

Bosch Digital Twin Industries

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Manufacturers, energy companies, and other enterprises dependent on heavy equipment do everything they can to keep their expensive machines up and running. Many would like to use IoT and predictive AI analytics to ward off trouble before it leads to more serious problems.

But applying AI analytics to industrial equipment is not easy to do. Large businesses have thousands of sensors in machines operating in plants across the globe, all of them rapidly generating performance data in a dozen different formats. Just collecting this information can be a nightmare, and it is often filled with errors, omissions, and inconsistencies. Predictive-analytics models must have reliable data to produce good results. If the data is wrong, incomplete, or too slow to arrive, the models may fail—leading to costly breakdowns.

Modern digital-twin solutions can overcome these problems, quickly cleaning and validating machine data before subjecting it to AI analysis. Digital twins can provide companies an accurate dashboard replica of machine operations everywhere—and send alerts that help solve problems before they get out of hand.

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@prescientPDI via @insightdottech

Harnessing Machine Data for AI Predictive Maintenance

An industrial digital twin requires several technologies to function together like clockwork. To help one of its manufacturing customers predict machine behavior, German engineering technology company Bosch GmbH began working on a digital twin solution, using its expertise in industrial machinery to create AI algorithms that can spot significant deviations in pressure, temperature, vibration, and other important metrics.

But Bosch Digital Twin Industries realized it needed help to develop another crucial part of the solution—corralling the company’s vast array of machine sensor data and preparing it for AI use. A customer recommendation led Bosch to [Prescient Devices, Inc.](#), a firm that specializes in data engineering and IoT solutions.

“AI is critically dependent on data quality—if it’s bad, the AI outcome is going to be bad,” says [Prescient Devices CEO Andy Wang](#).

Industrial data is notoriously challenging to manage, in part because the large quantity of machines and sensors provide more opportunities for error. Sensors can become disconnected or turn off unexpectedly, or a network can go down, creating information gaps that give AI algorithms a false picture of operations. And faulty sensors sometimes send duplicate data.

“You have to correct for these problems for the data quality to be high,” Wang says. “And the corrections must be accomplished quickly, on large data sets that follow different protocols and are transmitted at high speed. Our platform supports a very high-speed data rate. We were able to collect the customer’s high-speed sensor data, clean it, format it, and deliver it to Bosch in time to meet their time-to-market.”

The two companies continued honing the solution, which was integrated into the Bosch Digital Twin IAPM, or integrated asset performance management system. It is now used by companies in many industries to monitor machines made by Bosch and other manufacturers. Access to timely, accurate machine data enables industrial businesses to stop potential problems before they happen.

“The data may tell you there’s a small machine component that’s getting old and not working properly. You could solve the problem by replacing it for \$1,000,” Wang says. But without such advance knowledge, the degrading part could lead to a cascading set of failures.

For example, if the component gets burned through, it can damage the next component, which can damage a bigger component. Eventually the engine can get damaged. When a million-dollar machine goes bust, it can cost thousands or millions of dollars to fix.

Worse yet, a defective machine can cause the entire production line to shut down, costing factories enormous amounts of time and money. “If machines go down unexpectedly, they can take multiple days to fix. With predictive AI analytics, managers can fix them during preplanned maintenance windows, so the production line would never go down,” Wang says.

Implementing Digital Twins for Manufacturing

Companies can obtain the Bosch Digital Twin IAPM by purchasing a starter kit containing sensors, an on-premises industrial PC, and a sensor master to transfer the sensor data to the computer for processing before it is sent to the Bosch cloud for AI analysis.

Prescient’s software is installed on the Intel-powered computer to automatically recognize different sensor types and quickly clean and validate their incoming data. Intel is known for its reliable and long-lifetime processors—a key value for businesses with equipment in remote areas.

“For example, one of Bosch’s customers is an oil and gas pipeline company with computers deployed in locations that are difficult to access. Technicians have to apply for permission to enter and schedule appointments weeks in advance,” Wang says.

The Digital Twin IAPM also allows companies to reduce the amount of data they send to the cloud, transferring only the kinds of information they deem useful. That eases cloud data ingestion problems and saves money.

For companies that prefer not to use the cloud, a newer version of the solution—the Bosch IAPM Digital Twin in-a-box—is like having a data center at the edge. It runs the Bosch AI model on-premises, using a high-performance computer that contains both Intel CPU and GPU processors for advanced AI analytics.

“Many companies do not want to ship their data to the cloud for security and privacy reasons, and running AI directly at the plant is also less expensive. This solution is gaining a lot of traction from customers across the globe,” Wang says.

Prescient’s software can also save money—and time—for builders of AI-enabled machines. “The majority of data scientists spend only about 20% of their time building and working with AI models. They spend the other 80% preparing data to go into the models,” Wang says. “We have the technology to prepare data very quickly, speeding their production of AI solutions.”

Improving Operations with Industrial AI

Whether they operate in the cloud or at the plant, industrial digital twins create an indelible record of machine performance. By analyzing this information, companies can adjust machine settings to changing conditions and make other tweaks to optimize their processes. Historical data can also help them predict spending on equipment and repairs, and make informed decisions about vendors and service providers. These capabilities can give companies an important competitive advantage, Wang believes.

“I predict that in the near future, every company that has large, expensive physical assets will be using a digital twin solution,” says Wang.

This article was edited by [Georganne Benesch](#), [Editorial Director for insight.tech](#).