



The power of predictive maintenance

Four use cases demonstrate how real-time insights into legacy assets minimize downtime and lower costs

White paper | October 2020

automation.omron.com

Introduction

Unplanned machine downtime is a huge headache for the business sector. In 2016, the Aberdeen Group found that these events cost companies an average of \$260,000 per hour – a 60% increase over its 2014 survey. While Aberdeen hasn't published any further updates, it seems likely that ongoing problems – including pain points like aging infrastructure, skilled worker shortage, and recent societal disruptions – are continuing to drive up operational costs by reducing equipment availability.

In manufacturing, plant operators are tackling unplanned machine downtime by migrating from preventive maintenance to predictive maintenance. Unlike preventive maintenance, which is performed according to a schedule that reflects historical events, predictive maintenance monitors asset condition in real time and prompts interventions before failures disrupt production. Advances in sensors, analytics, and communication technologies are making predictive maintenance increasingly practical and affordable for small, medium, and large manufacturing companies.

This white paper discusses the ways in which a solid predictive maintenance strategy backed by state-of-the-art technologies can help manufacturers stay ahead of equipment problems and minimize downtime. Four use cases are provided to help guide decision makers and define work efforts and budgets.



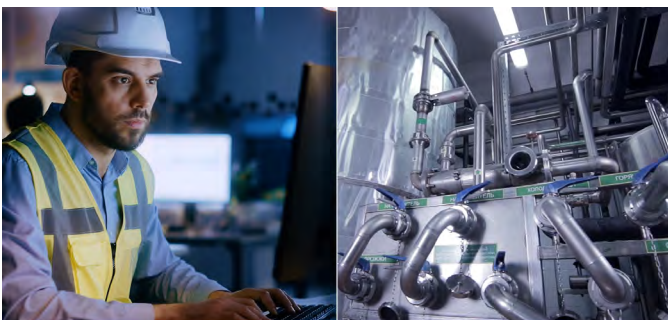
Contents

Using online monitoring and artificial intelligence to optimize efficiency.....	4
Developing a plan that delivers significant results in less time.....	5
Use case 1: Electric motor condition monitoring.....	6
Use case 2: Recirculating pump condition monitoring.....	7
Use case 3: Hydraulic system condition monitoring.....	8
Use case 4: Power supply with onboard monitoring.....	9
Summary.....	10

Using online monitoring and artificial intelligence to optimize efficiency

While predictive maintenance may seem unfamiliar, the strategy actually employs well-understood methodologies to replicate the analyses of skilled maintenance engineers. Once these analyses are entered into an algorithm, predictive maintenance solutions use artificial intelligence (AI) software to monitor assets and generate alerts when unusual conditions, such as abnormal vibrations or high temperatures, are detected.

Adding sensors to key assets and accumulating data on how they perform provide both immediate and long-term benefits. Plant operators are able to eliminate time-consuming maintenance and inspection activities, minimize quality defects, and strengthen safety and security measures. Ultimately, any insights derived from the data will allow manufacturers to correlate machine behavior with events on the factory floor. This analysis helps companies maximize efficiency in an increasingly competitive marketplace.



Preventive maintenance vs. predictive maintenance

Manufacturers that employ traditional preventive maintenance strategies often find themselves either missing key signs of failure that occur in between inspections or prematurely replacing equipment to avoid these potential failures. These issues are two sides of the same coin, which is the lack of 24/7 monitoring of critical equipment.

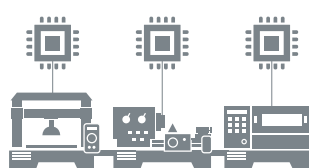
By migrating to a predictive maintenance strategy, manufacturers can rest assured that their equipment is being monitored around the clock and that real-time data analysis will reveal any potential issues well in advance of an actual failure. This minimizes downtime while also dramatically cutting costs overall.

Developing a plan that delivers significant results in less time

If there is an obstacle to implementing predictive maintenance, it is equipment connectivity. As a recent survey notes, up to 92% of legacy machines are not designed for connectivity.

Manufacturers are understandably reluctant to abandon these investments, which is why they are turning to retrofitted solutions as a way to modernize while keeping costs affordable. Industry providers have already brought several technology solutions to market for upgrading legacy assets with little or no equipment modification.

Retrofit programs typically begin with prioritizing the installed base. Prioritization enables manufacturers to focus initially on the assets that require the most frequent maintenance and have the biggest impact on production output. After critical assets are identified, implementing the predictive maintenance solution is straightforward. Key steps include replicating engineer knowledge for the targeted asset, establish a baseline of acceptable conditions, retrofitting one or more sensors to the asset, and setting warning and alarm thresholds.



Equipment monitoring
Digitization



Abnormality Alarm
Remote Monitoring



On-site maintenance
Maintain as necessary

Use case 1: Electric motor condition monitoring

Worn components is a leading cause of three-phase electric motor failure. Omron recently helped a beverage company find an effective solution for reducing these failure events. Prior to the solution's implementation, the company manually inspected its bottling line motors at three- and six-month intervals and overhauled motors once a year. With this preventive maintenance strategy, workers replaced parts frequently, but this approach was expensive and failed to eliminate unplanned downtime.

Retrofitting the motor with a current transformer allowed a monitoring AI to run a distortion

analysis in real time, detect abnormalities, and analyze the failure mode. With this insight, the company has been able to eliminate time-consuming inspections and rely on alerts that signaled a service requirement. The transition to a predictive maintenance solution has proven to reduce costs and streamline maintenance work while also improving product quality by detecting rubber gasket failures before foreign matter can contaminate products. The company is planning to deploy the solution to other facilities and change some existing maintenance practices.



Use case 2: Recirculating pump condition monitoring

Industrial recirculating pumps run almost continuously. One semiconductor manufacturer used manual inspections to check a motor in its water treatment plant, but conducting accurate inspections was difficult without shutting down the pump. Scheduling maintenance was always challenging because of ongoing production needs. This meant that service might be performed too early (wasting time and materials) or too late (after an unexpected failure impacted production).

Retrofitting the recirculating pump with a vibration sensor allowed the monitoring AI to measure high-frequency vibrations, detect abnormalities, and analyze the failure mode. Alerts permit maintenance engineers to monitor pump health remotely, judge the potential impact of abnormalities, and solve problems without being onsite. This use case shows how a predictive maintenance solution can streamline maintenance work while also supporting semiconductor production by preventing unplanned downtime.

Omron's advanced predictive maintenance products

Omron makes it easy for manufacturers to keep tabs on their equipment 24/7 with high-performing technologies.

S8VK-X

Power supply

The S8VK-X keeps track of DC output voltage, current, peak current and runtime on a remote basis to quickly identify any DC circuit abnormalities and maximize longevity.



K6CM

Motor condition monitor

The K6CM monitors vibration, temperature and current and insulation resistance monitoring to predict motor failures and eliminate the need for manual inspections.



K6PM

Thermal condition monitor

The K6PM remotely tracks the temperature of high-voltage control panels and other equipment to eliminate manual inspections and ensure a faster response to overheating.



Use case 3: Hydraulic system condition monitoring

Hydraulic valves are essential to the normal operation of many industrial machines, and temperature increases often suggest debris contamination in the hydraulic fluid flowing through the valves. When a leading auto manufacturer was relying on manual thermal inspections to monitor the condition of valves on its body panel hydraulic presses, unplanned downtime lasting days or weeks sometimes occurred. This was due to the fact that maintenance engineers were unable to continuously monitor valve temperature.

Retrofitting presses with thermal image sensors allows the monitoring AI to continuously measure

valve temperature, detect abnormalities, and analyze the failure mode. Increases in surface temperature generate automatic alerts that allow maintenance staff to take immediate action if necessary. This predictive maintenance solution reduced overall maintenance needs and improved machine availability. Furthermore, since the company no longer needed to move production to other hydraulic presses, efficiency also improved and costs like overtime pay went down.



Use case 4: Power supply with onboard monitoring

Large production environments often house hundreds of control panels. Temperature increases in control panel power supply often indicates that these components are degrading. Maintenance engineers for one automotive manufacturer were using digital voltmeters to check power supplies for out-of-spec conditions. These manual inspections were time-consuming and imprecise since components sometimes degraded between inspections. To limit downtime, these workers relied on preventive schedules to replace power supplies regardless of device health.

Retrofitting control panels with intelligent power supplies has brought AI functionality to the factory

floor. With temperature, voltage, and power sensors, each power supply is able to calculate its own remaining service and send a real-time health-grade to a built-in display. Onboard networking also supports remotely monitoring multiple power supplies from a central location. Using intelligent devices as part of a predictive maintenance solution provides a framework for building an IoT environment. It allows intensive monitoring without hands-on inspections, improving efficiency and equipment availability while lowering costs.



Summary

The benefits of preventive maintenance only go so far. At some point, manufacturers are bound to start missing signs of equipment degradation or driving costs up by replacing perfectly functional equipment on a “just in case” basis. A round-the-clock monitoring strategy is the only way to truly keep track of equipment and minimize downtime.

Throughout the automotive, semiconductor, commodities and other manufacturing industries, predictive maintenance solutions can streamline maintenance work while also supporting production.

References

1. Arsenaault, Ryan for Aberdeen. (2016). "Stat of the Week: The (Rising!) Cost of Downtime". Retrieved Friday, October 2, 2020 from <https://www.aberdeen.com/techpro-essentials/stat-of-the-week-the-rising-cost-of-downtime/>.
2. Blyler, John. (2018). "Microservices Connect Legacy Assets to the IIoT". Retrieved October 2, 2020 from <https://www.insight.tech/industry/microservices-connect-legacy-assets-to-the-iiot>.



Omron Automation | 800.556.6766 | automation.omron.com

