

Predicting the Future

The Downstream Benefits of a
Predictive Maintenance Solution



0002	0.45 ▲ +0.45%
0003	-0.23 ▼ -2.34%
0004	-1.01 ▼ -1.89%
0005	0.02 ▲ +0.21%
0006	+2.58 ▲ +3.05%
0007	-0.14 ▼ -1.42%
0008	-0.73 ▼ -0.90%
0009	+1.08 ▲ +5.12%
0010	-0.87 ▼ -3.88%
	-0.65 ▼ -1.37%



Long-Term Benefits of Predictive Maintenance



Organizations today are looking for solutions that deliver benefits long after the implementation is complete. As you explore the benefits of predictive maintenance (PdM) solutions, it's natural to look for the initial return on investment (ROI) and whether it justifies the cost. While the most evident cost savings result from reduced downtime, look for a solution that delivers downstream process improvements with significant and ongoing financial benefits.



Gain Operational Advantages with Predictive Maintenance

The rise of new technologies driven by the Internet of Things (IoT) has paved the way for innovative PdM solutions. These solutions allow you to determine the condition of in-service equipment and forecast when maintenance should be performed to reduce downtime and avoid loss of performance.

Typically, a one-dimensional view of a PdM solution suggests a cost savings of up to 10 times the planned maintenance cost—and can be realized (with industry variations) from reductions in unplanned maintenance and downtime. However, that is a limited view. You should also consider the downstream benefits offered by PdM solutions—and the additional cost savings they deliver.

A multi-dimensional view reveals that PdM can significantly reduce quality issues, improve scheduling accuracy, lower the need for on-hand spare parts and enhance employee safety. To appreciate the operational advantages and overall return on investment of predictive maintenance, you should consider the value these downstream processes add to your bottom line.

1 Reduce Equipment Failure, Unplanned Downtime and More

Competitive markets are forcing manufacturers to provide higher-quality products at lower margins, which requires reducing production costs that typically include unplanned downtime, missed schedules, scrapped material and lost income due to poor material quality and warranty losses.

In addition, many companies continue to struggle with unplanned equipment downtime due to irregular maintenance plans, a backlog of planned maintenance projects and shortages of repair materials. These organizations face a constant battle between reducing break/fix work and executing planned maintenance, which results in an ongoing cycle of increased equipment failure and production downtime.

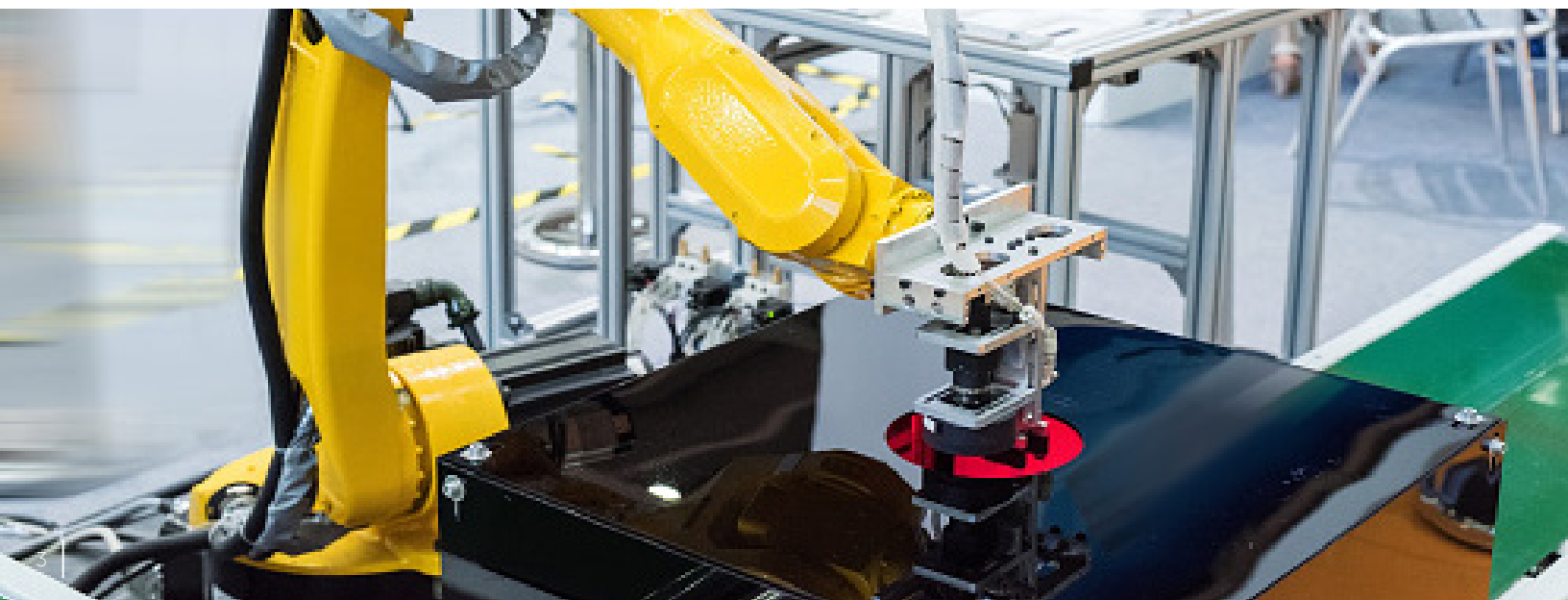
This cycle can be broken. Predictive analytics allows you to address these maintenance gaps by providing equipment failure information based on real-time data about the health of the equipment. By connecting devices such as sensors and video cameras with performance systems such as product lifecycle management (PLM), enterprise asset management (EAM) or manufacturing execution systems (MES), you gain real-time information to identify, monitor and resolve maintenance issues.

2 Convert Unplanned Maintenance to Planned Maintenance

The goal of PdM is to reduce downtime by converting unplanned maintenance into planned maintenance. In a live deployment, PdM data becomes a scheduling enhancement tool that includes maintenance tasks, parts ordering, key personnel availability, and so on. Ideally, predictive output leads to recommended repairs, which can be scheduled based on existing planned maintenance, parts inventory/ordering, impending demands for service and other issues.

Decision making must also include what to do with assets that have varying degrees of health. For example, is it better to run the asset until it breaks, or should it be pulled from service when degradation reaches a specific point? Should a group of assets be taken offline if they share a similar risk for an unplanned event? The answer to these questions varies in every case and over time as your PdM system matures, but you can expect early gains from implementing additional service tasks to planned maintenance downtime schedules.

The greatest financial benefits of PdM result from improvements in efficiency, production margins and safety. With a PdM deployment, your maintenance personnel can focus on preventive rather than reactive maintenance to reduce unplanned downtime and increase asset life expectancy. You can now expand and improve internal capabilities without increasing staff.





Benefits of Predictive Maintenance and Analytics for Manufacturers

- Increase asset performance and uptime
- Reduce break/fix volume with data identifying pending failures or changes in asset performance
- Increase preventive maintenance, reduce reactive maintenance, improve asset performance and longevity
- Reduce capital expenditures (capex) with improved maintenance planning and execution
- Lower cost of emergency maintenance, repair, and operations (MRO) materials for reactive repairs
- Improve forecasting of equipment end-of-life replacement for financial planning
- Validate accuracy of existing planned maintenance schedules
- Replace manual entries into EAM/Computerized Maintenance Management Software (CMMS) systems for maintenance collection plans
- Update prescriptive maintenance work orders to include the appropriate resolution for existing failures

3 Elevate Quality Programs Throughout the Organization

Over the years, manufacturing companies have used programs that included technology, processes and people to reduce product quality issues identified on the shop floor. IoT provides an additional dimension to improving quality by providing a mechanism to collect data from the floor and blend it with IT and other available data sources allowing for artificial intelligence (AI) solutions. Additionally, fog and edge software has enabled AI solutions to be on or close to the equipment that might be responsible for quality issues found in the manufactured products.

So, how does implementing a PdM solution improve quality? Often, quality issues are directly related to the degradation of equipment. By ensuring a machine receives in-time maintenance—prior to failure—and with no additional investment, your customer will see fewer quality issues. The machine learning models built into the PdM solution identify equipment that is starting to fail and notify maintenance in the early stages of degradation. As a result, many organizations see reductions in quality issues.

If you want to reduce quality issues further and gain more from your initial investment, you can use the PdM data to build a quality solution. The solution can include new machine learning models built specifically for the quality function. It can also include new data sources such as videos or images and blend them with the data collected from the PdM solution to quickly identify quality-related issues.

To improve downstream quality benefits, you can integrate your PdM solution directly with a quality solution. With this approach, the PdM solution serves as input for a quality solution, along with the data being collected from a scheduling platform. For example, when the PdM solution predicts failure on a machine, the failure prediction is input into the quality solution and strongly influences a predictive model that suggests the widgets created using the machine could have a quality issue.



4 Enhance Production Scheduling to Deliver Increased Value

PdM solutions can also help to improve production scheduling. With accurate information about when an asset will or won't be available for use, you can create smarter, data-driven production plans. The following examples show how PdM can positively impact production scheduling.

- Compartmentalize production to avoid risk of wasted product. If there is a period of higher risk for an asset or group of assets, production efforts can be halted prior to the high-risk phase. When the risk is mitigated, there might be a surplus of partial product, but the reward is that a great deal of waste has been avoided (that is, the at-risk asset didn't create flaws that ruined good product).
- Decrease time for planned maintenance completion. Additional issues are often discovered during planned maintenance, which leads to unplanned repairs and more asset downtime than originally expected. With PdM, you gain insights into assets and can identify an asset that is at higher risk for additional problems prior to planned maintenance, so you can plan accordingly and avoid surprises. These insights promote more accurate estimates of expected planned downtime, so parts can be ordered in advance, a substitute asset can be brought online, and the impact of unexpected issues during planned maintenance can be reduced.
- Lower risk with alternative product production. In many manufacturing facilities, the same assets are used to make different products. PdM can provide information that helps to determine risks specific to different production modes. If there is an amplified risk for a delay, fault, quality issue or other problem, production can be altered, so lower-risk scheduling can be deployed to improve the production schedule.

5 Reduce Spare Parts Inventory

Many organizations implemented just-in-time inventory management in the early 2000s to increase efficiency and reduce waste by receiving materials only as they are needed in the production process. However, this strategy requires accurately predicting material demand, usage and vendor performance, which is a challenging task for the majority of warehouse management personnel. They often have neither visibility into upcoming demand nor confidence in their forecasts for raw or MRO materials.

Predictive maintenance provides a common platform for improved planning and forecasting of replacement parts. These accurate predictions of future demand apply to consumable spares (such as screws, gloves and bolts) as well as more expensive critical spares (such as pumps and motors). These predictions are especially crucial for critical spare parts, which are typically expensive capital items that require long lead times and are tracked and traced throughout their usefulness within the organization. These critical spare parts are installed, removed and repaired. They fail, break and sometimes get recalled.

When critical spare parts fail, they can cause production lines to stop, creating unplanned downtime and production loss. Many of these parts are candidates for IoT and predictive analytics, where you can track, monitor and forecast failure, and determine when a part's life expectancy is critical. The related data, such as the age of the component, number of repairs, failures, current condition and expected end of life, is also valuable as part of your planning process for spare parts and capex forecasts.

With the introduction of PdM, organizations can understand component performance and gain enhanced visibility and predictability for critical spare parts. Using this information, manufacturers can reduce inventory and accurately plan for the replenishment and replacement of MRO materials.



6 Enhance Employee Safety and Regulatory Compliance

Employee safety is an ongoing concern for manufacturing companies. When you implement a PdM solution, you gain actionable insights into maintenance schedules that can reduce the risk of employee injury related to machine malfunctions.

Employee safety can be further enhanced when blending data from a PdM solution with OSHA-certified¹ wearables to support regulatory compliance. The data collected from the wearables serves as a wellness monitor for specific kinds of injuries, such as knee, shoulder and lower back, and ultimately can reduce workers' compensation claims.

Blending the solutions together can have the benefit of reducing incidents of employee injury on the shop floor, and can lead to reduced insurance premiums.

¹ The Occupational Safety and Health Administration (OSHA) is an agency of the U.S. Department of Labor.

Why Hitachi for Predictive Maintenance and Analytics

Hitachi has over a century of experience in the manufacturing industry as well as over half a century of experience developing IT solutions. We have a strong track record of solving operational challenges with solutions that combine the latest cutting-edge technology, including IoT and AI-driven data analytics.

Our team of data scientists, researchers and industry thought leaders at the Hitachi Center for Social Innovation has developed a suite of PdM technologies and solutions for the manufacturing, transportation, oil and gas, mining and healthcare industries. Using sensors, image analytics, machine learning and advanced algorithms, these solutions provide insights that guide maintenance personnel to take the right actions at the right times, avoid unexpected failures, decrease maintenance costs and increase equipment availability.

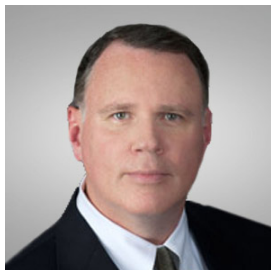


Hitachi has deployed sustainable and repeatable predictive maintenance solutions for some of the world's most successful enterprises, and we can do the same for your organization.

To learn more about how we can help your organization gain the downstream benefits of predictive maintenance, contact Hitachi Consulting at info@hitachiconsulting.com



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