

# Predictive Maintenance Prevents Machine Downtime and Reduces Maintenance Costs



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## A Telekom, Intel, and SAP Partner Solution

Specialty machine manufacturing is the designing and manufacturing of customized machines and equipment. Applications range from machines for construction and food processing to packaging systems for the pharmaceutical industry. It is essential that this production equipment has a long service life, minimal downtime, and low maintenance costs. This is where predictive maintenance—methods that help determine the condition of in-service equipment to predict when maintenance is needed—plays a role. Its source of data comes from sensors related to performance, temperature, or rotation speed. Businesses and manufacturers analyze this data so they can more quickly identify parts that are fatigued or worn and need to be replaced, thereby proactively preventing costly production downtime. Furthermore, such analyses reduce the cost of service and maintenance.

The most important requirement for efficient data analysis is a big data infrastructure capable of evaluating a large volume of data in real time. Take, for example, Telekom's SAP solutions, which can also be used by medium-sized enterprises, and are available in the classic sense on-premise in the data center, or in the security-enabled Telekom private cloud. The core components of Dynamic Services for SAP HANA\* include the SAP HANA in-memory database and the latest generation of the powerful Intel® Xeon® processor E7 family.

Industry 4.0 is big data in its purest form. Sensor data from industrial equipment, telematics data from vehicles, and RFID data from the logistics chain—with the digitalization of all commercial and technical processes, the volume of data that companies must manage continues to grow. If it is properly prepared, filtered, and analyzed, this data is an invaluable source of information for any enterprise. This is also true for manufacturing companies, in particular those connected to the fourth industrial revolution.

The term "Industry 4.0" denotes the use of the Internet of Things (IoT) in the industrial sector. Its aim is to create interconnected, sensor-supported and nearly self-controlling production processes using intelligent machines, components, and systems, and all of these processes can be automated according to customer specifications. Intelligent components communicate autonomously, for example,

via RFID chips, with the equipment. They then find their way to the next machine on their own, and even conduct quality control at the end, meaning customizations are possible, for example, in the manufacturing of sports shoes, automobiles, or clothing (lot size 1).

Since the machines, sensors and products are interlinked, an abundance of unstructured data indicating the status of a machine or equipment is generated in the digital factory, along with process and product data. By intelligently monitoring and analyzing production data, even medium-sized companies can respond to changing parameters in near realtime and optimize production accordingly. Furthermore, it is possible to identify machine maintenance requirements early on and prevent costly downtime (predictive maintenance). Even production-related tolerances can be captured and used in the quality control of the end product.

### Predictive maintenance reduces costs

Predictive maintenance, that is, proactive servicing or maintenance, is a key application for predictive analytics in the industrial sector, and a major theme in specialty machine manufacturing. Predictive analytics predicts the probability of future events occurring. To do this, it uses sophisticated algorithms or statistical methods and mathematical calculations to identify correlations and especially trends in data sets.

In addition to classical data mining methods such as clustering or regression analysis, simulation processes, elements of game theory, and machine learning also play important parts. In machine learning, the algorithms learn from examples and existing data over time, create a data model, and use it to predict and make decisions. Predictive maintenance is much the same.

The data comes from machine and sensor data that indicates the status of equipment, such as its performance, temperature, rotation speed, and capacity. This data is then (usually) transferred to a cloud platform. The solution analyzes this information to identify error patterns and qualitative substandard components, and can then predict errors. The predictive maintenance systems can thus predict the need for expensive repairs or serious failures and initiate preventative actions before major damage occurs. Service can respond quickly and replace a specific part or perform maintenance work ahead of schedule.

The manufacturers of this equipment can either use this data themselves or make it available to their customers. With the help of predictive maintenance, businesses minimize the probability of expensive machine downtime, extend the operational

life and service life of the equipment, and reduce costs for service and maintenance, thereby avoiding unnecessary maintenance. The quality of the manufactured goods improves and machine throughput increases. Finally, parts subject to wear, such as air and water filters, are replaced only when absolutely necessary and not routinely or at scheduled maintenance intervals.

### Analyzing large volumes of data in real time

Predictive maintenance faces two challenges: The data must first be pooled from the most varied sources and then analyzed in real time. The company's ERP system plays an important role here, functioning as the integration hub. It collects market data, customer information, and supplier and product data, and links it to the manufacturing and logistics data from production and the supply chain, along with sensor data from the machines themselves. This data must fulfill the most critical quality requirements, such as completeness, correctness, uniformity, and consistency—and it must be up-to-date as well.

The volume of data and information will continue to grow as Industry 4.0 takes hold. That is why ERP and big data systems need a powerful infrastructure they can use to quickly process large volumes of data, preferably in real time. In-memory database technologies such as SAP HANA offer the solution to these challenges. Since in-memory databases store information in their main memory and not on hard drives, queries from multiple servers can be processed simultaneously and with very low latency. This is an important requirement for analyzing data in real time

and optimizing production processes in the industrial sector.

As a market leader in ERP systems, SAP stands ready to support Industry 4.0 with products and solutions, such as the application suite SAP S/4HANA\* or SAP Predictive Maintenance and Service\*. The ERP suite SAP S/4HANA is based on the SAP HANA in-memory platform, which analyzes information from the most diverse sources in one single database in near real time. This makes it possible for SAP S/4HANA to process multiple material postings simultaneously. Since this process always provides current data on material requirements and the existing material that is available for production planning and control, manufacturers can respond immediately to emergency situations and avoid delivery delays.

SAP Predictive Maintenance and Service enables service technicians to record and analyze a machine or system's real-time data, such as temperature, rotation speed, or vibration, through data connections. Costly travel for technicians is often eliminated because this method transcends country borders and continents. If the tool identifies certain patterns or if defined thresholds are exceeded, an alert is issued signaling that action should be taken. The answer could be, for example, an inspection or machine repair. The service technician can then decide if a site visit is necessary or if the work can be performed by operating personnel.

### The solution—Dynamic Services for SAP HANA

Both SAP S/4HANA and SAP Predictive Maintenance and Service are available for local installation (on premise) or as a cloud

solution. One of SAP's most important and experienced partners worldwide is Deutsche Telekom, together with its IT service provider, T-Systems. Telekom offers traditional SAP solutions for medium-sized companies as well as a cloud hosting platform, or both as a combined hybrid solution. Since 2004, SAP's partner has employed Dynamic Services for SAP Solutions to operate complex SAP landscapes for global companies in all industries from a certified and secure private cloud.

Since 2013, Dynamic Services for SAP HANA has also given SAP HANA in-memory technology the edge in the quick analysis of data in real time as a cloud offering. Dynamic Services for SAP HANA makes these technologies available as standardized, industrialized and integrated solution elements. This means businesses in (specialty) machine manufacturing benefit from the following advantages:

- **Rapidly deployable:** State-of-the-art in-memory technology without major internal investment and operation expenditure
- **Scalable:** Easily customized to fulfill customer requirements
- **Reduced costs:** Billing according to actual use
- **Solution for test operation:** Free license for three months to test development environment
- **High availability:** Some service level agreements with 24/7 availability, 365 days a year, if required, customer systems are mirrored in the secure twin-core data centers
- **The cloud "Made in Germany":** Internal physical resources in Telekom's highly security-enabled data centers in Germany, regulated by the German Data Protection Act

- **Comprehensive consulting:** Telekom's ASP and cloud experts stand ready to offer consultation, planning, and implementation support
- **Powerful hardware:** By employing the latest generation state-of-the-art Intel Xeon processor E7 family, SAP HANA installation fulfills all requirements

### Intel's fast processors are at the core

The foundation for Dynamic Services for SAP HANA is the latest generation of the Intel Xeon processor E7 family, with up to 18 cores and up to 1.5 TB of memory capacity per socket. With four to eight sockets, adequate servers offer sufficient memory for SAP HANA. In-memory database performance is also enhanced thanks to Intel® Transactional Synchronization Extensions (Intel® TSX). Transactional memory or TSX, ensures that interdependent threads rarely encounter locked memory areas.

The additional options offered by the Intel® Advanced Vector Extensions 2 (Intel® AVX2) 2560bit vector integer instructions and Fused-Multiply-Add instructions improve performance even further. To ensure that systems operate without interruption, Intel has improved RAS (reliability, availability, scalability) features for the Intel Xeon processor E7 platform. For example, only areas with data are mirrored in the memory. In the future, Telekom will equip servers with the latest generation of Intel Xeon E7 v4 processors. They offer twice the memory capacity of their predecessor with three TB per socket, making the solution ideal for SAP HANA.

### The benefits of predictive maintenance at a glance

- High availability of systems through reduction of unplanned downtimes
- Proactive maintenance prevents equipment failure
- Reduction of maintenance costs
- Longer service life for equipment and machines

### Gateways for the integration of existing systems

The majority of legacy systems in the industrial sector are not interconnected through the Internet. That is why companies face the challenge of connecting new systems to old devices and the cloud for secure data exchange. With gateway solutions for the IoT, Intel offers integrated, prevalidated hardware and software solutions with open standards and interfaces to ensure interoperability. These solutions translate between logs and normalized data to prevent redundancy. The gateways are fixed to sensors or equipment, collect data, and transfer it securely to the network or cloud for analysis.

### About Deutsche Telekom

Deutsche Telekom is one of the world's leading integrated telecommunications companies, with some 156 million mobile customers, 29 million fixed-network lines, and more than 18 million broadband lines (as of December 31, 2015). The Group offers fixed-network/broadband, mobile communications, Internet, and IPTV products and services for consumers, and information and communication technology (ICT) solutions for business and corporate customers. Deutsche Telekom is present in more than 50 countries. With a staff of some 225,200 employees throughout the world, it generated revenue of 69.2 billion euros in the 2015 financial year, about 64 percent of it outside Germany.

### About SAP

As the market leader in enterprise application software, SAP SE helps companies of all sizes and industries run better. SAP applications and services enable customers to operate profitably, adapt continuously, and grow sustainably. From back office to boardroom, warehouse to storefront, desktop to mobile device, SAP empowers people and organizations to work together more efficiently and use business insight more effectively to stay ahead of the competition. Approximately 320,000 customers from the private sector and public administration rely on SAP applications and services to achieve their goals more efficiently and effectively. For more information, visit [www.sap.de](http://www.sap.de).

### About Intel

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