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Improve uptime and reduce industrial costs

Enable predictive maintenance with condition monitoring and anomaly detection with new AWS machine learning services

Maintain momentum with the right predictive maintenance solution

Digital transformation continues to accelerate in the oil and gas, mining, agriculture, transportation, and utility industries, among many others. The benefits of this new era are becoming clear: improved operational efficiencies and reduced costs.

But while emerging technology enables new opportunities, it also increases the stakes for competition. Unplanned downtime is less acceptable and more harmful to operations and customer relationships than ever before. A study from Aberdeen Group calculated the average cost of downtime across all businesses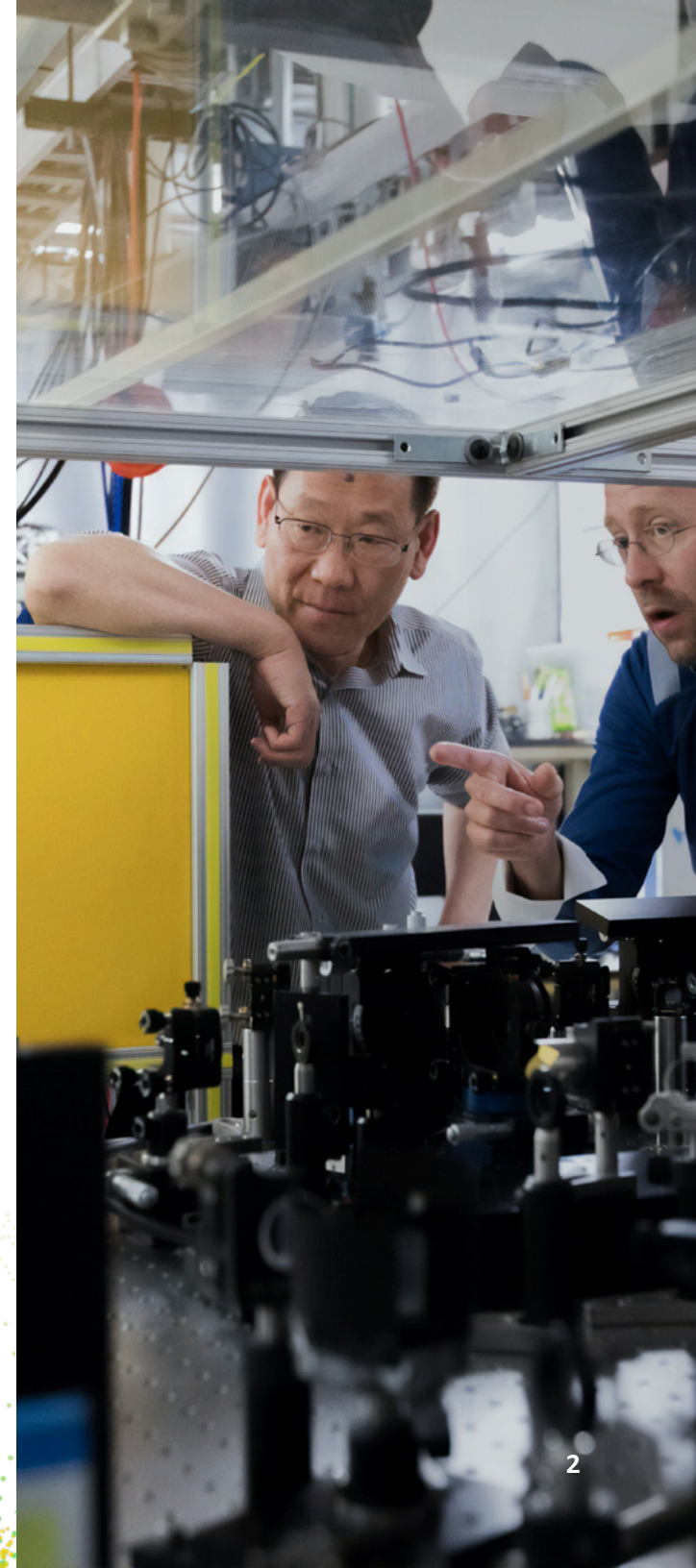 at $260,000 per hour.[1] And another report on downtime found that 70 percent of companies lack complete awareness of when equipment assets are due for maintenance or an upgrade.[2]

To remain competitive, industrial companies must keep the momentum, continuing to accelerate digital transformation in ways that minimize unplanned downtime and optimize costs. Predictive maintenance is increasingly recognized as a vehicle for achieving these results—but, with many options available, designing the right predictive maintenance strategy for your business can be quite the challenge.

This eBook will explore how new machine learning-powered solutions make activating predictive maintenance simple and cost-effective—with no data science skills required. Read on to discover how you can prevent failures before they occur, reducing unplanned downtime to keep your business running smoothly.

[1] https://www.aberdeen.com/techpro-essentials/stat-of-the-week-the-rising-cost-of-downtime/
[2] https://lp.servicemax.com/Vanson-Bourne-Whitepaper-Unplanned-Downtime-LP.html

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Moving maintenance from reactive to predictive

Historically, the majority of machine maintenance is either reactive or preventive in nature. In the reactive approach, maintenance is performed after a machine fails. This results in high costs and lengthy downtimes. A preventive approach, while preferable to reactive, still relies on periodic scheduling of maintenance—which can result in errors, unnecessary costs, or breakdowns between maintenance cycles.

Predictive maintenance is a fast-emerging alternative to other maintenance strategies. Instead of performing work on a regular schedule, predictive maintenance evaluates equipment condition and enables you to perform updates at appropriate times to prevent failures before they occur.

For example, a study by Deloitte Analytics Institute found that, on average, predictive maintenance increases productivity by 25 percent, reduces breakdowns by 70 percent, and lowers maintenance costs by 25 percent.

Unfortunately, two key challenges have so far prevented a broad rollout of predictive maintenance for industrial companies. First, maintenance teams lack financial or technical resources to build a system that is easy to use. Second, current methods of analyzing sensor data are limited by trend-based approaches that miss key information and struggle to define relationships between multiple machines.

Recent machine learning techniques have emerged that can offer data-driven models and learn from historical data, enabling true predictive maintenance. But building, deploying, and managing such models has proven time-consuming and costly, often requiring the resourcing of machine learning experts or data scientists.

In the next sections, we'll explore two machine learning-powered solutions that can help you realize the business value of predictive maintenance: **Amazon Monitron** and **Amazon Lookout for Equipment**.

Predictive maintenance delivers value

A study by Deloitte showed predictive maintenance helps you mitigate unplanned downtime and prevent catastrophic asset failures.

Increases productivity	Reduces breakdowns	Lowers maintenance costs
25%	70%	25%[3]

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Which asset performance solution is right for me?

There are many differences between these solutions, and you may find it appropriate to deploy both of them across different parts of your business and infrastructure. In an effort to help you find the best way to begin your predictive maintenance journey, however, here's a simple way to distinguish them—and determine which one best fits your immediate business needs.

- Amazon Monitron includes wireless sensors, a gateway device, the Amazon Monitron Service, and a mobile app. This solution is ideal if you don't already own sensors—or don't want to continue using your existing ones.

- Amazon Lookout for Equipment uses the data from your existing sensors and systems to help you detect abnormal equipment behavior. This solution is ideal if you already own sensors and want to continue using them.

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Amazon Monitron:
Activate predictive maintenance in minutes

Industrial and manufacturing businesses can detect abnormal machine behavior and enable predictive maintenance with the same technology used to monitor the equipment at Amazon Fulfillment Centers with Amazon Monitron.

How Amazon Monitron works

Amazon Monitron is an end-to-end system that uses machine learning to detect abnormal behavior in industrial machinery, enabling you to implement predictive maintenance and reduce unplanned downtime.

You can start monitoring equipment health in minutes, without any development work or machine learning experience required.

Amazon Monitron includes:

• Wireless sensors to capture vibration and temperature data from equipment

• A gateway device to securely transfer data to AWS

• The Amazon Monitron Service, which uses machine learning to analyze data for abnormal machine patterns

• A companion mobile app to set up the devices and receive reports

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Why Amazon Monitron?

- **End-to-end solution**
  Use the Amazon Monitron wireless sensors and gateways with the Amazon Monitron Service to start tracking machine health in just a few minutes, with no development work, machine learning experience, or vibration analysis expertise needed. If an issue is detected, Amazon Monitron can send notifications via web or mobile app to your on-site maintenance technicians.

- **Applicable to a range of use cases**
  From monitoring just a few critical machines, like cooling fans in a data center, to larger installations across miles of conveyor belts in a wide-ranging logistics operation, Amazon Monitron works for many common industrial use cases.

- **Data privacy and security**
  Amazon Monitron encrypts your data at rest and in transit, and sensors and gateways verify authenticity using unique identity keys.

- **Cost-effective equipment monitoring**
  Amazon Monitron is a low upfront hardware investment compared to conventional hard-wired sensors, and it is a pay-as-you-go service.

- **Continuous improvement and accuracy**
  You can enter feedback on the alerts in the mobile app. Amazon Monitron learns from that feedback to continually improve over time.

- **Easy to get started**
  Buy sensors and gateways right on Amazon.com, and get started quickly.

Learn more or get started with Amazon Monitron now

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Amazon Monitron in action

Amazon Monitron enables companies across industries to implement predictive maintenance capabilities to help them maintain efficiency, keep customers satisfied, and stay competitive in their fields. Here are just a few examples:

Fender

Fender Musical Instruments Corporation is an iconic brand and a leading manufacturer of stringed instruments and amplifiers.

"Amazon Monitron can give both large industry manufacturers as well as small 'mom and pop shops' the ability to predict equipment failures, giving us the opportunity to schedule equipment repairs preemptively."

Bill Holmes, Global Director[4]

GE Gas Power is a leading provider of power generation equipment, solutions, and services.

"From our initial work on vibration-prone tumblers, we see this vision come to life at an amazing speed: the ease-of-use for the operators and maintenance team, the simplicity, and the ability to implement at scale is extremely attractive to GE."

Magnus Akesson, CIO[4]

RS Components is a leading player in industrial components and predictive maintenance.

"Although we stock over 500,000 products from 2,500 different suppliers, this is the first ML-powered end-to-end wireless vibration and temperature condition monitoring solution in our portfolio. Working with AWS will enable us to support our customers' efforts to adopt IoT and machine learning as emerging technologies and accelerate their Industry 4.0 strategies."

Richard Jeffers, Technical Director[4]

[4]https://aws.amazon.com/monitron/customers/

Amazon Lookout for Equipment:

Detect abnormal equipment behavior automatically

Successfully implementing predictive maintenance requires you to use the data collected from all of your machine sensors—under your unique operating conditions—and then apply sophisticated machine learning techniques to detect abnormal machine conditions as early as possible.

Amazon Lookout for Equipment uses the data from your sensors to detect abnormal equipment behavior, applying powerful machine learning models automatically and with minimal oversight. It helps you detect equipment abnormalities with speed and precision, quickly diagnose issues, take action to reduce expensive downtime, and reduce false alerts—all with no machine learning experience required.

How Amazon Lookout for Equipment works

Amazon Lookout for Equipment:

- Analyzes the data from your sensors, such as vibration, pressure, flow rate, RPMs, temperature, and even motor current

- Augments that data with other process data, environmental data, or any variables that could affect performance

- Automatically trains a specific machine learning model based on your data for your equipment

- Analyzes data to quickly and accurately identify warning signs that could lead to machine failures

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Why Amazon Lookout for Equipment?

- **Get high-accuracy results**
  Amazon Lookout for Equipment handles data from up to 300 sensors in one model, along with historical logs, to give you accurate alerts when your equipment behaves abnormally.

- **Respond to issues faster and with precision**
  The solution automatically monitors your equipment and identifies any anomalies compared to healthy operation. It can then pinpoint the sensor(s) indicating anomalies, enabling you to respond quickly.

- **Accelerate issue resolution**
  You can use data from Amazon Lookout for Equipment to trigger action when anomalies are detected, such as filing a trouble ticket or sending an alarm that notifies you immediately of any issues. The data from the solution can be integrated into your existing monitoring software, or you can use **AWS IoT SiteWise** to collect, store, organize, and monitor data.

- **Improve accuracy of alerts over time**
  The solution continuously improves model performance and accuracy of alerts by incorporating human review feedback and learning expected operational usage trends.

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Amazon Lookout for Equipment in action

In addition to increased uptime and reduced costs, the precision and accuracy Amazon Lookout for Equipment delivers to industrial and manufacturing companies provides a critical benefit in the Industry 4.0 era. Here are a few examples:

GS EPS

GS EPS generates and provides electricity using clean fuel like natural gas and bioenergy.

"Amazon Lookout for Equipment is enabling our plant operation teams to build models on our equipment with no ML expertise required. We are leading the transformation of our organization into a data-driven work culture with AWS and Amazon Lookout for Equipment."

Kang Bum Lee, Executive Vice President[5]

DOOSAN

Doosan Infracore is a leading global manufacturer of heavy-duty equipment and engines.

"Leveraging AI is critical in advancing Doosan's next generation equipment, so we have partnered with AWS to develop use cases where automated and scalable machine learning could be leveraged."

Cho, Jae Yeon, VP[5]

OSIsoft

OSIsoft, LLC is a manufacturer of application software for real-time data management called the PI System.

"Amazon Lookout for Equipment expands the scope of services and insights available to customers by delivering automated machine learning built specifically for equipment monitoring."

Michael Graves, Director[5]

GE

GE Digital is a subsidiary of the American multinational conglomerate corporation General Electric.

"With the introduction of Amazon Lookout for Equipment and Amazon Monitron products, AWS continues to enhance their platform for Industrial IOT use cases that can be leveraged by GE Digital to continue exploring ways to help customers further improve uptime and reliability by applying predictive analytics and proven asset management practices to a broader range of plant equipment."

Pat Byrne, CEO[5]

[5] https://aws.amazon.com/lookout-for-equipment/customers/

Another option for data scientists:
Amazon SageMaker

Many industrial companies are also using Amazon SageMaker to build ML models for predictive maintenance. Amazon SageMaker helps data scientists and developers to prepare, build, train, and deploy high-quality machine learning (ML) models quickly by bringing together a broad set of capabilities purpose-built for ML.

For predictive maintenance, Amazon SageMaker offers built-in algorithms, pre-trained models available through the AWS Marketplace, and the ability to bring your own algorithm. Regardless of which option you choose, Amazon SageMaker provides all the tools you need for machine learning end-to-end so you can easily develop high-quality predictive maintenance models. To make it easier to get started, Amazon SageMaker JumpStart provides predictive maintenance solutions that can be deployed readily with just a few clicks. Solutions, including example datasets, AWS CloudFormation templates, and reference architectures, can be easily modified to work with any dataset.

With Amazon SageMaker, you can accelerate innovation, reduce costs, and boost operational efficiency.

Learn more about Amazon SageMaker

FORMOSA PLASTICS CORPORATION

Formosa Plastics Corporation is one of Taiwan's top suppliers of plastic resins and petrochemicals and ranks among the world's leading plastics manufacturers.

"We decided to explore machine learning to enable more accurate detection of defects and reduce manual labor costs, and we turned to AWS…to help us do that. Using Amazon SageMaker, (we) reduced our employee time spent doing manual inspection in half."

Bill Lee, Assistant Vice President[6]

[6] https://aws.amazon.com/sagemaker/customers/

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Transform your business with easy-to-use, automated condition monitoring and anomaly detection

Amazon Monitron and Amazon Lookout for Equipment are easy to implement, easy to use, and—unlike many predictive maintenance alternatives—are informed by your unique data from your specific equipment and processes. Prevent downtime, reduce costs, and gain greater control over the volume of your data. Unlock the full potential of predictive maintenance with AWS—and thrive in today's industrial world.

Learn more about Amazon Monitron »

Learn more about Amazon Lookout for Equipment »