

Succeeding with Predictive Maintenance: How to Justify Technology Investments and Maximize ROI

Sponsored by:



Maintenance teams are the backbone of industrial operations, yet they often face the stress of unexpected breakdowns, emergency repairs, and long hours troubleshooting equipment failures. Predictive maintenance (PdM) empowers these teams by shifting maintenance from a reactive, high-pressure environment to a proactive, strategic approach. By leveraging real-time condition monitoring and advanced forecasting, PdM minimizes unplanned downtime, extends asset life, and streamlines daily operations—allowing maintenance professionals to focus on innovation rather than crisis management.

In a space where reliability and efficiency are paramount, building a strong business case for PdM is essential. This paper explores the hidden costs of traditional maintenance strategies, the measurable benefits of PdM, and the key steps organizations can take to justify and successfully implement this game-changing investment.

The High Costs of Reactive and Preventive Maintenance

The success of any manufacturing operation hinges on the reliability of its equipment. However, traditional maintenance strategies—reactive and preventive—often fall short of delivering the reliability, efficiency, and cost-effectiveness many organizations demand. Both approaches come with hidden costs and limitations that hinder progress and waste valuable resources.





Reactive Maintenance: Paying the Price of Unplanned Events

Reactive maintenance, or “run to failure,” might appear cost-effective because it involves fixing equipment only when it breaks. However, this strategy comes with substantial hidden costs including unplanned downtime. Depending on the industry and scale of operations, downtime can cost manufacturers thousands—or even millions—of dollars per hour in lost output and revenue. In addition to this, emergency repairs conducted under time pressure tend to be more expensive due to expedited shipping of parts, overtime labor, or reliance on external contractors.

These reactive scenarios also pose serious safety risks, as unexpected failures can create hazardous working conditions that increase the likelihood of accidents, injuries, or even fatalities. These incidents not only endanger workers but can also damage a company’s reputation and expose it to legal liabilities.

Moreover, running equipment to the point of failure accelerates wear and tear, ultimately shortening the lifespan of assets and leading to more frequent replacements. This cycle of inefficiency and unplanned expenses makes reactive maintenance an unsustainable approach for maintenance teams. While reactive maintenance may suffice for low-priority or noncritical assets, its unpredictability and costs make it unsustainable for critical equipment.

Preventive Maintenance: The Pitfalls of Scheduled Servicing

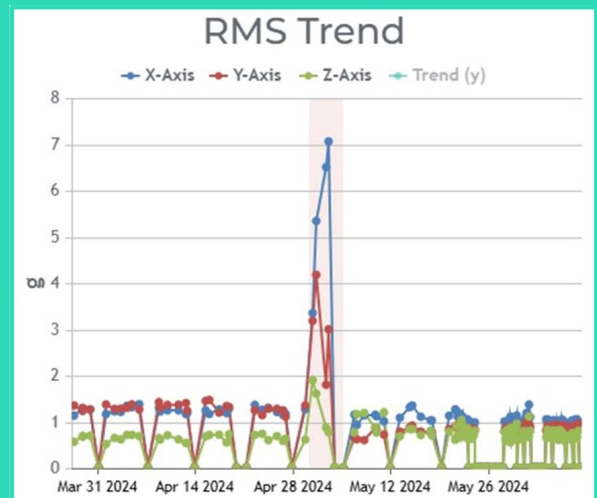
Preventive maintenance aims to address the limitations of reactive approaches by servicing equipment at predetermined intervals, offering a more proactive strategy to mitigate unexpected failures. However, it comes with several drawbacks. Scheduled maintenance often results in over-servicing, where work is performed on assets that are still operating within optimal conditions, wasting valuable resources such as labor, parts, and lubricants. On the other hand, because preventive maintenance relies on rigid schedules rather than real-time asset condition, it can miss emerging issues that develop between inspections, leading to sudden failures.

A preventive maintenance approach also inflates costs by servicing equipment that may not require immediate attention, eroding profit margins over time. Even planned downtime for routine maintenance can disrupt operations and reduce production capacity, particularly when assets are unnecessarily taken offline. While preventive maintenance is an improvement over reactive methods, its one-size-fits-all approach lacks the precision and adaptability needed to truly optimize asset performance.

The High Cost of Preventive: Rapid Changes Undetected

A food and beverage manufacturing facility averted a costly failure when RMS acceleration readings suddenly spiked on both of its compressor's ODE vibration monitoring points. Signs pointed to thrust bearing wear. The condition monitoring engineer assigned to the plant noted this and recommended an inspection and replacement, otherwise a shutdown within a few days to avoid further damage.

The maintenance team replaced the male thrust bearing on the ODE side of the compressor. Afterward, vibration readings returned to normal.



This rapid change was detected using continuous vibration monitoring and predictive maintenance technology. If the change had occurred between monthly preventive inspections, a sudden failure would have cost the plant an estimated **\$150,000 in both maintenance work and lost revenue due to stalled production.**



Why Predictive Maintenance is the Logical Next Step

Predictive maintenance (PdM) empowers maintenance teams like never before, leveraging advanced sensor technology to monitor equipment in real time and forecast potential failures before they occur. By focusing on the actual condition of assets rather than relying on scheduled servicing or waiting for breakdowns, PdM offers a range of benefits:

- **Early Fault Detection:** PdM uses data collected by sensors to identify early warning signs of wear, allowing teams to address issues before they escalate into expensive failures.
- **Resource Optimization:** Maintenance is performed only when necessary, reducing waste and avoiding the inefficiencies of overservicing.
- **Improved Reliability:** With PdM, manufacturers can lengthen the lifespan of critical assets and enhance overall productivity. PdM systems that combine multiple condition monitoring technologies in one pane-of-glass dashboard can show asset life extension, helping with capital planning of assets.
- **Cost Savings:** By addressing issues proactively, PdM reduces emergency repairs, labor costs, and parts expenses.

For organizations that want to stay ahead of the competition, PdM emerges as the next logical step in the evolution of maintenance strategies. Its data-driven, precise approach not only addresses the limitations of reactive and preventive maintenance but also sets the foundation for sustainable, long-term reliability.

Maintenance Strategy	Reactive	Preventive	Predictive
Approach	Fix equipment after it fails	Service equipment at scheduled intervals	Use real-time data to predict and prevent failures
Primary Goal	Restore functionality	Reduce the likelihood of failure	Prevent failures by addressing issues early
Trigger for Action	Equipment breakdown or malfunction	Predefined schedules based on time or usage intervals	AI and machine learning-generated alerts showing changes and anomalies in condition
Costs	High Includes emergency repairs, downtime, and overtime labor	Moderate Resources spent on routine servicing, even if unnecessary	Lowest Maintenance is targeted and efficient
Downtime	Significant and unplanned	Planned but may still disrupt operations	Minimal, with early detection allowing for optimal maintenance scheduling
Asset Lifespan	Shortened due to frequent failures and wear	Longer than reactive, but any increases may be offset by overservicing	Maximized by addressing issues before failure and ensuring peak asset health
Safety Risks	High Failures can lead to hazardous conditions	Reduced Lower risk/frequency of failures than with reactive	Low Failures are prevented before they become critical; hard-to-access equipment in unsafe areas are serviced only when needed
Resource Utilization	Inefficient Repairs are unplanned and labor intensive	Moderate Routine servicing often involves unnecessary work	Efficient Resources are used only when needed
Reliability	Low Issues left unaddressed and frequent breakdowns reduce machine reliability	Moderate Scheduled servicing reduces breakdowns but may miss emerging issues	High Proactive identification of issues prevents failures and minimizes wear, thus maximizing reliability
ROI	Negative Costs of repairs, replacements, and downtime outweigh operational savings	Neutral Cost savings from fewer breakdowns can be easily offset by overservicing	Positive Savings optimized through maximum uptime, performance, and production as well as maintenance efficiency

This table compares reactive, preventive, and predictive maintenance, showing how predictive strategies use real-time data to prevent failures, maximizing uptime and reducing costs.



Understanding the ROI of Predictive Maintenance

PdM brings substantial benefits not only in terms of financial savings, but also for the people who operate and maintain machines every day. At its core, PdM empowers maintenance teams by reducing the stress and unpredictability that come with unplanned downtime. By identifying potential issues before they become critical, technicians avoid the frantic rush of emergency repairs and are free to focus on long-term strategies and improvements instead. This shift leads to less burnout, a better work-life balance, and ultimately, a more satisfied, motivated, productive workforce.

Investing in PdM also delivers significant financial and operational benefits, far beyond just reducing direct repair costs. One of the most overlooked yet critical aspects of PdM's return on investment is its ability to prevent cascading failures across the production line.

When a single machine operates in a faulty state, it can negatively impact interconnected systems, placing undue stress on adjacent equipment and resulting in misalignment, increased wear, and even unexpected failures. For example, an overloaded motor compensating for a failing gearbox can experience accelerated degradation, increasing energy consumption and the likelihood of further breakdowns.

By leveraging continuous condition monitoring through vibration and oil analysis, maintenance teams can identify and address early warning signs before they create a chain reaction of failures. This proactive approach ensures:

- Machines operate at peak efficiency, reducing energy waste and minimizing performance bottlenecks.
- Secondary failures are prevented, avoiding pauses in production associated with multiple equipment repairs.
- Production flow remains stable, preventing delays that could impact order fulfillment, customer satisfaction, and revenue.

This holistic view of PdM's financial impact strengthens the business case for investment, proving that the cost of inaction is far greater than the cost of prevention.



Building a Business Case for Predictive Maintenance

Implementing PdM requires a compelling business case to secure buy-in from key stakeholders. A structured approach can help demonstrate the value of PdM and align it with organizational priorities. Here's how to build a strong business case:

1. Assess Your Current Approach

Begin by evaluating your existing maintenance strategy to identify pain points and opportunities for improvement. Consider the frequency and impact of downtime, the costs associated with emergency repairs, and any safety incidents linked to equipment failures. Highlight specific gaps in your current processes where PdM could deliver immediate value, such as reducing unexpected breakdowns or addressing recurring machine issues.

2. Define Clear Objectives

Establish measurable goals that align with your organization's goals and KPIs (see "Calculating the Value of PdM" chart below). For example, you might aim to reduce maintenance spending by 20%, increase equipment uptime by 15%, or achieve a significant reduction in safety incidents. Clearly defined objectives make it easier to demonstrate the tangible benefits of PdM and provide benchmarks for evaluating its success over time.

3. Quantify Savings

Break down the potential financial benefits of PdM by focusing on cost avoidance, efficiency gains (OEE, uptime, and throughput), and productivity improvements. Calculate the costs of downtime for critical equipment per hour or day, including potential revenue losses from unplanned downtime, to emphasize the potential savings. Similarly, estimate the expenses associated with emergency repairs or replacements that could be avoided with PdM.



4. Evaluate Total Cost of Ownership (TCO)

A thorough analysis of the total cost of ownership helps stakeholders understand the long-term value of PdM. Account for all expenses, including software subscriptions, hardware like sensors and gateways, employee training, and ongoing system maintenance. Compare these upfront and recurring costs with projected savings over time, such as reduced downtime, lower repair expenses, and extended equipment lifespan. This comparison illustrates how PdM can deliver a strong ROI despite initial investments.

5. Address Common Objections

Be prepared to tackle concerns that may arise during the decision-making process:

- **Initial Costs:** Emphasize the long-term return on investment, showing how PdM pays for itself through improved uptime and less frequent repairs.
- **Resistance to Change:** Highlight the inclusion of employee training and upskilling programs to ease the transition and build confidence in the new approach. Involve maintenance teams early in the process to secure their buy-in.
- **Data Security:** Address concerns about IoT devices and data integrity by showcasing robust cybersecurity measures to protect sensitive information.

By following these steps, you can present PdM not only as a solution to current challenges but also as a strategic investment that supports long-term growth, efficiency, and safety.

Calculating the Value of PdM Over Time: Key Metrics

Cost Savings & ROI	☒ Return on Investment (ROI) = (Total Savings - Cost of Implementation) / Cost of Implementation ☒ Total Cost of Maintenance (TCM) = Preventive + Corrective + Predictive Maintenance Costs ☒ Cost per Failure Event = (Downtime Cost + Repair Cost + Labor Cost) / Total Failures ☒ Reduction in Emergency Maintenance Costs = Baseline vs. Post-Implementation ☒ Reduction in Overtime Labor Costs = Overtime Hours Saved × Hourly Rate
Equipment Performance & Reliability	☒ Mean Time Between Failures (MTBF) = Total Operating Time / Number of Failures ☒ Mean Time to Repair (MTTR) = Total Downtime / Number of Repairs ☒ Asset Uptime (%) = (Total Operating Time / Total Available Time) × 100 ☒ Failure Rate (%) = (Number of Failures / Total Assets) × 100 ☒ Reduction in Unplanned Downtime = Downtime Before vs. After Predictive Maintenance
Production & Operational Efficiency	☒ Overall Equipment Effectiveness (OEE) = Availability × Performance × Quality ☒ Planned vs. Unplanned Maintenance Ratio = Planned Maintenance Hours / Total Maintenance Hours ☒ Capacity Utilization (%) = (Actual Output / Maximum Possible Output) × 100 ☒ Throughput Increase (%) = (New Throughput - Baseline Throughput) / Baseline × 100 ☒ Reduction in Maintenance-Related Production Delays
Safety & Compliance Metrics	☒ Reduction in Safety Incidents = Incident Count Before vs. After Implementation ☒ Reduction in Regulatory Non-Compliance Events ☒ Audit Pass Rate (%) = Number of Passed Audits / Total Audits × 100
Inventory & Spare Parts Management	☒ Reduction in Spare Parts Inventory Holding Cost ☒ Reduction in Urgent Spare Part Orders ☒ Inventory Turnover Rate = Cost of Goods Sold / Average Inventory Value
Environmental & Energy Efficiency Metrics	☒ Reduction in Energy Consumption per Asset ☒ Reduction in Carbon Footprint (CO2 Emissions Saved) ☒ Waste Reduction from Equipment Failures
Predictive Maintenance Effectiveness Metrics	☒ Accuracy of Failure Predictions (%) = Correct Predictions / Total Predictions × 100 ☒ Reduction in False Positives & False Negatives ☒ Reduction in Unnecessary Maintenance Interventions



Best Practices for Ensuring High ROI from Predictive Maintenance Investments

Implementing predictive maintenance (PdM) can yield significant benefits, but achieving a high return on investment (ROI) requires a strategic and thoughtful approach. By following these best practices, organizations can maximize the impact of their PdM programs.

Start Small

Launching a full-scale PdM program across an entire operation can be overwhelming. Instead, focus on implementing pilot programs targeting the most critical assets—those whose failures would result in the highest costs or production disruptions. By starting small, organizations can demonstrate the value of PdM with measurable results without needing to monitor many assets. This phased approach also allows teams to gain experience with the tools and processes before scaling up to include additional assets.

Integrate Systems

To maximize the ROI of predictive maintenance (PdM), integrating it with existing Computerized Maintenance Management Systems (CMMS) or Enterprise Resource Planning (ERP) platforms is crucial. A well-integrated PdM system streamlines workflows, eliminates redundant tasks, and ensures maintenance actions are effectively executed.

Prioritize Training

A predictive maintenance program is only as effective as the people operating it. Training is essential to equip maintenance teams, engineers, and managers with the skills and knowledge needed to interpret data, respond to insights, and fully leverage PdM tools. This includes understanding how to use sensors and analytics platforms as well as integrating PdM data into day-to-day workflows. By investing in upskilling employees, organizations can ensure the program's success and foster a culture of continuous improvement.

Optimize Over Time

Predictive maintenance is not a “set it and forget it” solution. To maximize ROI, organizations must regularly evaluate their PdM strategy and make adjustments based on data and feedback. This includes scaling the program, performing RCA to identify the cause of frequent alerts, and addressing any gaps or inefficiencies in the process. A continuous improvement mindset ensures that the PdM program evolves alongside business needs and technological advancements, maintaining its value over time.

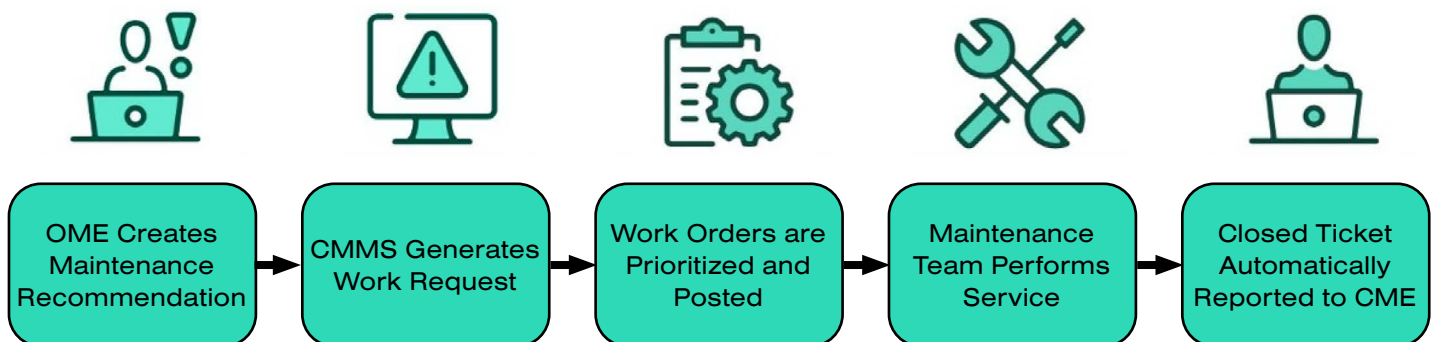
End-to-End Condition Monitoring: AssetWatch's Game-Changing Service Model

AssetWatch is leading the shift to predictive maintenance with its end-to-end condition monitoring solution. By continuously tracking vibration and temperature data on critical equipment through Vero® remote sensors, AssetWatch helps maintenance teams detect early signs of wear and potential failures before they escalate.

AssetWatch puts expert support at the forefront, dedicating Condition Monitoring Engineers (CMEs) to every customer to analyze real-time equipment data and provide prescriptive recommendations to maintenance teams. AssetWatch's condition monitoring platform, powered by AI and ML, continually scans data points across industries and assets. CME experts work directly with maintenance and reliability leaders at both the facility and corporate level to ensure insights are translated into timely, data-driven actions and ROI.

AssetWatch also provides seamless integration with CMMS platforms, simplifying operations by eliminating manual data entry and ensuring that predictive insights translate into actionable work orders.

- When an issue is detected, AssetWatch automatically reports it to the CMMS, creating a maintenance recommendation.
- These recommendations are prioritized, generating work orders that guide the maintenance team's actions.
- Once the service is performed, the event is closed and logged back into the system, maintaining a complete maintenance history without extra administrative work.



By combining advanced sensor technology, expert analysis, and a centralized platform that integrates with existing systems, AssetWatch provides maintenance teams with clear, actionable insights to optimize maintenance schedules, extend asset life, and reduce equipment failure. Organizations that actively monitor and respond to AssetWatch alerts can transform their maintenance strategy—shifting from reactive firefighting to proactive problem solving.



In-House vs. Partnered Solutions: Comparing Costs, Savings, and Speed to Value

When comparing in-house solutions with partnered solutions, an end-to-end managed service offers significant advantages. An end-to-end managed service can provide a comprehensive solution that eliminates many of the complexities and costs associated with in-house implementations.

For example, a managed service solution might include critical components such as sensors, gateways, installation, system maintenance, condition monitoring, software, and data storage in one streamlined package at a low monthly subscription rate. This contrasts with in-house wireless and wired solutions, which often involve significant upfront investments on the required elements as well as reliance on internal resources. In-house solutions frequently require extensive engineering and IT efforts as well, leading to delays and higher implementation costs.

Time to deployment can be a major factor as well. Whereas an end-to-end solution can be operational in as few as 1–2 days, in-house solutions typically take 1–2 years to deploy, delaying the realization of ROI. An end-to-end solution is also designed to scale easily without the need for additional infrastructure or personnel, while in-house options require significant effort and expense to expand.

Additionally, the human resources needed to manage an in-house solution can be substantial. In-house wireless and wired systems require 2–3 full-time employees with vibration expertise, which adds to the overall price of implementation. In contrast, a subscription service might include dedicated expert support, effectively extending maintenance and reliability teams without incurring hiring and training costs.

By bundling technology, expertise, and scalability into one solution, an end-to-end managed service not only reduces the financial burden but also simplifies the implementation and maintenance of condition monitoring systems. This ensures faster ROI and frees up internal resources, allowing companies to focus on their core operations rather than the complexities of system management.

Predictive Maintenance in Action

Predictive maintenance isn't just a theoretical advantage—[it delivers tangible results](#) across various industries. The following case study showcases how a glass manufacturer successfully used AssetWatch's end-to-end condition monitoring solution to avoid production disruptions. By acting on data-driven insights, they prevented failure and saved \$300,000.



Another case study highlights the power of combining vibration analysis with oil analysis. Elevated vibration data indicated potential issues in a rolling mill gearbox, prompting an oil sample analysis. The results revealed excessive wear metals, high particle count, and water contamination—key indicators of lubricant breakdown.



By integrating both condition monitoring techniques, the team identified a leaking input seal and low oil levels before catastrophic failure occurred. Replacing the seals and changing the oil helped the customer avoid a gearbox replacement, saving \$50,000.



Bottom Line: The Strategic Value of PdM Investments

Predictive maintenance is more than a cost-saving tool; it is a strategic investment in long-term reliability and sustainability. By reducing unplanned downtime and extending asset life, PdM empowers manufacturers to remain competitive in an increasingly demanding market. Taking the first step—whether through a pilot program or consulting a reliable PdM partner—ensures a more resilient and sustainable future.

Get Started with **AssetWatch**

Vibration and Oil Analysis Solutions – All in the Same Platform

Experience the transformative impact of leveraging machine learning and artificial intelligence to strengthen your maintenance strategy with AssetWatch. AssetWatch is a turnkey partner in predictive maintenance, from software, to hardware to expertise. Truly own your machine health data, all in one place, with the help of condition monitoring engineers that will turn your data into prescriptive insights and maintenance recommendations.

Get started today.