI-Driven Maintenance Solutions

With input costs and wages still elevated, organizations are under increasing pressure to justify capital expenditures.

Solutions that reduce MTTR, minimize rework, and improve labor efficiency are top contenders for funding.

Real-Life ROI Metrics:

25% reduction in downtime.

When AI-driven maintenance alerts help address issues early.

Up to

90% improvement in task efficiency.

When AI-driven maintenance alerts help address issues early.

10.4x ROI

In scenarios where modest cuts in downtime translate into multimillion-dollar savings.

09.

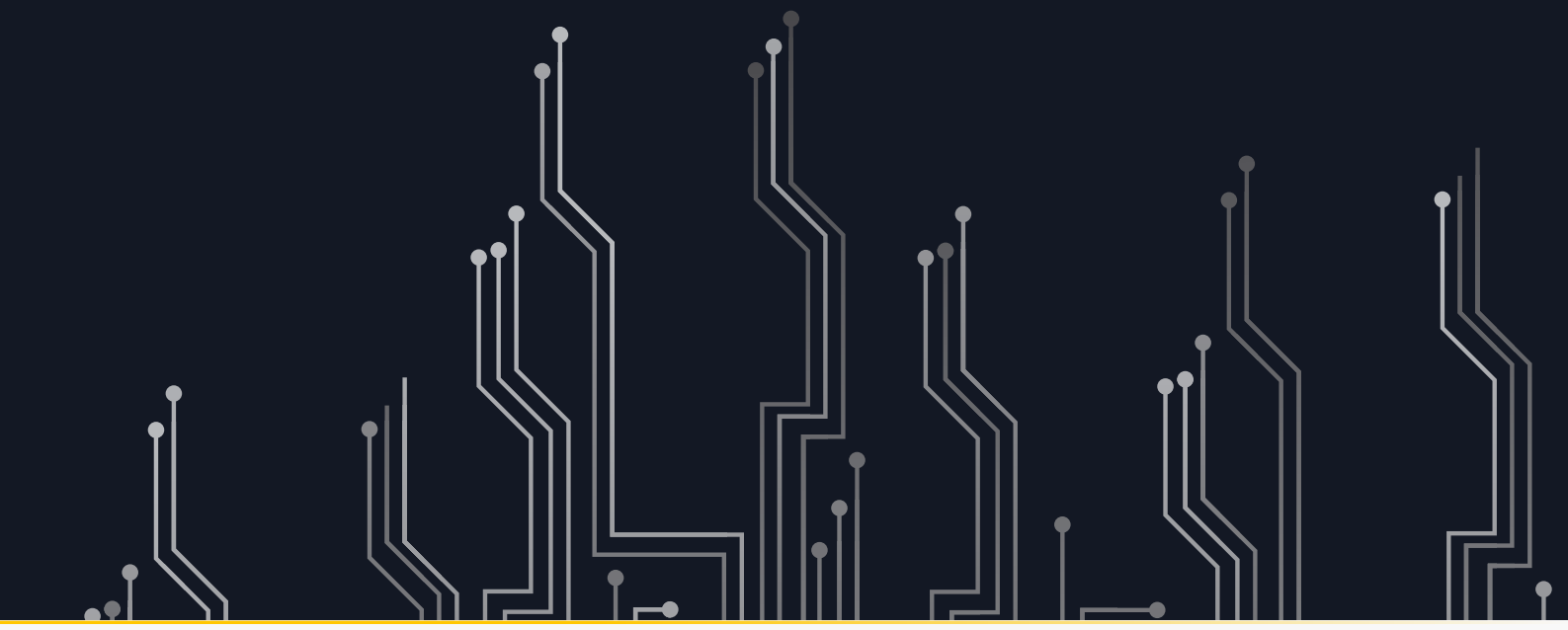
Field Teams Empowered with Mobile Solutions

Frontline teams need on-demand access to technical data and troubleshooting tips.

Mobile-optimized AI applications can dramatically shorten time to resolution, allowing technicians to scan a QR code, speak an error code, or reference critical schematics from anywhere.

How AI Can Ramp Up Your Resolution Time:

- **Immediate Guidance.**
  Apps deliver relevant parts lists, manuals, and historical records in seconds.
- **Lower Cognitive Load.**
  A single interface for data and instructions helps field workers focus on high-value tasks.
- **Permanent Knowledge Capture.**
  Quick note-taking and photo uploads help build a robust library of best practices, reducing future rework.



10.

Proactive Decision-Making With AI

Despite mixed economic signals—a potential resurgence in demand if interest rates dip or an intensified slowdown if labor markets continue cooling—AI can equip manufacturers with the agility to pivot.

What's Next For Manufacturers In Gen AI?

Targeted Investments.

Manufacturers are taking a measured approach to gen AI, focusing on high-impact use cases like product design, customer support, or maintenance.

Outcomes > Hype.

Survey data shows companies increasingly evaluate AI projects by traditional ROI metrics rather than "hype" alone.

Expanding Use Cases.

AI's footprint in manufacturing—from inventory optimization to demand planning—will likely grow as data quality and governance mature.

Key Takeaways for 2025

From balancing cost challenges and softening demand to leveraging AI-based maintenance solutions, manufacturers in 2025 are poised at a crossroads of risk and opportunity.

Real-time insights, predictive analytics, and carefully orchestrated digital workflows can help organizations reduce unplanned downtime, bridge the workforce knowledge gap, and improve compliance readiness.

Take Your Maintenance Operations to the Next Level

Stay ahead of the game and your competition in 2025.
Here's how:

Plan for Upswings.

With the possibility of lower interest rates, manufacturers may see renewed demand, calling for robust maintenance and AI strategies to handle production surges.

Stay Agile on Talent.

Even as labor pressures ease, 60% of manufacturers still cite workforce shortages as their number-one concern, highlighting the need for systematic knowledge capture and skill-building.

Focus on ROI.

AI adoption is increasingly driven by measurable benefits—faster repairs, better asset health, and streamlined operations all translate into meaningful savings.

Watch Policy Developments.

Potential trade and tariff changes could reshape raw material costs and supply chain strategies, making flexible, AI-based systems an even greater asset.

2025 and Beyond

By aligning strategic priorities with the 10 trends explored in this report, manufacturers can chart a course through uncertain times—positioning themselves for sustainable growth and technological leadership in the year ahead.

References

[1] S&P Global data (as cited in Deloitte analysis).

[2] Aberdeen Strategy & Research. (2016). The True Cost of Downtime.

[3] TeamSense. (2023). The High Cost of Downtime in Manufacturing & How to Reduce It [2024]

[4] Deloitte. (2024). Future of the Digital Customer Experience Survey.

[5] Deloitte & The Manufacturing Institute. (2024). 2024 Skills Gap in Manufacturing Study.

[6] US Bureau of Labor Statistics. (2024). Employment Cost Index (ECI) for total compensation in manufacturing.

[7] ReliablePlant.com. (n.d.). Root-Cause Analysis and Minimizing MTTR.