

WHITEPAPER

Leveraging the Industrial Internet of Things to Transform Maintenance and Reliability



PROMETHEUS GROUP



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The Industrial Internet of Things (IIoT) is transforming the way companies conduct business. By adding automation and machine learning to traditional asset maintenance practices, IIoT is revolutionizing the way organizations are approaching maintenance and asset management.

This paper will outline the synergies, challenges, and opportunities for IIoT in maintenance organizations, and how connecting assets with tools like Prometheus IIoT can bring new life to asset management and the bottom line.

What is IIoT?

IIoT relies on collecting data, doing analysis on the data, predicting events based on that data, and taking actions accordingly. IIoT optimizes the decision-making process by connecting sensors, control systems, smart technologies, mobile devices, and software solutions.

Grounded in the digitization and automation of industry, IIoT relies on machine-to-machine communication for data collection and advanced analytics supported by machine learning.

The sheer volume of sensor data poses a new challenge for companies.

The core of IIoT is the automatic gathering and sending of data to a centralized data historian. Because so many assets are equipped with sensors, companies are facing a new challenge of managing and utilizing the sheer volume of data being generated.

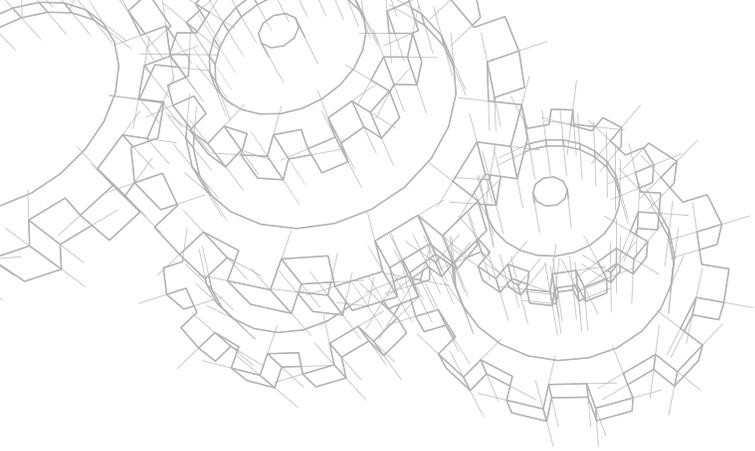
A data historian consuming hundreds of thousands or even millions of records from sensors makes conducting analysis and coming to actionable conclusions highly challenging. Companies must choose where to focus efforts.

Connections Between IIoT and Asset Maintenance

Maintenance is data-driven, with each decision weighing asset and work histories against current operating and environmental conditions. Historically, there has been a disconnect between maintenance and reliability systems, with work order information being held in one location and sensory data held in another. One side does not always have access to the other and vice versa. IIoT brings them together.

Deploying IIoT in maintenance environments allows the condition of assets to be electronically monitored by their attached sensors, whether installed by the original manufacturer or added later as part of a predictive maintenance program. Automation of manual inspection and data collection processes improves timeliness and frees resources for other work. IIoT also allows for more robust reliability-centered maintenance (RCM) programs with analysis of assets that were not previously monitored.

Commonly connected systems in IIoT systems include enterprise resource planning software, data historians, machine condition sensors, mobility solutions for field connectivity, and email servers for sending notifications. EAM, CMMS, and reliability software are natural extensions.



The Impact of IIoT on Maintenance

IIoT reduces asset failures and unplanned downtime by alerting maintenance teams immediately of issues that need attention. Analysis is simplified and decisions are better coordinated by correlating maintenance and reliability system information. Corrective actions can be applied in real time on the plant floor.

Whether the full promise of IIoT is realized depends on how the solution is implemented. Unfortunately, initial IIoT implementations in maintenance organizations are often incomplete, with sensors capturing large volumes of data that are not fully utilized. The missing link results in work processes that require manual intervention. The following is a common scenario:



A sensor monitoring a bearing's temperature will collect streams of real-time temperature data as it rises and falls during the course of a day. This data is fed to the data historian. An event is raised if the temperature recorded is too high.



Someone needs to find the event on an alert board or dashboard, evaluate the priority, determine whether a work order for this condition has already been entered, and create a new work order in the system if needed.



The outcome of the completed work order is stored only in the EAM/CMMS. It is not passed back to the data historian.

A more complete IIoT implementation looks like this:

A sensor monitoring the bearing collects real-time temperature data throughout the day and feeds it to the data historian. An event is raised if the temperature rises too high.

The temperature data passes through the data historian to an IIoT software solution, triggering a workflow that makes work order decisions based on set temperature thresholds:

- A low-level alert serves as an early warning and triggers an inspection work order.
- Mid-level alerts generate a preventive or predictive maintenance work order that can be scheduled for a planned outage.
- A high-level alert will generate an emergency work order, indicating the temperature condition is now critical, bearing failure is imminent, cascading equipment failure is likely, and maintenance is required immediately.

The system automatically sends notifications to the appropriate maintenance personnel to schedule and complete the work.

Failure codes and other details are automatically sent back to the historian when a work order is closed in the EAM or CMMS. This gives big data analytics teams knowledge of what work was done on each high-temperature event and why.

The latter scenario is possible with IIoT solutions like Prometheus IIoT. Complex workflows and additional what-if analyses set up in the solution fuel automated decision-making, which saves time and labor. It knows whether to escalate an existing work order by changing its priority, or create a new routine or emergency work order, thus avoiding duplicates. Two-way integration between the EAM/CMMS and the historian keeps both systems up-to-date and enables continuous improvements in machine learning and analytics quality.

Tremendous Savings Potential

With a solution like Prometheus IIoT, a major fertilizer company estimated it could save 12 to 15 days per year of lost production, representing millions of dollars in annual savings. The company had been experiencing four or five compactor bearing failures each year, and each failure caused roughly three days of downtime for equipment repairs.

With a solution like Prometheus IIoT, a major fertilizer company estimated it could save millions of dollars in lost production time.

The company's reliability engineers already knew from analysis that when a bearing starts to heat up, they have 12 hours to fix it before failure. The bearing will fail and take production down if the problem is not caught and corrected within the 12-hour window. Manual inspections of the bearing temperatures were inadequate, as it was not feasible to conduct the manual process at short enough intervals. As a result, some failures were inevitably missed.

Now, the fertilizer company is pushing its compactor bearing temperature readings into their data historian, and alerts are sent automatically to Prometheus IIoT as the temperature starts to rise. Predictive maintenance work orders are automatically being generated in their EAM/CMMS and then escalated if the readings continue to rise. With more timely insight into compactor bearing conditions, failures are prevented, and downtime costs and production losses are avoided. Closed work order information is passed back to the historian, enabling continuous improvement.

Similarly, another company had a piece of equipment that would fail if the oil levels dropped too low.

*The cost of a single failure of that one piece of equipment was about **\$300,000.***

With Prometheus IIoT installed and workflows properly configured, the company can be alerted when the oil level moves below a specified threshold, allowing sufficient time to make corrections and avoid failure.

Inventory and procurement processes also benefit from this approach. If it is known that a given breakdown event will necessitate a certain new part, Prometheus IIoT can be set up to automatically generate a purchase order for that part at the exact moment the breakdown occurs. The result is a shorter mean time from failure to when the new part is on hand, allowing just-in-time maintenance that minimizes production downtime.

Challenges and the Future of IIoT

For IIoT technology to have its intended effect, certain challenges must be understood and addressed.

- 1. You can't predict anything from bad data.** Bad or incomplete data is useless. A level of commitment is needed to improve the data, and it starts with entering failure codes in the work orders, because it is impossible to predict a failure if you don't know the reason for the last one. Mobile devices make it easy to enter the data while the information is still fresh in the technician's mind.
- 2. Don't put the cart before the horse.** If you're not using sensors to collect real-time data, then you are not ready to leverage IIoT capabilities.
- 3. Where are sensors most needed?** Focus on equipment that is most at risk. The most critical assets are those whose downtime have the greatest negative impact on an organization. These are prime candidates for sensor-based monitoring. Conduct a formal criticality analysis to help to narrow down the options or enlist third-party assistance.



4. Finding the relevance between sensor data and maintenance data. Actively using edge devices and collecting hundreds of thousands of data points is no guarantee of success. A global aluminum company found it impossible to correlate events happening in their historian to events happening in their EAM/CMMS until they installed Prometheus IIoT, which connected the solutions with a two-way interface.

5. How well do you know your equipment? Defining workflows for IIoT requires a sophisticated understanding of equipment behavior relative to its application and physical environment. In these environments, big data analytics, machine learning, and artificial intelligence become more important. Further IIoT opportunities for asset management efficiency can be expected. We envision a future where technicians will waste less time waiting to witness symptoms that are dormant during inspection or closing work orders prematurely due to a lack of evidence. From their mobile device, they'll be able to initiate a series of condition monitoring tests on the equipment, and then move on to other responsibilities while waiting for the symptom to reappear. They will be notified automatically when data and analytics are available to assess and correct the problem.

How IIoT Affects Business Goals

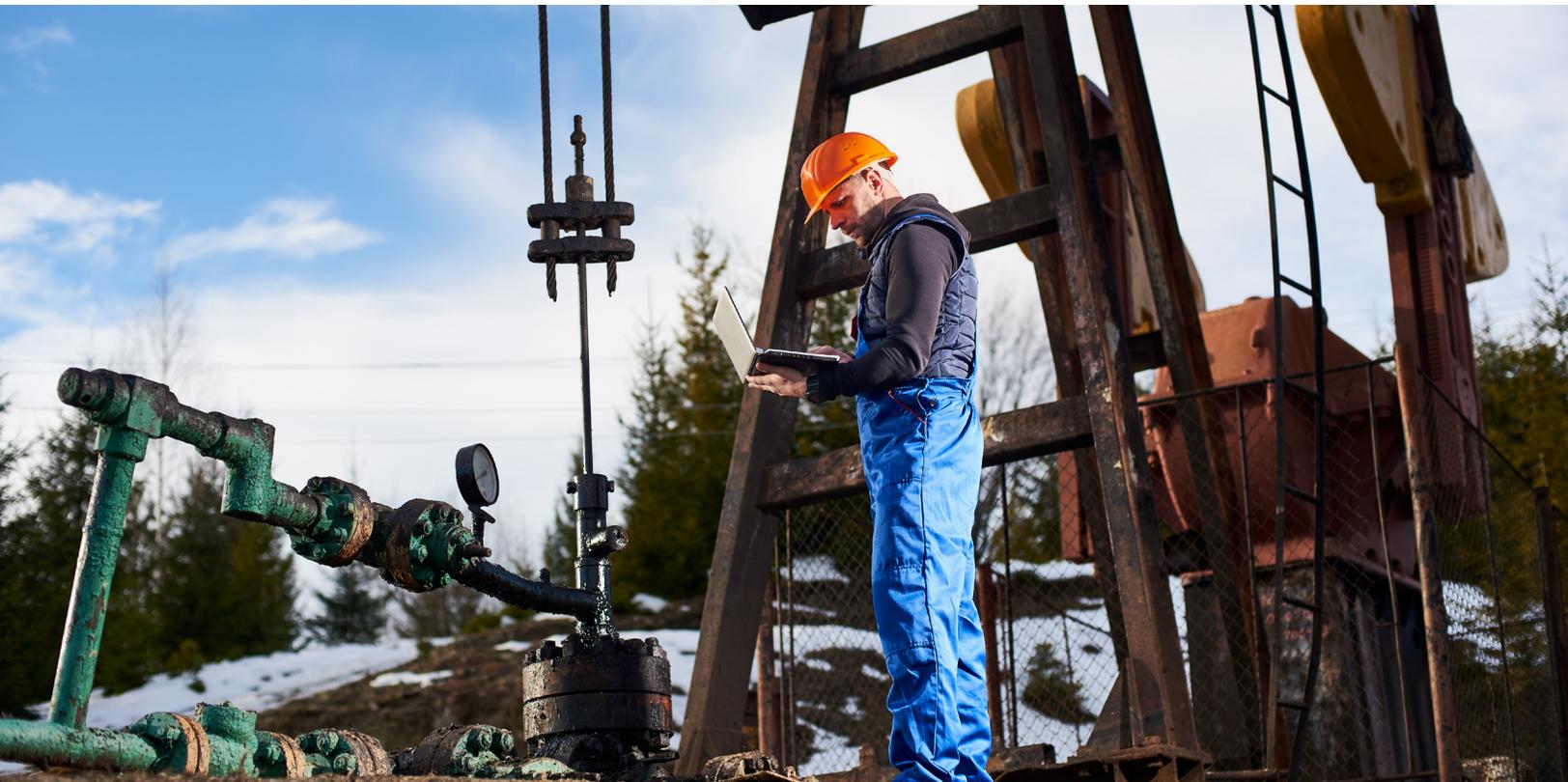
Maintenance organizations worldwide are responsible for ensuring company assets are running at peak performance to meet production requirements. The sheer volume of incoming sensor data can create challenges for a company.

IIoT has the potential to change the way businesses operate every day. IIoT promises a predictive rather than reactive maintenance program. It is a once in a lifetime business disruption that incites new capabilities and promises new opportunities. Companies are leveraging connected devices to:

- Reduce failures and downtime
- Increase savings
- Optimize productivity
- Erase departmental and industrial boundaries

Regardless of the industry, IIoT and its connected sensors and devices are revolutionizing asset management.

In addition to driving productivity and business growth, IIoT also has the potential to fundamentally alter the work experience.



Connecting Reliability and Maintenance

There is often a disconnect between maintenance and reliability professionals, but IIoT technology has the potential to bridge the gap.

Maintenance tends to be focused on routine inspections and fixing problems that occur, whereas reliability personnel proactively avoid downtime with RCM, predictive technologies, and failure analysis. Reliability professionals operate best when they have access to both maintenance and historian data. Prometheus IIoT is a niche application that links this information, improving the quality of reliability-based analytics and delivering tremendous return on investment.

Ease of Implementation Drives Success

Prometheus IIoT is very practical. Its quick install, ease of use, and rapid evidence of ROI help end users to justify its adoption.

With Prometheus IIoT, connections to multiple systems are easily managed, whether it's more than one production system, a test EAM/CMMS instance, or a mail server for email notifications. It is open-ended middleware that connects to any system that would push an event to a web service, like historians to an ERP solution and vice versa. On a technical level, it can listen to any web service and write to any web service or stored procedure.

Prometheus IIoT quickly and easily connects your data historian and your ERP.

Reusable templates make it easy to create workflow actions. Complex workflows can be built to make decisions based on a variety of conditions found in event and EAM/CMMS system data. Multiple integrated dashboards added in Prometheus IIoT allow each user to see only what is important to them.

Prometheus IIoT is also fully integrated with Prometheus (VIZIYA) scheduler and mobile products, further simplifying maintenance and reliability efforts, and extending the value of the IIoT solution. The integrated Prometheus Planning & Scheduling (VIZIYA) immediately alerts schedulers when a new work order has been generated and provides predictive insights by sending notification of which assets require maintenance. Prometheus Mobility sends push notifications instantly to technicians when IIoT events are triggered and allows technicians to update the maintenance status directly from their mobile device, as well as block new work events for assets undergoing planned maintenance.

IIoT solutions like Prometheus IIoT present a unique opportunity for industrial organizations to increase efficiency and boost the bottom line.

Learn more about how Prometheus Group can help your organization today.

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About Prometheus Group

Prometheus Group is a leading global provider of comprehensive and intuitive enterprise asset management software solutions that work within ERP systems and span the full work management life cycle for both maintenance and operations. Developed jointly with end users, Prometheus software enhances the customer experience for planning, scheduling, and executing work for both routine maintenance and shutdowns and turnarounds, all while protecting the workforce with safety solutions and electronic permit to work. Our straight-forward functionality, graphical visualization, and simple processes enable customers to increase productivity, reduce costs, and improve reporting. For more information, please visit www.prometheusgroup.com.