

Smart Maintenance

**Reduce Cost, Improve
Quality, and Enhance
Productivity**

This information is for a maintenance or operations manager who:

- Wants to reduce maintenance-related disruptions in production.
- Manages maintenance for buildings or plants, or across large production facilities.
- Is ready to position maintenance as a driver of efficiency and cost savings for the business by improving equipment effectiveness, reducing machine failures and shutdowns, and maximizing asset longevity.



Estimated reading time: <9 minutes

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The transformation of maintenance

Across any supply chain, hundreds of critical functions keep things moving. The sales team works with customers. The accounting team tracks finances, customer support maintains relationships, plus logistics, shipping, scheduling, human resources, and many more contribute to overall operations. In this big picture of a typical supply chain, the value of maintenance for buildings, plants, machinery, and vehicles is often overlooked. But maintenance alone has the power to bring the supply chain to a halt in minutes.

Around the world and in your own company, many work processes are shifting to digital. The biggest advantage of this transformation is the potential for new data-driven insights. For example, plotting delivery routes with GPS data can help save time, fuel costs, and wear on vehicles. Smart maintenance brings this kind of data collection and analysis to maintenance, where its potential is currently unrealized.

The COVID-19 pandemic has significantly accelerated the need for remote monitoring and diagnostics of operations and assets. As the supply chain is impacted from all directions, maintenance can be the steady, reliable part of the puzzle that helps get things back on track.

In this e-book, you will learn about the five maintenance approaches that fit into a smart maintenance model:

1 Reactive maintenance

2 Preventive maintenance

3 Remote condition-based monitoring






4 Predictive maintenance

5 Cognitive maintenance

A maintenance model for today





Before we launch into the future of maintenance, let's understand the downside of traditional maintenance.

Traditional maintenance is built primarily on a reactive and preventive approach. When something breaks, you fix it. When it's time to change the oil, you change it. This approach can lead to:

-  Downtime and lost production.
-  Safety risks.
-  Unnecessary expenses related to planning, overtime, rush orders of spare parts, and inventory carrying costs.
-  Loss of brand value.
-  Loss of customer satisfaction.

Smart maintenance for stronger supply chains

The smart maintenance model includes reactive and preventive approaches, but goes further with remote, condition-based monitoring, predictive maintenance, and cognitive maintenance. Overall, a smart maintenance model delivers some rich benefits:

-  Maximize longevity for buildings, plants, machines, and vehicles.
-  Reduce costly machine failures and unplanned shutdowns.
-  Improve throughput, quality, and uptime.
-  Improve working conditions, especially regarding safety.

Each of the five approaches within the smart maintenance model has a place in your organization. Now let's explore how each approach fits into the overall smart maintenance model, when each one should be used, and what you need to make it work.

The smart maintenance model



Less technology▶ More technology

1 Reactive maintenance

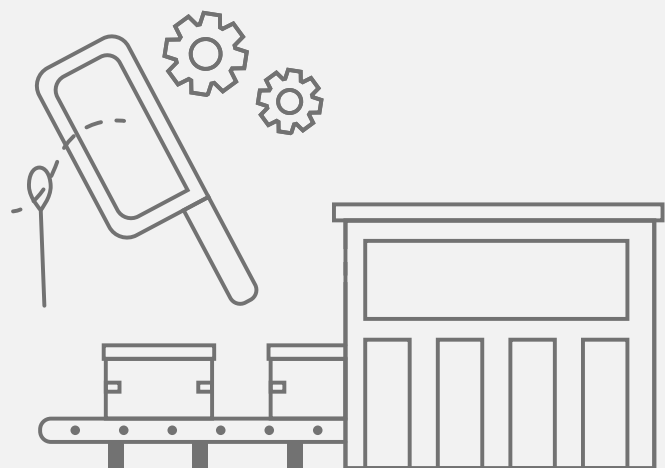
This should be familiar. If something breaks or wears out, fix it or replace it. There are scenarios when this approach is best, even in a technologically advanced organization.

How reactive maintenance fits into the model

Reactive maintenance works well for tools and items that are part of the supply chain but aren't likely to cause disruption if they go offline. Every plant or manufacturing facility has items like these that fall outside the rigors of a more advanced maintenance program.

Example

A hand-held textile brush used to sweep threads and lint from a finishing workstation.



Use reactive maintenance with items that:

- Are small.
- Are unlikely to fail.
- Are redundant.
- Have a low cost for downtime.

What you need to make it work:

- Workers trained to spot the failure as soon as it happens.
- Back-up parts and inventory to ensure redundancy is maintained.

2 Preventive maintenance

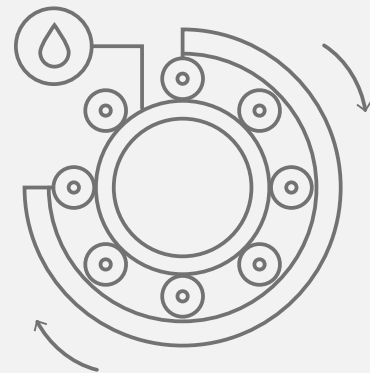
The preventive approach, which has been around for decades, might be the first maintenance methodology based on data. Changing the oil in vehicles every 3,000 miles, for example, is based on evidence showing that a lot of engine problems can be avoided if the oil is used for only a certain number of miles. With data showing the 3,000-mile mark to be optimal under normal conditions, we can create a preventive maintenance schedule.

How preventive maintenance fits into the model

As the foundation that other maintenance approaches build on, preventive maintenance means fixing and maintaining before failure can happen.

Example

Lubricate bearings after every 10,000 units, or inspect the condition of a motor on the first of every month.



Use preventive maintenance with items that:

- Are in heavy use.
- Are expensive to replace.
- Have many moving parts that require inspection and/or regular maintenance.
- Are critical to the supply chain.

What you need to make it work:

- A schedule for maintenance that's built into the supply chain timeline so there are no surprises or disruptions when a machine goes offline.
- A preventive method that's right for each piece of machinery or part: time-based maintenance for a compressor every 15 days, for example, or usage-based for electrical components after every production cycle.
- A maintenance team dedicated to maintaining the schedule and inventory necessary for upcoming inspections.

3 Remote condition-based monitoring

This approach refines preventive maintenance by implementing wireless sensors that relay data to a maintenance manager. Now instead of performing preventive inspections on a monthly schedule, for example, maintenance can be performed whenever the data says it's necessary.

How remote condition-based monitoring fits into the model

With the power of sensors and data collection, preventive maintenance becomes a sophisticated, more accurate, and efficient practice. Integrating sensors and data collection also:

- Lays the groundwork for more advanced maintenance approaches.
- Turns machinery and parts into Internet of Things (IoT) devices so they can be monitored from anywhere.

Example

The preventive maintenance schedule on a conveyor belt calls for an inspection two days from now. But a sensor on the belt reports that vibration has reached critical levels and an adjustment is needed immediately. This notification appears on the maintenance manager's dashboard and she assigns the work order.



Use remote condition-based monitoring with items that:

- Have random failures with no discernible pattern.
- Are not subjected to wear.
- Have measurable activities, such as vibration, temperature, water, or air flow, pressure, or audio.

What you need to make it work:

- The ability to gather data from your factory or equipment via sensors.
- A platform or dashboard to collect the data and deliver notifications.
- Training for your employees so they can properly respond to work orders.

4 Predictive maintenance

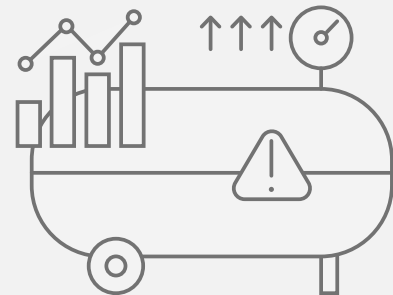
Accurate predictions rely on quality data. Predictive maintenance brings together data and technology to accurately inform the maintenance schedule.

How predictive maintenance fits into the model

With the groundwork laid for remote condition-based monitoring, we're ready to advance into smart maintenance. Up to this point, the maintenance approaches described have fit a specific need, but they're limited in their usefulness. The digital feedback loop that's part of smart maintenance means we can be predictive, anticipating equipment failure or maintenance needs based on both historical data and near real-time data. Then we can act to prevent failure before it happens.

Example

A temperature sensor on a compressor indicates it is overheating. In combination with analyzing the performance history of this specific compressor, the software determines that a part will fail within the next two production cycles, whereas ordinarily this signal would indicate only that more coolant fluid is needed.



Use predictive maintenance when:

- Your company has shifted its maintenance culture to a proactive mindset.
- Equipment is subject to wear-out.
- Replacement parts or servicing products, such as lubricant, are readily available.
- The failure pattern of equipment is known.

What you need to make it work:

- Comprehensive training so that everyone understands how the predictive maintenance program works, why it's important to the company, and what their role is in making it successful.
- A technology partner to help bring all the elements together, from sensors to data collection, dashboards, and data analysis.

5 Cognitive maintenance

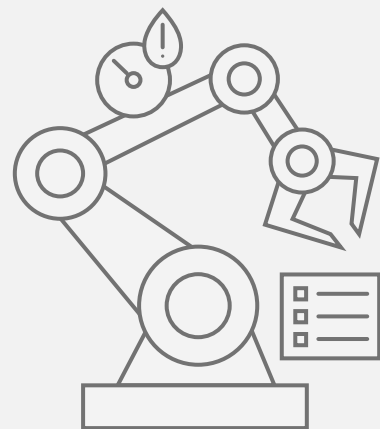
Here we've reached the pinnacle of the smart maintenance model. Cognitive maintenance means your program is able to think ahead with much more specificity and accuracy than the predictive maintenance model can.

How cognitive maintenance fits into the model

As the most technologically advanced approach to maintenance, cognitive maintenance helps ensure that equipment is in good working order. But it also helps optimize your workforce, production, sales, and customer satisfaction by eliminating downtime and increasing throughput.

Example

A sensor on a robotic arm detects low hydraulic pressure. The software combines historical data for this specific robotic arm, preventive maintenance guidelines, and the expected performance level of this robotic arm at its age and use level. Instead of recommending additional hydraulic fluid, the software determines that a part will fail within the next 30 days. It sends a notification to the maintenance manager, orders the replacement part, and sends a work order to the maintenance worker on the floor.



Cognitive maintenance is best for companies that:

- Have high production capacity or a large volume of equipment in high use.
- Are already embracing digital transformation in other areas with strong support from leadership.
- Understand the value of building business continuity through intelligent, unified systems.

What you need to make it work:

- Comprehensive training so that everyone understands how the cognitive maintenance program works, why it's important to the company, and what their role is in making it successful.
- A technology partner to help bring all the elements together, from sensors to data collection, dashboards, and data analysis.

Self-assessment

What level of smart maintenance is your company ready for?

This exercise will tell you what level of smart maintenance your company is ready for, based on your existing maintenance approach and plans for the future.

For each true statement, give yourself one point.

Leadership recognizes the importance of proactive maintenance and its impact on business success.

We have a formal maintenance program that uses software and technology to help schedule repairs.

Maintenance leadership is open to new ways of getting work done.

Training for maintenance workers is ongoing and comprehensive.

We have real-time equipment and process telemetry that can be visualized and presented to maintenance teams.

We have created a robust hardware breakdown and associated FMECA model for most of our assets.

Our maintenance procedures and equipment enable us to collect equipment condition data in a systematic fashion.

We have created a proof-of-concept model that incorporates AI and can create notifications based on equipment telemetry.

There is a major company-wide initiative around IoT and Industry 4.0.

We currently synchronize our maintenance schedules with production schedules.

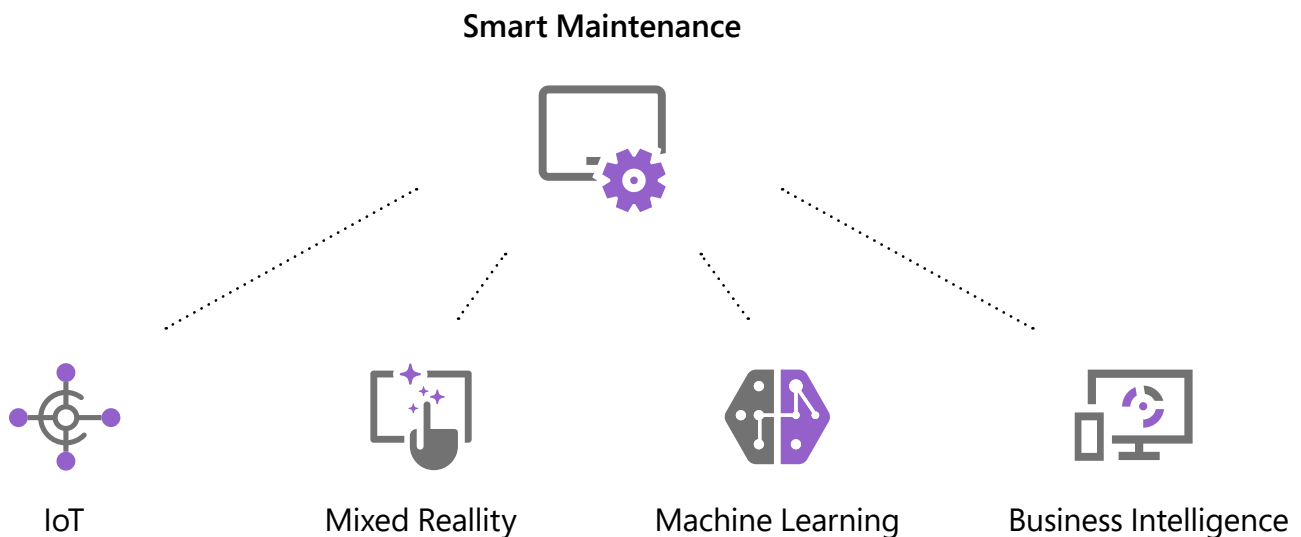
Scoring

- 8-10 points ready for cognitive maintenance
- 6-8 points ready for predictive maintenance
- 4-6 points ready for remote condition-based monitoring

Microsoft Dynamics 365 Supply Chain Management

Dynamics 365 Supply Chain Management gives you the agility and foundation to transition to the cloud, to support whatever maintenance approach you're currently using. You can easily integrate with your existing IT infrastructure to work with your legacy systems, then upgrade on your own schedule.

Transform your maintenance workloads from reactive to cognitive to become a factory of the future. With seamless native integration, you can make data-driven decisions with confidence in real time and improve the overall resilience of your supply chain.



Accelerate your move to proactive maintenance with the capabilities of Dynamics 365 Supply Chain Management:

IoT

Sensors monitor temperature, vibration, air flow, water flow, and pressure. This is the data that drives a smart maintenance program.

Improve uptime, throughput, and quality by proactively managing shop floor and equipment operations.

Reduce costly downtime of business-critical equipment.

Mixed reality

Dynamics 365 Guides uses HoloLens to allow workers to take a heads-up approach to their tasks, with handsfree delivery of work instruction in their field of vision.

Remote users can see what the worker/employee is seeing, allowing repair experts, consultants, or offsite managers to offer remote assistance.

Dynamics 365 Guides uses HoloLens to quickly train employees on tasks, so they are productive sooner.

Machine learning

Algorithms can analyze large volumes of data from your maintenance program and identify patterns to help the system learn and take action.

Save time on maintenance across the company as issues are identified more quickly.

Enhance safety by catching maintenance problems before they happen.

Business Intelligence

Analyze and assess the supply chain across several levels of detail.

These insights can empower more informed decisions.

Identify potential risk and take action to prevent supply chain failures.

Understanding the synergies in the supply chain promotes strong awareness of the factors impacting success.

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