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Ways Predictive Maintenance Streamlines Manufacturing

New Internet of Things solutions are helping manufacturers improve product quality, increase productivity, decrease costs, and make smarter business decisions.

The Internet of Things (IoT) is ushering in a new Industrial Revolution that will transform how products are made. Already, fabrication facilities are becoming “smart factories,” where vast quantities of sensor data are continuously analyzed to increase productivity and efficiency.

According to [Markets and Markets](#), manufacturers will spend \$74.8 billion per year on smart factory technology by 2022. And [McKinsey & Company](#) estimates that by 2025, the total economic impact of smart factories could reach \$3.7 trillion per year.

One of the first ways that smart factories are benefiting from the IoT is through predictive maintenance. These solutions collect equipment data and analyze that information with sophisticated algorithms. Using historical performance as a guide, the software forecasts how monitored equipment and the production line as a whole will behave.

For example, IoT sensors might monitor the temperature of a key piece of equipment. If the temperature begins to rise, a predictive maintenance solution can take actions to avoid equipment or product damage and notify staff of the problem.

The challenge is figuring out how to implement this technology. Because every factory is different, predictive maintenance must be customized for each facility. This involves myriad decisions about everything from how data should be gathered to where data should be analyzed — in the cloud or at the edge of the network. Making these choices can be difficult because IoT solutions require expertise in both information technology (IT) and shop-floor operational technology (OT) — and these two disciplines historically have had little in common.

To overcome these challenges, Intel, IBM, ADLINK, and PrismTech, an ADLINK company, combined their expertise in number crunching, big data, and industrial automation.

The result is an all-in-one predictive maintenance solution that incorporates factory-optimized hardware, secure data distribution, and advanced analytics.

For manufacturers that deploy such a solution, the potential payoff is huge. Predictive maintenance offers four key benefits: improved product quality, increased yield and productivity, decreased downtime and costs, and faster, better-informed decision-making.

1 Better Product Quality

A 2015 [IDC report](#) found that improving product quality is manufacturers' primary goal. That makes sense, as better quality naturally leads to other benefits, including decreased waste, lower costs, increased customer satisfaction, and sales growth.

However, for many organizations, quality improvements are difficult to achieve. Many factors influence product quality, and not all of those factors are under manufacturers' control. Fortunately, one of the most common causes of quality problems — faulty equipment that hasn't been set, maintained, or calibrated properly — is an area where predictive maintenance can help.

Often, manufacturers don't know they have a problem with equipment until products fail in testing — or in the worst-case scenario, when customers report the problem. Consider the case of an auto industry supplier whose process includes application of paint to metal parts. If the temperature at the painting station is outside



specifications, the paint may not adhere properly. The part could pass visual inspection and make it through the quality control processes at both the supplier and the assembly plant only to have customers see signs of rust after only a year. The end result

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could be a costly recall and lasting brand damage for both the automaker and the supplier.

Predictive maintenance can prevent this sort of scenario by using IoT-connected sensors to monitor the temperature of the painting equipment. When the software detects that the temperature is too high, it sends an alert to staff members so that they can take corrective action immediately.

In addition, predictive maintenance can use historical data to identify situations where the temperature might be in danger of rising too high — for example, during certain weather conditions or at certain times of day. In these cases, predictive analytics can alert workers to problems before they occur, enabling them to be proactive rather than reactive.

2 Higher Yield and Productivity

Obviously, improving product quality reduces scrap, but predictive maintenance can increase yields and productivity in other ways as well.

In some types of manufacturing, the volume of finished products that result from the raw materials varies from one run to the next. In the semiconductor industry, for instance, the number of usable chips created from each silicon wafer can vary because of a variety of factors.

IoT solutions with advanced analytics capabilities can analyze historical sensor data to identify the conditions that led to high or poor yields. For example, a semiconductor manufacturer could determine which factors historically resulted in more (or fewer) salable components. Staff members can use that information to

make the tweaks to equipment and processes that allow them to maximize yields.



Predictive maintenance also allows workers to plan repair and maintenance activities when they will be the most effective and the least disruptive to manufacturing processes. With predictive analytics, companies learn well in advance when their

equipment is going to need work, which helps improve productivity for technicians and the facility as a whole.

3 Less Downtime and Lower Costs

When a production line isn't running, the company isn't making money. Even worse, products that were partway through the manufacturing process may be lost. If an oven breaks down in a food processing plant, for example, the half-baked ingredients may need to be scrapped.

How Predictive Maintenance for Manufacturing Works

The solution from Intel, IBM, ADLINK, and PrismTech provides an excellent example of how predictive analytics is implemented. The solution can predict asset failure or quality issues. And organizations can integrate data into back-end systems for further analysis and business improvements. Let's look at how it works.

A device called a smart gateway gathers data from sensors in the factory and performs on-the-spot analytics (also known as edge analytics). Optimized for operational technology environments, these ruggedized gateways from ADLINK use Intel's standards-based architecture and built-in security features to provide the consistency and performance that smart factories need. PrismTech's data distribution service makes it easy to connect and integrate new devices into the solution. And IBM PMQ software provides the predictive model for edge analytics.

On the server side, an ADLINK industrial server is preconfigured to support data capture, visualization, scoring model updates, and results deployment. The scoring engine is developed using a software modeler, which is part of the IBM PMQ platform. With its sophisticated machine learning capabilities, the system provides stable, accurate, secure, and fast analytics in the most extreme environments.



But with predictive maintenance, technicians would receive alerts about problems with the oven before the food goes in to bake. Technicians can then swap out parts or complete maintenance work without needing to scrap any product. This reduces downtime and helps keep the line as productive as possible.

Predictive maintenance can also reduce costs by identifying opportunities to improve efficiency. Going back to the food processing example, IoT sensors can alert staff when the oven is drawing more current than it should. The technicians may then be able to



tune, adjust, or repair equipment that isn't running up to spec.

Over time, the operations staff can optimize each piece of equipment on the floor, ensuring that the facility is running as efficiently as possible.

4 Faster, Better-Informed Decision-Making

Without an IoT solution, managers are often in the dark about how equipment on the manufacturing line is functioning. They may assume that everything is running as it should until an emergency arises. This reactive approach to dealing with problems is inefficient, not to mention stressful for the managers and staff.

With an IoT solution, managers know exactly what is happening with their equipment and can prevent problems before they occur. This visibility can be a powerful tool for helping manufacturers improve their agility and competitiveness.

In addition, the best predictive maintenance solutions use machine learning capabilities to

The Benefits of Analytics at the Edge

The best IoT predictive maintenance solutions offer the option of performing analytics at the edge. For example, the solution from Intel, IBM, ADLINK, and PrismTech uses smart gateways to analyze Internet of Things (IoT) data on the factory floor, right where the data is collected. Known as edge computing, this technique can lower costs and improve operations in several ways:

- **Easier data management.** IoT sensors gather tremendous amounts of data, and much of that data is only valuable for a brief period of time. With edge computing, only the most important data gets saved to data centers or cloud facilities, helping reduce data storage costs.
- **Decreased network traffic.** Because the solution doesn't have to transmit all data to a centralized cloud computing environment, less data is flowing over company networks and incurring cloud storage and processing costs.
- **Decreased latency.** When data is transmitted to a company data center or public cloud facility, it takes additional time for the information to be moved off-site and then sent back to the facility. But when the data is analyzed on-site, staff members learn about potential problems as quickly as possible.
- **Increased availability and self-sufficiency.** Because the solution doesn't rely on a cloud or data center connection, analytics are able to continue in the event of a network outage or poor network connectivity.
- **Improved security.** When data doesn't leave the factory floor, it's much easier to protect against threats.

update their models constantly. This allows companies to make small, incremental improvements that help them become more efficient over time.



For example, the ADLINK Vortex Edge PMQ platform employs IBM PMQ software with machine learning capabilities. The system learns over time, providing managers with insights about which tweaks to the system

are likely to be beneficial. That enables the company to continually optimize the performance of each piece of equipment and the manufacturing process as a whole.

More broadly, a good first step is to try out a proof of concept to see how predictive maintenance performs in your environment. This will give you a baseline that you can use to better determine where and how to deploy predictive maintenance across your operations — and a justification for making the investment on a larger scale.

What to Look for in a Predictive Maintenance Solution

Not all IoT predictive analytics solutions are created equal. Each must be customized in order to meet the exact needs of each individual facility, and this adds a layer of complexity that can make it difficult to select the

right solution. That's why it's smart to look for solutions from market leaders working together such as Intel, IBM, ADLINK, and PrismTech. Their solution is designed from the ground up for factory environments and is customizable to each application. Such a solution offers the following advantages:

- Easy deployment into existing IT and OT environments
- High scalability with prevalidated architecture
- Low bandwidth consumption and low latency
- The flexibility to analyze data at the edge of the network or in the cloud
- Built-in security
- Minimal IT management overhead

By taking advantage of these synergistic solutions, manufacturers can deploy predictive maintenance in a way that grows with their business. The result is continually improved product quality, increased yield and productivity, reduced downtime and costs, and improved decision-making — all adding up to a higher return on investment.

To learn more, visit prismtech.com/vortex/vortex-edge-pmq.

SMART FACTORIES BUILT ON COLLABORATION

Intel's partnerships with IoT leaders such as ADLINK, IBM, and PrismTech are bringing transformational change to industries worldwide. With best-of-breed solutions for smart factories, these partners are helping manufacturers unlock operational efficiency, optimize production, and increase worker safety.