Applying the Internet of Things to manufacturing

8 IoT use cases to boost ROI

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Introduction

Manufacturers are under increasing pressure to optimize profits and efficiencies while simultaneously reducing costs – a daunting challenge. However, the emergence of digitalization and its associated technologies is making this feat possible for the manufacturing industry.

Specifically, the market has seen the convergence of information technology (IT) and operational technology (OT) due to advances and synergies between the respective areas. This has resulted in the industrial Internet of Things (IoT), which is a solution that collects and centralizes mass amounts of machine data gathered from industrial environments. Applications built on these IoT platforms collect, analyze and enable you to quickly act on the data to fundamentally boost operational efficiency and production.

The IoT has already gained traction within countless industries, including food and beverage, oil and gas, healthcare, automotive and more. For machine builders, it is quickly becoming a business imperative. According to an IDG and Siemens IoT survey, 53 percent of companies have started an IoT initiative. To keep pace with leaders in the industry, you need to start acting now.

But how?

The Forrester report, "*Internet-Of-Things Heat Map 2018: Prioritize IoT Use Cases Based On Value To Your Company Operations*," details the optimal IoT use cases for a wide range of industries. Combining the information in the Forrester report, along with Siemens' domain knowledge and hands-on expertise with the industial IoT, this ebook takes a logical look into how the IoT can best be applied for machine builders and original equipment manufacturers (OEMs).

"Arguably the biggest driver of productivity and growth in the next decade, the Industrial Internet of Things will accelerate the reinvention of sectors that account for almost two-thirds of world output."

"Winning with the Industrial Internet of Things"
Accenture,
February 2017

Eight IoT use cases for machine builders

This section details the top use cases machine builders and OEMs can implement to add the most value and return-on-investment (ROI) to their business.

Digitalization and the industrial IoT can be resource heavy as implementation gets under way, so it is often best to go after the lowest-hanging fruit and then scale up. The following use cases begin with the foundational implementations, but then each builds on the other to drive more and more value.

The Siemens Digital Maturity Model
for manufacturing processes

The Siemens Digital Maturity Model is a phased, planned approach to IoT adoption that provides targeted outcomes for organizations on their digitalization journey.

Asset Management

Asset Maintenance

Energy Optimization

Digital Twin

System of Systems

Self-Optimizing Systems

Condition monitoring

Once your assets are connected and streaming data to a centralized IoT platform, you can perform condition monitoring. Condition monitoring allows you to view specific parameters (for example: temperature, vibration and pressure) and key performance indicators (KPIs) to track operating conditions for all connected assets. If metrics deviate from normal operating conditions on an asset – indicating an issue – the application will alert users.

What is the benefit?

Proactively identify production line issues and start remedial actions prior to asset failure, which reduces unscheduled downtime

Maximize the uptime of critical assets

Gain transparency into asset health and performance across global locations

25%

increase in production is experienced by implementing consistent, accurate condition monitoring.

(Source: U.S. Department of Energy)

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Asset performance management

By monitoring and tracking the condition and status of your machines with KPIs, you can identify which machines are running below peak efficiency and productivity. IoT-powered asset performance management applications generate automated alerts when a machine moves outside of optimal operating conditions, notifying you to make changes to a production line to enhance performance.

What is the benefit?

Quickly react to anomalies with real-time alerts that indicate the need for action, reducing unplanned downtime. This accelerates production and creates a positive ripple effect on allocation, time-to-market and customer satisfaction

Refine baseline KPIs to more precisely determine machine performance

Continuously adjust machines for performance improvements based on real-time data

20%

or more improvement to a manufacturer's bottom line with 10% improvement in overall equipment effectiveness (OEE) - availability, performance and quality.

(Source: "Achieve better manufacturing outcomes with close condition monitoring of your machinery and equipment," Innius, March 2017. https://innius.com/machine-condition-monitoring)

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Predictive maintenance

By actively collecting and analyzing a machine's health and performance data, you can identify when key thresholds are met for a part, indicating it needs to be serviced or replaced. This allows you to perform maintenance on a need-only basis, eliminating scheduled and drastically reducing unscheduled maintenance.

What is the benefit?

Improve productivity and reduce maintenance costs by eliminating scheduled downtime. Only service a machine when it needs it, not when it might need it

Reduce unscheduled downtime by predicting when a part needs to be fixed or replaced. Knowing about a failure before it occurs reduces the amount of inventory you need on hand for emergency fixes

Understand the root cause of quality and production issues to increase asset uptime, utilization and yield

Proactively maintain machines to prolong their lifecycle

30%

reduction in overall maintenance costs with predictive maintenance.

(Source: Operations & Maintenance Best Practices: A Guide to Achieving Operational Efficiency, Release 3.0, Pacific Northwest National Laboratory, U.S. Department of Energy)

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New revenue channels

The IoT provides real-time visibility into the condition of your parts and machines, even after they leave the factory. This allows you to remotely monitor a machine's condition, which means you can offer new services to your customers, such as predictive maintenance or diagnostic capabilities.

What is the benefit?

$ Offer maintenance as a service to open new revenue channels

   Increase customer satisfaction by offering a guarantee of machine uptime

   Continuously interact with customers to foster a more loyal, long-term relationship

70%

reduction in asset breakdowns by implementing predictive maintenance.

(Source: Operations & Maintenance Best Practices: A Guide to Achieving Operational Efficiency, Release 3.0, Pacific Northwest National Laboratory, U.S. Department of Energy)

Energy management

Track and manage the energy usage of your plants and machines to identify where you can reduce consumption.

What is the benefit?

Identify peaks or dips in energy usage that may indicate an anomaly that needs inspection

Find ways to cut waste that contribute to excessively high energy bills

Better understand how individual machines and processes are contributing to overall energy consumption and use this data to improve forecasts

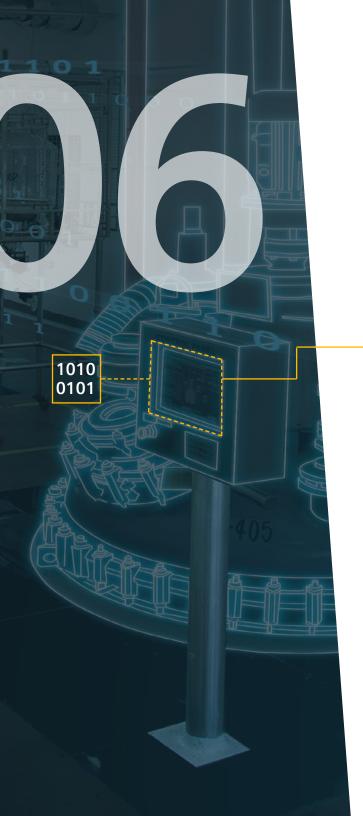Discover nonpeak energy times to run your machines to reduce costs

Improve your environmental sustainability efforts

37%
of energy brought into industrial plants is wasted.

(Source: "How Manufacturers Achieve Top Quartile Performance." Emerson)

Digital twin of performance

Receive real-time data regarding the physical performance of your production line and product. Use this data to quickly adjust production, improve product design and enhance your virtual models.

What is the benefit?

Receive real data to supplement your virtual models. Use this data to see how close actual performance is to what was expected, and make the necessary changes to bring them in line. This reduces the risks and costs associated with adjusting machines and processes

Quickly improve the next iteration of your product with real-time performance feedback. This will boost quality and time-to-market by allowing you to make immediate changes

Collect data into a centralized platform from thousands of machines sold to customers around the world. Track the machines to see if they work as expected to identify possible defects or supply problems, and to discover how customers actually use them

€75B

The potential in digital twins will reach €75B by 2025.

(Source: German Association for Information Technology, Telecommunications and New Media)

Inventory, warehouse and supply chain management

A fully integrated IoT solution can help you manage supplies and inventory at all manufacturing locations. Suppliers with an IoT platform can implement dynamic supply chains that better align to needs.

What is the benefit?

Optimize space and minimize costs by perfecting just-in-time (JIT) inventory and resource forecasting

Gain greater knowledge on the quality of supplies coming from vendors

Establish mutually beneficial relationships with attentive suppliers

Rapidly pinpoint assets and equipment with location-tracking sensors

"The client found that its workers spent 47 percent of their time just looking for the right tools, but with an IIoT solution, the worker could be told that the tool they needed was 10 meters behind them and to the left." [1]

Dr. Richard Soley Executive Director
Industrial Internet Consortium (IIC)

New business model – products as a service

Adding technology to your products opens up a new sales channel: products as a service. With connected sensors and devices added to the machines you sell, you can track the amount a machine is used in real time. This means you can start leasing your machines and charging based on usage.

What is the benefit?

$ Replace capital expenses with operational: Companies that cannot afford to buy a machine may be able to lease one. Customers that cannot afford to buy more than one machine may be able to lease more than one

Sell outcomes versus a product. For example, if a factory needs compressed air, that is what they want to buy, not the machines that create it

Provide customers with ongoing value through continuous assistance maintaining asset health and performance

Track usage of your owned assets to write-off a machine's depreciation

Create predictable, ongoing revenue streams

> "Rolls-Royce, a traditional manufacturer of airplane engines, does not just sell engines anymore. Instead, it charges its customers for the use of thrust on a power-by-the-hour basis."

(Source: "The Dawn of Digital Industries White Paper," Frost & Sullivan, August 2018)

Extending IoT outcomes

Once a solid IoT foundation is in place, you can gain additional value by building on top of your deployment. Two specific ways you can extend the value of your IoT implementation is by integrating **enterprise systems** and **emerging technologies.**

Think beyond machine data

Do not limit your IoT platform to physical assets – think bigger. Connecting web- and enterprise-based systems, such as enterprise resource planning (ERP) and customer relationship management (CRM), to your physical assets provides the opportunity to push the IoT value beyond the factory floor. Integrating other systems into your platform allows you to combine data sets and realize value beyond asset, production and product performance. For example, when inventory systems talk with production lines and suppliers, you can automate restocking and dramatically reduce inventory overhead.

Watch emerging technologies

By leveraging an open IoT platform, your IoT deployments can evolve with advances in technology. Large strides in artificial intelligence (AI), virtual reality (VR) and augmented reality (AR) show promising ways of bolstering the power of the IoT. For example, artificial intelligence drives deep machine learning. With the enormous amount of big data being generated, AI is well-suited to parse through the data to find meaningful insights and alert users to act. Virtual reality will increase the effectiveness of prototyping, finding possible issues faster in the design process and accelerating time-to-market. Augmented reality will allow engineers to project data and insights into their live environment. For example, holding a tablet in front of a machine could pull up a live diagram of the machine's internal components and wiring.

Conclusion

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Implementing the IoT is no longer in the innovators part of the product maturity curve. As the risks associated with digitalization have dramatically dropped, there has been an uptick in companies willing to take the first steps. Acting now will set the foundation for strategic business value before the early adoption curve grows into the early majority.

Employing the IoT in manufacturing will optimize your production. "Executives that implement IoT use cases for manufacturing lines seek better visibility and control over operations. This can enable them to change over production runs faster, detect and prevent emerging problems, and automate production of highly customized products" (Source: Forrester, Internet-of-Things Heat Map 2018).

Many organizations that are new to the industrial IoT need help ensuring long-term value and effectively implementing IoT applications. Siemens provides expertise in both the industrial space and in IT, with significant experience developing digital automation solutions. With this level of leadership, Siemens can help machine builders confidently plan and deploy IoT solutions that create new value for their business.

To learn more about the IoT, visit: www.siemens.com/mindsphere

References:

1. https://www.wired.com/wiredinsider/2018/07/industrial-iot-how-connected-things-are-changing-manufacturing