

Past is Present: The History of Remote Monitoring

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There is plenty of talk these days about the Internet of Things and wearable tech. We see this everywhere we go: everything from wristbands that monitor our step counts and heart rates, to Internet-enabled watches, to Google Glass. The approaching ubiquity of these devices is seen in many circles as a breakthrough. While the consumer fascination with these capabilities is relatively new, what is often lost in the conversation is this: packaging companies have been building networks that connect machines for years — most often referred to as the “Industrial Internet” — and OEMs have increasingly been enabling this connectivity across the machines they produce.

Over the last decade and a half, huge leaps in progress have been made — and the possibilities on the horizon are astounding. In its 2013 report, “The Industrial Internet @ Work”, General Electric estimated that this accelerated growth in productivity will boost global GDP by as much as \$10-15 trillion over the next two decades.

In the packaging industry specifically, operators on the line can anticipate potential issues and prevent stoppages in a wide range of applications, including material handling, filling and labeling. Stoppages create costly downtime and waste, which can erode end users’ bottom line. Software designers, working hand-in-hand with OEMs, can embed machine-to-machine communication solutions that identify lags in productivity and place this data at the fingertips of the manufacturer. This information adds tremendous value to the equipment; highlighting modifications that boost efficiency and profitability while building a foundation for long-term loyalty.

To understand just how this is possible, it’s helpful to think of this technology in terms of its evolution, and see the capabilities as a simultaneous confluence of the

Industrial Internet's Past, Present & Future.

The Past

The Industrial Internet grew out of one very simple but important requirement: the ability to monitor machinery from anywhere – removing the need to be in direct physical contact with machines when checking them. Some of the earliest applications for the technology involved the use of Remote Terminal Units (RTU) in public utilities such as electric grids and wastewater purification plants. These early systems operated on land-based communications systems like LAN lines or over telephone wires and they were most often simple alert systems; sounding alarms if a machine went down or was overheating and close to failure.

As the technology boom of the 1990s enhanced the sophistication of networking technology, so too did the sophistication of these systems increase. Remote monitoring grew to be more complex; gathering more data and incorporating Internet-based technologies to reach company personnel who were offsite and/or outside of the network.

In addition, the networks grew the capability to collect actionable data. Relationships to specific parts and processes could be determined. No longer was monitoring limited to the determination of whether a machine was up or down. People using these systems could institute predictive failure analysis and identify specific points of failure and/or a need for replacement parts before something went wrong. All of this data could be reported and used as a baseline to show what happened month-to-month and year-over-year.

The Present

Though some of the benefits of past systems were predictive in nature — for example, the ability to tell whether a specific part needed replacement, most of the data collected were related to past performance. Looking across the reporting, you could gain insights into how things had operated through the prior monitoring period. Over the next decade, however, remote monitoring technologies took on increasing sophistication and a whole new host of capabilities.

Today's technology now allows for the implementation of both remote monitoring and service functionality. Those responsible for the machines can connect from anywhere and not only check status, but also make actual updates and modifications. Predictive failure analysis allows technicians to replace worn parts before they fail completely – leading to fewer surprise outages. These abilities ensure that machine downtime is kept to a minimum. And because technicians don't necessarily need to visit facilities in person to fix issues, large companies can save hundreds of thousands of dollars on travel alone.

Innovations in data collection, transmission and storage have led to other capabilities as well. According to Cisco's 2013 white paper, "Embracing the Internet of Everything", greater amounts of data and information can be accumulated, allowing for a clearer picture of an operation as a whole. Efficiency is no longer just

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about a specific machine's uptime, but rather about how the entire operation works together at all stages of production. Through improved data mining, executives can gain a deeper understanding of their businesses thanks to the collection of millions of bits of information, gleaned from thousands of data points. The economy of scale is nearly limitless; ultimately paving the way for greater profitability.

The ways in which these data are collected have also changed, allowing for more freedom and accessibility. The incorporation of wireless systems and remote storage services (also referred to as "cloud services") allows for greater amounts of data to be collected with less hardware (hard-wired systems strewn across facilities, subject to failure). Cloud-based, off-site storage systems allow for the collection of the ever-increasing amount of data without need for deletion or concern over space issues.

The increasing complexity of data collection has also led to a greater sophistication of security services. As systems have grown to be more flexible, and accessible through more channels, the danger posed by hackers has increased accordingly. Properly secured systems now incorporate specialized hardware that protects and encrypts accumulated data at all points as it is transmitted from facilities to storage centers.

Finally, the interfaces that allow personnel to monitor the machines have become more user friendly and have been tailored specifically to today's modern, connected world. Smartphone apps are available to provide instant access to equipment status, regardless of the user's whereabouts. This access offers the opportunity to make changes on-the-go that create positive impacts for operations.

Taken together, these new advances enjoyed in current remote monitoring systems allow operators to react immediately to changes on the plant floor by connecting managers to equipment using mobile apps - all with a much greater trove of information at their fingertips. The result is greater efficiency and a better understanding of how facilities function as a whole, allowing for higher productivity and profits.

Packagers reduce their downtime and save money by pinpointing problem areas on their machines. When tied into aftermarket parts services, they can even order replacements seamlessly; preserving uptime. This also holds additional benefit for the OEMs as well, as it allows them to better service their customers once their machines are in operation in packaging and filling facilities.

As the depth of the collected data increases, and the ability to collect, save and analyze that data grows in tandem, the granularity to which the analysis can reach builds accordingly. Better algorithms work across larger data sets to better predict early failure in machines. Based on this wealth of information, powerful analysis emerges that shows efficiencies across an entire global enterprise.

The data accumulated across multiple enterprises allows benchmark setting for whole sectors of the packaging industry. Companies can build new operations from scratch, with a clearer understanding of the metrics they'll need to hit. The years

spent waiting for data to accrue, and the time and efficiency lost in those waiting periods, are a thing of the past.

The Future

As the growing depth of data allows personnel to understand a specific machine's performance at a specific moment in time, the technology will quickly dovetail into areas of Quality Assurance. Operators will be able to immediately detect anomalies on the packaging or filling line. Anomalies will be tracked down to a particular batch or even a specific product. They will be able to catch and discard or repack faulty products much more accurately than methods of random testing.

These advanced alert capabilities will speed reactivity to critical inline issues. In printed packaging, for example, presses will be closely monitored for any number of issues including, but not limited to, misprints, unwanted color variation, ink spotting, or problems with the plates themselves. Monitoring via the Industrial Internet will boost the value of print defect devices by correlating machine parameters to enable operators to spot defective printed materials and stop potentially recurring issues just seconds after they start.

Quality assurance is of utmost importance in filling facilities, especially in food packaging, as health and human safety are paramount. Anomalous changes in product weight, density, and heat will be immediately detected – no matter how small – and addressed accordingly without delay. Data accumulated from these instances will tell plant supervisors the likelihood of recurrence, and allow them to tailor operations to limit or eliminate instances of improper filling or contamination.

In Closing

The Industrial Internet, and the remote monitoring services it enables, is continually evolving and holds great potential for all manner of packaging. From the earliest RTU-based systems to today's analytics-based capabilities, modern remote monitoring paves the road for a fundamental shift in the way companies streamline and maintain their operations. The technology's history is part of its present.

The earliest approaches, which set equipment scoreboards and allow for production assessment, still are present, providing machine data to business systems for accurate production of reports. Currently, modern systems allow for immediate reaction to changes on the plant floor and connect managers to equipment with a wider swath of available data, using security-backed, mobile channels like smartphone apps. And future benefits are just on the horizon, like quality assurance capabilities. Through the power of the Industrial Internet, these capabilities will change packaging forever.

About Ei3

Founded in 1999, Ei3 Corporation is a leading provider of smart services that enable the world's most complex machines to communicate with their human operators,

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facilitating data-driven efficiencies and improved uptime. Customers rely upon Ei3's platform to analyze remotely monitored data and deliver securely encrypted, actionable business data to centralized monitoring stations and mobile devices. Ei3's technology integrates seamlessly with machinery found in a wide range of industries including manufacturing, converting, printing, and information technology. <http://www.Ei3.com>

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