

# Predictive Maintenance for Manufacturing

*How to improve productivity, minimize downtime  
and reduce costs*



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## Overview

In the face of continuing cost-control efforts, plant managers, maintenance engineers and quality control champions all want to know how to sustain quality standards while avoiding expensive unscheduled downtime or equipment failure. These professionals are seeking more effective ways to control the costs of labor and inventory for maintenance, repair and overhaul (MRO) operations. In addition, managers in finance and customer service—and, ultimately, in the executive suite—have a stake in how well production processes deliver finished goods.

The challenge for manufacturing has always been to produce high-quality goods while optimizing resources at every step of the production process. Over the years, manufacturers have developed a number of sophisticated approaches to quality control, supply chain management and equipment maintenance.

Today forward-looking manufacturers rely on predictive maintenance to go beyond preventative and regularly scheduled maintenance, ensure production quality and maximize value at every step of the process. Driven by predictive analytics, this leading-edge capability is helping manufacturers reach new standards of quality, and save money, by minimizing downtime from unscheduled maintenance, practically eliminating unnecessary maintenance and providing superior forecasting of warranty accruals.

In this white paper, you'll learn the basics of predictive maintenance, the specific benefits it provides for manufacturing operations and the underlying technologies that make it possible.

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## Predictive analytics: A game changer for manufacturing

The basis of predictive maintenance is powerful predictive analytics software, which gathers information in real time from a variety of sources, including maintenance logs, performance logs, monitoring data, inspection reports, environmental data and even financial data. The software can detect even minor anomalies or failure patterns from this structured and unstructured data to determine the areas of greatest risk. It then proactively directs resources towards those areas before risk becomes reality.

This early identification of maintenance requirements and operational issues is critical for preventing production interruptions, improving usability and service levels for customers, as well as meeting and exceeding service level agreement (SLA) expectations. In this way predictive maintenance can deliver sizable cost savings, labor efficiency, increased production continuity and higher levels of customer satisfaction, enabling manufacturers to compete on an entirely new level.

Now let's take a closer look at the three areas where predictive maintenance delivers the most significant benefits: the production line, field level customer service and warranty claims.



## Preventive maintenance in action Motorcycle manufacturer

By adding predictive maintenance capabilities to its warranty claims, a leading motorcycle manufacturer reduced the time to detect quality issues from days and weeks to minutes and hours, thereby significantly reducing maintenance costs.

In addition, the company was able to proactively address warranty issues and identify and address equipment anomalies several months before the riding season.

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## Predictive maintenance on the production line

The two reasons for stopping a production line are due to regularly scheduled maintenance or equipment failure. Performing timely maintenance is critical to preventing failures that may result in costly production interruptions, but relying on a fixed schedule may result in higher than necessary costs for both parts and labor. Predictive maintenance leverages the rich set of data that manufacturers already have available, such as equipment type, number of days in operation, operating voltage, days from last service, days to next service, failure history, costs for planned and unplanned maintenance, parts analysis and other data depending upon the machinery involved.

A fully automated process analyzes this data in real time. It quickly detects failure patterns and identifies the root cause of the problem. Because engineers have 24/7 access to the reliability of every piece of equipment, they can evaluate the current status of every asset and build a maintenance schedule that performs inspections and/or maintenance just in time to prevent failures. This eliminates the need for shutting down a line simply to perform “regularly scheduled maintenance” that may not be really necessary.



## Preventive maintenance in action Construction equipment manufacturer

A large equipment manufacturer saved \$1 million in just two weeks by using preventive maintenance to proactively identify problems and take action before failure occurred.

By minimizing downtime and repair costs across all its manufacturing operations, the manufacturer achieved a 1400% return on investment in just four months.

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As operating conditions change, the reliability of every piece of equipment is updated in real time. The advanced algorithms contained in the predictive maintenance software can determine the reliability of every asset at any point in the future, so that inspections and maintenance can be performed at the optimal and most cost-effective moment. Predictive maintenance also identifies the replacement parts required to support this highly accurate maintenance schedule. It eliminates the need for unnecessary and expensive overstocking of spare parts.

With predictive maintenance, manufacturers can maximize both the allocated labor resources and spare part inventories. The result is the elimination of undue maintenance, prevention of costly downtime/repairs and reduction in MRO inventory carrying costs.

### Predictive maintenance for field-level customer service

Predictive maintenance addresses a number of customer service issues, including customer complaints because of downtime due to unscheduled maintenance and product failures, and the pressure to meet stringent customer SLAs.

Consider this scenario. An HVAC manufacturer uses predictive maintenance to discover that a blower fan blade manufactured in one of its facilities will possibly break prematurely with extended use. Unfortunately, the problem is not discovered until the assembled A/C unit has already been sold to end customers.

Using predictive maintenance, the manufacturer can determine if certain production runs fail more often than others. They conduct a root cause analysis to determine the problem's source, and then analyze the financial implications of the failure to determine whether those runs warrant a recall or just a service bulletin to their distributors. Their analysis also shows where the failures will occur and what the demand in a given region will be for the replacement parts. They can then ensure that the correct supply of replacement parts can be available at the appropriate time.

### Reducing warranty claims

As a result, the company avoids many costly warranty claims by providing the resolution to its service channel even before most customers know a problem exists.

In many situations like this, predictive maintenance can identify when equipment in the field is likely to fail or need maintenance in order to predict future warranty claims costs and maximize uptime/in-service time for equipment sold to customers or for equipment used to deliver service. This helps manufacturers avoid high services costs and product recalls due to late product issue identification. It also minimizes or eliminates bad publicity and the resulting lost sales from recalls or negative customer product reviews.



### Preventive maintenance in action Automotive manufacturer

After implementing predictive maintenance capabilities in their warranty claims process, a European automotive manufacturer reduced its warranty cases from 1.1 to 0.85, achieving a 5% total reduction in warranty cases.

Overall, the preventive maintenance solution helps the firm save 30 million Euros annually.

## Developing a predictive maintenance application

While each company is different, a typical approach to developing a predictive maintenance application can be found below:

1. Identify the problem by focusing on failures of specific asset types or specific events.
2. Notice as many data sources (e.g. asset information, maintenance history, inspection reports, RFIDs) as possible.
3. Integrate all data sources, such as combining “fixed” attributes (e.g. asset type) and “dynamic” attributes (e.g. temperature).
4. Derive any additional fields to help with modeling, such as creating a “1” or “0” to signify if a part failed or not or calculating average cost per part, in addition to existing data of total cost and number of parts.
5. Identify the best predictors of failure.
6. Evaluate resultant models for modeling accuracy and quick logic test based on your own experiences.
7. Focus on the most effective methods of deployment within your organization (e.g. asset management, workforce management systems, business intelligence).
8. Create an information and response feedback loop to maintain accuracy and make continual improvements.
9. Monitor and track progress.

## IBM analytics and predictive maintenance technologies

IBM Business Analytics solutions provide leading-edge predictive maintenance capabilities and comprehensive sales and operations planning for manufacturers. IBM SPSS predictive analytics combine data from disparate sources and automatically detect failure patterns, enabling pre-emptive deployment of maintenance and repair resources and dramatically saving downstream costs. IBM Cognos Sales and Operations planning (S&OP) integrates planning activities across finance, operations, production, purchasing, sales and marketing to increase efficiencies and reduce costs.

Across every phase of production, IBM SPSS predictive analytics helps manufacturers:

- Efficiently perform root-cause analyses
- Reduce machine/appliance/asset downtime due to the failure of critical parts
- Minimize supply chain problems due to product issues
- Improve productivity of maintenance resources
- Avoid costs of machine/appliance/asset failure
- Realistically forecast warranty accruals

IBM Cognos Sales and Operations planning (S&OP) helps manufacturers understand the financial impact by:

- Integrating demand, supply and financial plans for better executive decision making
- Improving supply chain performance for better competitiveness and responsiveness
- Providing actionable insight (event driven, exception based, consolidated) to improve efficiency and reduce cost
- Providing real time dashboards that give visibility into all aspects of supply chain performance
- Reconciling sales and demand forecasts with supply chain and production plans

Working together, these industry-leading IBM solutions help manufacturers gain significant benefits.

## Conclusion

As manufacturers face increasing pressures to control costs and improve productivity, preventive maintenance has emerged as an essential capability. Supported by predictive analytics, predictive maintenance prevents production interruptions, improves usability and service levels for customers and helps to reduce warranty costs. It empowers manufacturers to isolate and solve maintenance and operational issues before they become significant and expensive problems. For manufacturers that need to achieve the highest levels of uptime and minimize the expense and labor of downtime, it's a game-changing technology.

To find out how IBM technologies can help your organization achieve the benefits of preventive maintenance, please visit:

[ibm.com/software/analytics/industrial-products](https://ibm.com/software/analytics/industrial-products)

## About IBM Business Analytics

IBM Business Analytics software delivers actionable insights decision-makers need to achieve better business performance. IBM offers a comprehensive, unified portfolio of business intelligence, predictive and advanced analytics, financial performance and strategy management, governance, risk and compliance and analytic applications.

With IBM software, companies can spot trends, patterns and anomalies, compare “what if” scenarios, predict potential threats and opportunities, identify and manage key business risks and plan, budget and forecast resources. With these deep analytic capabilities our customers around the world can better understand, anticipate and shape business outcomes.

## For more information

For further information or to reach a representative please visit [ibm.com/analytics](https://ibm.com/analytics).

## Request a call

To request a call or to ask a question, go to [ibm.com/business-analytics/contactus](https://ibm.com/business-analytics/contactus).

An IBM representative will respond to your inquiry within two business days.



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