

**Industrial
IoT World**

PLEX[®]

**THREE WAYS INDUSTRIAL IOT (IIoT)
YIELDS BOTTOM-LINE BENEFITS**



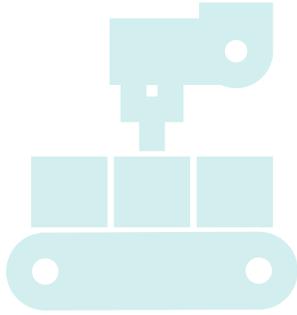


CONTENTS

- 3 Manufacturing Challenges
- 4 IIoT and Smart Factories
- 6 How IIoT Simplifies Maintenance and Compliance
- 7 Monitoring Machine Health in Real Time
- 8 How 'Smart' Data Yields Better Operational Intelligence
- 9 About Plex

Manufacturers constantly struggle with machine downtime and their lack of visibility into real-time production status — and as a result, many plant operations are reactive, rather than preventative. Since downtime affects the bottom line, gaining visibility into small anomalies can provide new methods of preventing failures and reducing waste.

This eBook looks at three key areas where utilizing Industrial Internet of Things (IIoT) — the next generation of smart factory intelligence — can have a significant impact while reducing the management and maintenance burden across the enterprise.



Manufacturing Challenges

Many factories are struggling with aging machinery, as plant managers work to extend the life of their investments. Although machines are aging, businesses strive to improve Overall Operations Effectiveness (OOE) while keeping costs to a minimum. In an increasingly competitive marketplace, pressure on profit margins translates to squeezing every ounce of productivity from equipment and operations alike.

Traditional maintenance plans are reactive in nature, which often leads to unplanned downtime when a piece of equipment suffers problems, or fails. And although many organizations utilize a scheduled maintenance approach, they often find they are leaving money on the table by performing maintenance too frequently – and yet machines still fail, even if regularly maintained.

ANY downtime impacts capacity, customer satisfaction and the business' bottom line. Ultimately the lack of visibility into the status of each piece of equipment can lead to:

- Product quality issues when machines run out of spec, culminating in higher quality assurance costs, customer delays, and overall business risks
- The need for extra shifts or overtime to make up for downtime, resulting in increased costs and reduced margins
- Higher scrap or rework rates driving costs up even further
- Product quality issues which can impact customer satisfaction and lead to expensive plant floor audits

In the following pages, we will discuss how you can apply IIoT to help overcome these challenges, and showcase three scenarios where IIoT can have a demonstrated impact on plant efficiency and the organization's bottom line.





IloT and Smart Factories

IloT is evolutionary, not revolutionary. An IloT system simply connects 'smart' equipment and data flows so they can work together as part of an overall smart enterprise.

IloT really began decades ago with the very first simple sensors and actuators deployed on the plant floor. Over time, these devices gained more intelligence and automation, evolving into supervisory control and data acquisition (SCADA) and computer numerical control (CNC) systems that controlled and optimized operations.

IloT systems emerged from these beginnings, offering next-level automation, deeper visibility into overall operations and autonomous operations of many processes. Based on open and standard internet and cloud technologies, connected IloT devices – whether legacy or new and 'smart' equipment – work together to provide new levels of insight, efficiency and security that translate into better management of safety and performance.

The benefits to an organization are manifold, including:

- Visibility into enterprise-wide data, including automatic data capture of real-time equipment status and process conditions
- Support for a broad variety of machines, spanning manufacturers (including support for legacy equipment designed before the IloT era)
- Delivery of early notifications of non-ideal machine conditions allowing action to be taken before failure occurs
- Application of artificial intelligence and machine learning (AI/ML) tools to 'learn' the unique operations of every facility in the organization
- Cloud-based software-as-a-service (SaaS) capabilities that enable anytime, anywhere access to alerts and status from any device

IIoT provides the 'glue' between existing SCADA, manufacturing execution systems (MES), enterprise resource planning (ERP), customer relations management (CRM) and supply chain management (SCM) systems, linking their data to other IT and operations systems to offer a holistic view of operations that encompasses every aspect of the business. This enables new advanced analytics tools that power growth from reactive to predictive to prescriptive operations.

The next three chapters outline use cases that demonstrate how IIoT can drive up profitability, security and innovation, while reducing waste – both in dollars and resource utilization.

“Based on what we’ve seen of [Plex] ROI so far, we expect a **30% reduction** in unplanned downtime cost, about a **10% reduction** of plant maintenance, [and] about a **10% reduction** in job transition time.”

–Bob Bierwagen, VP of Digital Strategy, MPI Corporation



How IIoT Simplifies Maintenance and Compliance

Our first IIoT use case is centered on maintenance. Why start there? First, maintenance is a great place for a pilot IIoT project, as the results of maintenance improvements are immediately visible throughout the organization and benefits are easily quantified.

Typical plant floor maintenance programs are rarely proactive, and effectiveness is often difficult to measure. Although many organizations use overall operations effectiveness (OEE) as the measure of maintenance performance, other metrics such as planned maintenance percentage (PPC), mean time between failure (MTBF) and preventive maintenance compliance (PMC) are often considered as well.





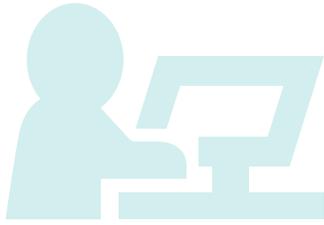
Whichever metric is utilized, constantly firefighting equipment difficulties with manual support procedures robs the organization of time and production capacity while driving up overall costs. IIoT makes a big difference by enabling maintenance to evolve from reactive to proactive to predictive, which not only can save considerably on scheduled maintenance expenses but also can reduce waste caused by machinery functioning outside of normal operating parameters.

IIoT does this by monitoring machine parameters and providing alerts when something is amiss, whether due to failure or erratic or out-of-spec operation. Once the IIoT system determines that a process or machine is out of its normal operating zone, it then alerts operators – or other machines – so that prompt action can be taken, and downtime averted.

Typical plant floor maintenance programs are **rarely proactive**, and effectiveness is often difficult to measure.

A key benefit of IIoT-based maintenance is the added context that is provided for failing or out-of-spec machines. A good IIoT solution can bring together all the relevant machine data with information from a Manufacturing Execution System (MES) including part numbers, the job number, orders involved and operators involved, combining OT data from devices and machines with IT data from client, order processing and production scheduling systems. This added context not only can pinpoint possible losses due to downtime, but by integrating MES and IIoT, decisions can be made that combine process, operational and machine-level data – both real-time and historical – to determine the best course of action for any given problem.

IIoT maintenance programs enable management to track and measure true real-time machine availability and can alert operators or management as to which customers might be impacted by an imminent outage. By providing a live and historical view of work-centers and individual assets, IIoT provides stakeholders at-their-fingertips access to critical information anywhere, any time.



Monitoring Machine Health in Real Time

Our second use case spotlights the monitoring of machine health in real time. Although there are an increasing number of smart machines on the plant floor, they have not always been connected, with a study showing that only about one in seven were connected and streaming data available to other machines, people or applications.

Pre-IIoT systems require a substantial amount of manual data collection, which is tedious and labor intensive, as well as subject to transcription or other human errors when collected. As a result, machine data is typically collected after the fact, rather than in real time, which means by the time it is collected, it is quite probably stale.

By contrast, IIoT production monitoring enables automation of both collection AND analysis of data, either on-demand or continuously. An IIoT dashboard provides an at-a-glance health report with color coding that flags anomalous indications if and when any status changes. More importantly, IIoT systems demonstrate how a problem that occurs NOW impacts production scheduled for LATER.

Access and analysis of data in real time provides new levels of insight that previously was available only with a team of data scientists armed with dedicated hardware and software. Now, real-time notifications are a click away, aggregated from a multitude of machines from a wide range of different vendors, without organizations having to hire a team of expert analysts and software engineers.

A great benefit of IIoT is the enablement of real-time reactions, even before machines are out of operating range. By detecting machine data trending toward an out-of-range condition, IIoT systems can initiate preventative actions which save or eliminate waste, slash or eliminate downtime, and even reduce the need for scheduled maintenance by capturing and analyzing operational information in real time. These benefits add up to improved maintenance programs, higher customer satisfaction and reduced expenditures.





How 'Smart' Data Yields Better Operational Intelligence

Enterprises exist in a data deluge, with information coming at IT and OT from every angle. And although more data can lead to better decisions, smarter data enables an entirely new way of using information to transform the business. In the case of IIoT, organizations are finding they gain a new level of operational intelligence by using smarter, contextualized machine data.

Although manufacturers want to take advantage of AI and ML, the value in their existing machine data is often locked into a single system. When these disparate data flows are connected and combined using IIoT, additional context becomes apparent, enabling new uses for information, new automation opportunities and methods for further optimizing workflows both on and off the plant floor.

Although **more** data can lead to better decisions, **smarter** data enables an entirely new way of using information to transform the business.

By integrating data from multiple applications (MES, ERP, CRM) and from multiple machines, IIoT systems can provide critical real-time information not previously available, answering questions including:

- Which orders rely on a given piece of equipment, and what impact will downtime on each piece of equipment mean overall?
- What customers will be impacted if a machine fails, and how can production scheduling be managed to ensure key accounts are properly serviced if an outage occurs?
- How much overtime or how many new shifts will be required to meet demand, whether that demand is caused by downtime or by a seasonal spike in business?
- Which employees have the highest production when working a given machine, and where can production be improved on those same pieces of equipment?
- If a machine is out of its operating range, what impact does that have on quality, and what is the precise genealogy of affected parts and products?

Smart machine data and its integration with CRM, ERP, MES and IIoT systems enhances decision making with a new depth and breadth of knowledge, which echoes from the plant floor to the C-suite.





About Plex

Plex Systems delivers the first smart manufacturing platform that empowers the world's leading innovators to make awesome products. Built in the cloud, the Plex Smart Manufacturing Platform includes MES, ERP, supply chain management, Industrial IoT (IIoT) and analytics to connect people, systems, machines, and supply chains.

Plex IIoT offers support for the widest variety of machines, providing a vendor-agnostic platform that delivers connectivity to virtually any asset or data stream, and supporting multiple data streams from connected machines and sensors.

With Plex IIoT, you get a 100% cloud-based SaaS solution, so you can get up and running with IIoT in hours, not months — with anytime, anywhere, any-device, easy-to-use access to business-critical information. Plex IIoT is not a toolkit requiring lots of work to deploy: it is a complete solution ready to go, adding context to machine data from the instant it is turned on.

Plex provides live dashboards that drill down from facility to work cell down to machine or asset level, with easy-to-understand color coding and real-time views of the status of each asset (off, in-cycle, idle, problem or other). Dashboards and reports offer both real-time and historical perspectives, including views of logged asset status and historical event logs.

By providing contextual data insights that combine process, operational and machine data, Plex offers visualizations of data over time with graphical trend lines, whenever and wherever needed, and with security controls that ensure access is restricted exclusively to authorized users.

[Click here](#) to learn more about Plex Industrial IoT.