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Gaining Visibility Into Asset Performance

White Paper

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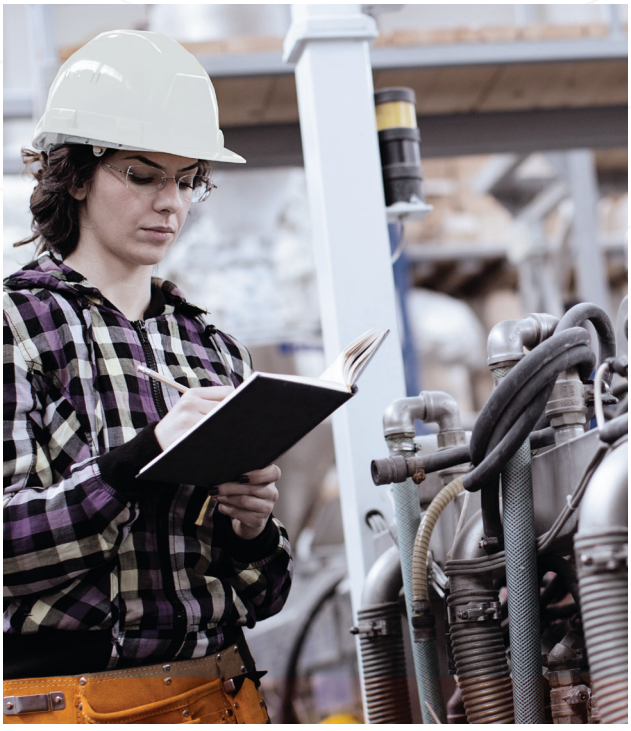
Refineries, petrochemical facilities, power producers, and oil and gas companies have always been concerned with the health of their assets because equipment performance has a direct impact on their operations.

Over the years, there have been a variety of ways to monitor asset health, but only recently have technologies like wireless connectivity, artificial intelligence (AI) and predictive algorithms taken these abilities to new heights. Today, companies have deeper insights into how their equipment performs; by using these insights, they can make more informed decisions to improve operational efficiency, productivity and safety.

But that wasn't always the case. Let's take a look at the evolution of asset health management technology and how it has changed over the years.



Walk-arounds and manual inspections

One of the most basic approaches to monitoring asset health required maintenance is for technicians, often employed by third party suppliers, to walk around the plant premises and manually inspect each asset. Given that the average plant has 5,000 assets, maintenance teams are continually inspecting assets because as soon as they complete one inspection cycle, it is time to begin the next one.

- Walk-arounds only provide a basic snapshot of an asset's performance at a specific time frame (i.e., on the day it's inspected). For example, an asset might be working correctly when a technician checks it on April 2, only to experience a problem on April 7. Because of the plant's labor-intensive data collection process, this asset won't be rechecked until May 2 — leaving a lot to go wrong between inspections.
- Maintenance technicians are spending an inordinate amount of time evaluating healthy equipment.
- Manually recording asset performance also creates data backlogs because of the vast amount of data collected. Plants don't have the resources to interpret all of the data. Up to 90 percent of the information gathered from manual inspections is never analyzed or is analyzed only after a failure determines the cause.

Factor in a higher likelihood of human error, data inaccuracies and inconsistent results, and it's easy to see why plants are looking for a better way to gauge equipment health.

Equipment sensors pinpoint failing equipment

Equipment sensors represented a huge step forward for asset health management because they eliminated one of the drawbacks of manual inspections: spending so much time evaluating healthy equipment. Sensors attached directly to asset used color-coded indicator lights to alert technicians of assets that were not operating within normal conditions. If its light was on, the technicians knew to stop and evaluate that asset. That entailed removing the sensor and using a handheld device to download asset performance data for later review. If the sensor was not indicating a problem, the technician could continue onto the next asset. By manually inspecting only those assets which showed problems, technicians saved hundreds of hours, which they could spend focusing on failing assets, not healthy ones.

Although first-generation equipment sensors created significant efficiencies, they also had drawbacks:

- No wireless connectivity
- Technicians had to pull the sensor from the asset and physically download the data.
- They then uploaded the data into a central hub so a reliability engineer could review the data and hopefully determine the issue.

These sensors still required a lot of manual work for reliability engineers to diagnose asset issues, but plants were a step closer to getting more visibility into their asset performance.

Adding wireless connectivity to equipment sensors

The next step in the evolution of asset health management technology included adding Bluetooth® wireless connectivity to equipment sensors.

Because Bluetooth has a limited range, these new capabilities didn't stop site walk-arounds, but it did eliminate the need for maintenance technicians to pull sensors and manually download performance data at each asset. With this advancement, when maintenance technicians passed within range of a "tripped sensor," they could immediately download equipment performance data to a mobile device using an app. Within the app, they could see the asset's current pressure, fluid, temperature, vibration and other conditions.

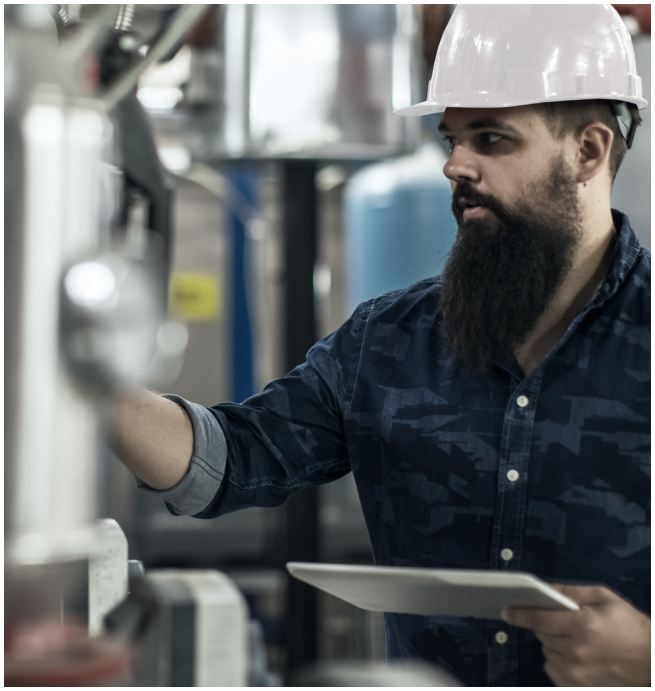
Maintenance technicians could also "push" this data to a portal where reliability engineers could further analyze it for insights.

While Bluetooth-enabled sensors offered significant efficiency improvements and immediate visibility into asset performance, they, too, had disadvantages. Anyone with a mobile device understands how quickly Bluetooth technology can drain a device's battery, and Bluetooth-enabled sensors were no different. The internal battery in these devices drained very quickly; since there was no external battery, once it was depleted, maintenance technicians had to install new sensors.

To overcome this challenge, rotating equipment OEMs developed sensors with removable batteries, so maintenance technicians could swap out dead batteries without changing the entire sensor. The addition of external batteries created a step change in asset health management by providing reliability engineers with a sustainable way to see which assets were experiencing a problem and gave them time to react to the problem before it caused a failure.

But for all the benefits Bluetooth-enabled sensors provided, catching performance issues early was still directly tied to a maintenance walk-around schedule. There was no way to know there was a problem unless a technician was within range of the asset.

What happened next changed that.



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Remote wireless monitoring brings a steady stream of data

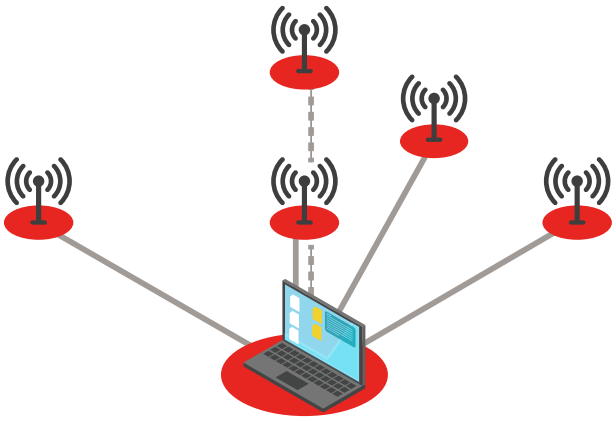
Remote wireless monitoring offered significant benefits compared to previous technologies. By installing remote wireless sensors on equipment, there was no longer a need for maintenance technicians to walk the plant checking for indicator lights or worrying about staying within “wireless range” of assets. Instead, remote wireless sensors streamed asset vibration, temperature and pressure information to a portal or database every 15 minutes, 24/7.

- ✓ The ability to capture a steady stream of information in real time meant operators no longer had to wait for scheduled walk-arounds. Reliability engineers could now set alerts, so they knew the exact moment an asset's performance dipped below a pre-defined threshold.
- ✓ Reliability engineers could also easily review performance over time, looking for trends and slight changes in conditions that could indicate a future problem.
- ✓ Plant operators could also use this data to make more informed decisions about plant-wide reliability improvements.

Transmission distance was also improved. Whereas previous sensors that used Bluetooth technology required maintenance technicians to be within 50 feet to download data, remote wireless monitoring sensors boosted that distance to three-quarters of a mile. Adding a signal repeater expanded that distance to a mile and a half, which meant plants could monitor all of their assets from one central location.

Remote wireless monitoring improved asset health management beyond any other technology available, but one question lingered: How can operations shift from a reactive approach to a proactive approach?

What came next would change asset health management forever.



Wi-Fi and boosted wireless networks

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From reactive to predictive analytics

Asset health management is all about identifying problematic equipment and fixing these assets before they create downtime and productivity losses.

Predictive analytics capabilities combine two critical aspects of equipment monitoring — innovative equipment sensors and algorithms that interpret data — to tell you when your equipment will fail, why it will fail, and what you can do to prevent it.

Predictive analytics can achieve this foresight because customers will receive near real-time critical asset monitoring, critical failure mode analysis, remaining time to maintenance, configurable trending reports, efficiency and performance optimization curves, customizable alerts and alarms.

Advanced algorithms can interpret equipment data to look for signs of a future issue and tell reliability engineers when their equipment will fail, why it will fail, and what they can do to prevent it. Now, operations can have a clear understanding of their equipment's remaining life, most likely failure modes and recommended actions — so they can take preventive action to respond to adverse equipment conditions before they impact their operation.

Many operations are wading into the predictive analytics pool slowly, reserving the technology for critical assets, such as between bearings, overhung, vertical and high-energy pumps. For non-critical, balance-of-plant assets, they are using remote wireless or enhanced condition data point monitoring to keep equipment up and running.

Always evolving

Asset health management technology is always evolving. Companies like Flowserve continue to develop innovative sensors, software, signal communication, analytics, cloud storage and remote monitoring technology to help technicians proactively monitor their assets.

About the author

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As a graduate of the University of North Carolina, Shashank has spent time learning and mastering the IoT industry. His years of experience and passion for innovation are unmatched. His expertise is leading Flowserve into the future of IIoT.

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