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OPTO 22
The Future of Automation.
The Automation Gap

BY MIKE FAHRION
Director of IoT and product management, Advantech

By understanding how technology lifecycles tend to make all technologies more affordable over time, companies of all sizes can take a long-term view of today’s bleeding-edge technology and plan for the future.

Technical advancements in manufacturing and automation technologies over the past several years have been impressive—driving gains in quality, safety, efficiency and effectiveness. And these gains don’t stop with manufacturing processes; they often extend to the manufactured products themselves. Industry 4.0, digital twins and artificial intelligence (AI) are all fascinating topics that have advanced well beyond theory and into practice at advanced manufacturing sites.

Amid these advances, there exists a massive automation gap. This gap represents the space between those advanced manufacturing sites and the area under the bell curve that represents the state of the industry for most manufacturers. In fact, drawing a bell curve around manufacturing and automation in the U.S. market shows that...
The Automation Gap

the typical manufacturing site has just a couple dozen employees. According to the U.S. Census Bureau, fewer than 4,000 of the 250,000 manufacturing sites in the U.S. have more than 500 employees.

Setting aside the large manufacturing sites, 98 percent of U.S. manufacturing sites are in the small to medium category. Most of those sites have a workforce measured in dozens and aren’t often able to make investments in bleeding-edge technologies like AI and digital twins. The majority of sites exist in that meaty area of the bell curve more heavily impacted by the trailing edge of the technology curve. This is the area where maturing technology drives down cost and complexity, making high-tech automation accessible—but this typically does not happen until a decade or more into a technology’s lifecycle.

In our own local manufacturing plant, we recently completed a digitization project in just a few days’ time. For just a few thousand dollars, we installed tablets at every work cell, making thousands upon thousands of work instructions instantly accessible at the touch of an assembler’s finger. From a technology perspective, the project leveraged touchscreen displays, wireless tech with video and voice recognition capabilities and multiple software applications. Imagine replicating that project 10 years ago, and it’s easy to envision its costs ballooning twentyfold with an implementation measured in months,
not days. In addition, such an end solution implemented a decade ago would have been highly proprietary, single-sourced, and high in maintenance and support costs. Today’s solution is multi-vendor, with a mean time to repair/replace measured in minutes.

With this reality in mind, as you consider bleeding-edge technology today, it is an interesting exercise to envision how that tech might manifest itself in three, five or 10 years. Will it become inexpensive, multi-sourced and highly accessible for a majority of manufacturing sites—as mobile, wireless and many software apps are today—or will it remain niche and unobtainable for most?

One could argue that the success of a particular technology is determined by its penchant to mature from bleeding-edge, single-source innovation to a position of “tech entitlement” and frictionless adoption by those of us that occupy the majority of the area under that bell curve.

This is equally well understood by marketers of innovative solutions who recognize the critical nature of not just selling to early adopters, but “crossing the chasm” to the majority of the market.

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The Automation Gap

is all good news. The forces of technology and economics are in your favor. Hardware costs are driven down by the confluence of Moore’s and Metcalfe’s laws as well as sheer volume. And the front-loaded economics of software development creates a remarkable value proposition on the mature end of software technology lifecycles.

With that in mind, the clever automation engineer looking to maximize return on investment and minimize risk can focus on technologies that have already moved into that mature state of adoption. Leverage the technology that might have been out of reach just a few years ago—smartphones, tablets, Wi-Fi, wireless sensing, industrial PCs that fit in the palm of your hand, cloud computing, data storage and data analytics. Use that technology to improve your overall equipment effectiveness (OEE), reduce energy consumption, and improve the productivity and safety of your staff.

Whether your operation has five or 500 employees, these technologies are all accessible and affordable. Remember that what was bleeding-edge 10 years ago is now easily deployable technology that enables the Internet of Things.

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Revolutionizing Just-in-Time Inventory Management With IIoT

BY TONY CORLEY
Senior manager of product marketing, Epicor Software

Through the use of IIoT to connect wireless pushbuttons in the field to ERP inventory and order management, Jergens Industrial Supply is transforming its business for the digital future of industry.

Jergens Industrial Supply (JIS) is a leading industrial distribution company founded in 1960 that presents itself as Ohio’s largest distributor of industrial products. JIS, which represents more than 300 of the top manufacturers of industrial supply products in the U.S., believes it is not just a company that sells product to customers, but a “partner in productivity.”

JIS generates about 30 percent of the business conducted by its parent company Jergens Inc., a manufacturer of standard tooling components, fasteners, hoist rings, vises and other work holding equipment.
Like many distributors, JIS found itself needing to reinvent its value proposition in the midst of many disruptive forces. These forces included increased competition from industrial supply behemoths with vast order volume and buying power, as well as the need to cater to a more empowered customer base with many buying options. Meanwhile, as Baby Boomers head off to retirement, JIS has had to also redefine its value proposition for a new generation of Millennial buyers with high expectations for an online customer experience.

In keeping with its commitment to add value to processes and reduce waste, JIS set out to offer a frictionless inventory management solution for today’s real-time, always-on manufacturing enterprise. This process began with the deployment of an AutoCrib vending machine system about seven years ago. The machines, which feature integrated barcode scanning, are stocked with up to 5,000 inventory items at a price point previously agreed upon with the customer. Personnel receive a unique pin code and “order” the parts they need for a job by scanning a barcode. Established parameters govern dispensing; for example, workers are given access to one set of gloves every 24 hours.

In 2015, realizing the opportunity to convert these vending machines into “smart machines,” JIS approached MindHarbor for help
integrating its vending systems with its Epicor Prophet 21 enterprise resource planning (ERP) system. Once this integration was complete, the two companies began studying the early Internet of Things (IoT) Dash Buttons from Amazon. From there, a plan to engineer a solution to support a simple, on-premise product resupply using WiFi-enabled IoT buttons—known as JIS Express buttons—was born.

Here’s how the system works: At 3 a.m., JIS vending machines place replenishment orders, which are then automatically logged, invoiced and staged with labels and delivery tickets for drivers. The JIS Express buttons, which are affixed to racks or shelving on or next to equipment or drawers, are installed onsite and connected to an on-premise wireless network and the JIS ERP system. The buttons are customized with a distributor’s name and/or the name of a frequently ordered product. Pushing a button triggers an order. One push equals one item at a pre-configured reorder quantity, and a confirmation email is sent to a pre-approved order manager. These confirmation orders include a link to the customer control portal—a secure webpage accessible by smartphone, tablet or PC. The order notification alerts track all buttons pushed in a 24-hour period. The order manager can review, edit and/or approve items ordered in the past 24 hours.

The system batches all items at 3 p.m. every day so orders are built and reviewed daily by the customer. Confirmed orders go directly
from the customer portal into Prophet 21 for review and approval and are then either shipped to the customer for replenishment or delivered by the distribution team.

**Metrics that matter**

With 115 vending machines in the field now integrated into this system, JIS has experienced 30 percent improved productivity, allowing the company to grow without having to increase its headcount. In addition, drivers now cover more ground on any given day when they manually restock machines on their routes, since now all they need to focus on is fulfillment following order directions via an iPad.

JIS has also seen a significant reduction in customer service effort and costs since product costs are now negotiated up front, eliminating the need to quote items for replenishment and manage orders.

Since JIS launched its JIS Express buttons in October 2017, demand has been substantial. The company has been doubling the number of buttons deployed in the field—as well as the number of orders received and corresponding sales volume—every two months.

The buttons have proved to be an exceptional entry-level offering for smaller customers with lower inventory volumes. Additionally, the
solution provides a replenishment method to manage and maintain oversized items that are too large to fit into vending machines. The JIS Express buttons cost only $10 to $15 each, as opposed to the vending machines that can run from $10,000 to $50,000.

**Additional benefits**

Because tool cribs can be a massive inventory black hole—leading to products being lost, horded, misused or simply not used—inventory waste consists not only of the cost of carrying excess inventory, but also the costs to finance, store and handle the inventory.
With JIS Express, JIS brings the concept of just-in-time inventory to a whole new pushbutton level. Effectively, the inventory is consigned yet available only steps away, so manufacturers are billed for inventory as it is dispensed.

This project demonstrates how the digital disruption can bring benefits and efficiencies to the manufacturing floor and the back office simultaneously. Every time a JIS Express button is pushed, it collectively represents hundreds and millions of dollars saved from the perspective of:

- Manufacturing floor workers—reduced walk time and “talk time” to get the tools and materials needed. Improved safety via quick, easy access to all requisite equipment and supplies (e.g., safety glasses, hard hats, etc.).
- Manufacturing back-office personnel—reduced time and effort in contracting and purchase order processing, and improved inventory management visibility, traceability and accountability.
- JIS customer service personnel—reduced time and effort in contracting, order entry and fulfillment.

With its JIS Express buttons, JIS has been able to reach a whole new customer demographic and box out competitors by giving
customers a reason to continue giving JIS their business: a smart and easy-to-adopt, just-in-time inventory management solution that offers ultimate convenience and can scale as they grow.

The company’s innovation and growth in its JIS division has also brought another big benefit to the company as a whole—a buffer from fierce economic realities. The company has been paying an additional 20 percent for steel since the tariffs took effect and has had to raise its prices to cover this increase. Jergens anticipates customers will likely push back against further increases, so the growth of JIS via its innovative inventory management solutions provides a solid business strategy to offset these business realities.

As Industry 4.0 continues to have widespread impact in manufacturing, examples of innovative use cases like this one will go from novel to normal. By connecting people, processes, data and things in an intelligent and strategic manner, organizations can streamline shop floor activities for greater efficiency, agility and customer-centricity.

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By now, we all know that cloud computing is an excellent asset for storing data that doesn’t have a need to be immediately analyzed or accessed. But what is the solution for data that does require real-time processing?

That’s where edge computing comes into play.

Considering that edge computing is still a relatively new technology, you might be asking yourself questions such as:

• What exactly is edge computing?
Deploying the Edge for Real-Time Analytics

• What are the benefits of processing data at the edge?
• How is the edge different than the cloud?

These are questions that industrial and manufacturing companies are contemplating when thinking about how to incorporate edge into their operations. But because edge computing is such a new concept, there isn’t one definition that can answer these types of questions for every user. But that doesn’t mean the questions can’t be answered in a way that will help you make an effective decision about this new area of technology.

Dueling definitions

At the present, there are several definitions that explain edge computing:
• Gartner says the “edge” is the physical location where things and people connect with the networked digital world.
• The OpenFog Consortium defines edge computing as the process of placing data and data-intensive applications at the edge (i.e., on premise) to reduce the volume and distance that data must be moved.
• The Linux Foundation defines edge technology as being a tool to improve performance, operating cost and reliability of applications and services. The foundation goes on to explain that edge computing shortens the distance between devices and the cloud, thereby
mitigating the latency and bandwidth constraints of today’s Internet, resulting in the development of new applications.

Taking these three definitions into account, we can arrive at this general concept: Edge computing enables data and analytics gathering at the source, and involves pushing computing applications, data and services away from centralized locations to the “edge” of the network.

This seems straightforward enough, but it gets a bit more complicated when delving into the approach and purpose of specific technology deployments. This is especially true if you’re thinking about deploying an edge device to help with your operation’s real-time analytics capabilities.

If that’s the case, here are three questions to keep in mind.

**How much data do you have and where is it stored?**

With edge computing, companies benefit from real-time processing capabilities, decreased latency and reduced costs. When considering how to deploy edge computing, knowing the amount of data that
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your operations will be processing and storing at the edge will ultimately help you determine the best course of action.

Given the broad range of industries and processes that could benefit from edge computing, it’s impossible to predict how much data individual industrial and manufacturing companies will actually push to the edge in the long run. What we can be confident of is that edge computing needs will only increase. New research from Gartner estimates that, by 2022, 50 percent of data is going to be created and processed at the edge.

**How connected is your facility?**

Most edge definitions presume that high levels of connectivity are required for edge devices. However, many industries have been deploying systems that would now be considered “edge” using minimal connectivity to the outside world. For example, the oil and gas industry has been using edge computing to monitor conditions on remote rigs located hundreds of miles away from the nearest data center. In these scenarios, the edge computing systems share only a subset of the most important data with core systems at headquarters or in regional data centers.
How secure are your operations?
A key difference about many edge environments is that there tend to be fewer humans around to effectively manage the hardware and software. In the past, limited or no connectivity often meant that these systems or sites were largely ignored. However, as these remote sites and systems become more connected, a higher level of
Deploying the Edge for Real-Time Analytics

security is needed. In short, you will need some sort of edge security strategy for these environments, and it is a good idea to look at them as having unique requirements rather than simply viewing them as an extension of your existing security measures.

When thinking about how to deploy edge devices, consider your operation’s data storage, connectivity levels and security requirements to best determine the right course of action. It’s also important to keep in mind the newness of the edge concept as a whole. As more use cases are developed for new operations, edge devices will become even more varied in their use.

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A Preview of What’s to Come in 2019 and Beyond

BY MICHAEL BOWNE
Executive director, PI North America

2019 is shaping up to be a very big year—at least it is for Profibus & Profinet International. With a number of major releases planned, now is the time to familiarize yourself with three major technological advancements coming your way.

These past couple years have been busy ones for the Working Groups of Profibus & Profinet International (PI). Working Groups develop all the technical advancements made to the Profibus, Profinet and IO-Link specifications. These groups are staffed by some of the smartest engineers in the industry from companies big and small. These folks volunteer their time to help drive our technologies forward—and one Working Group has been particularly busy.

The Industrie 4.0 Working Group (I4.0 WG) was initially convened in 2015 when trends like the Industrial Internet of Things (IIoT) were first gaining traction. At the time, the group was tasked with turning...
A Preview of What’s to Come in 2019 and Beyond

Concepts into reality. Instead of blindly adopting new technologies for technology’s sake, a different approach was taken. Collaborating with end users across vertical markets, the group first developed a long list of requirements. These requirements were then prioritized, which resulted in three main areas being highlighted—simplification, integration, and process.

**Simplification**

Time-Sensitive Networking (TSN) is all about making life less complicated when it comes to deterministic networking—a fundamental aspect of factory automation—over Ethernet. With Profibus, determinism was achieved via a closed fieldbus. However, since Profinet runs on standard open Ethernet, which is not deterministic by design, additional functions were built into the Profinet protocol to achieve this determinism. Namely, the protocol skips Layers 3-4 of the ISO/OSI Model and goes straight from Layer 2 to Layer 7. Furthermore, Profinet Isochronous Real Time (IRT) adds features like bandwidth reservation, synchronization, and scheduling to function even faster for high-speed motion control.

Now that other industries outside of factory automation are interested in deterministic Ethernet, the features we’ve built into Profinet for 15 years are becoming IEEE standards known as TSN. This simplifies...
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Industrial Internet of Things

networking, as determinism can be taken for granted via TSN mechanisms. Though it might sound trivial to bring the TSN tools into the Profinet specification, it has taken a few years of continuous effort within the I4.0 WG to make this happen. In mid-2019, PI will release its Profinet@TSN spec, and we expect the first products with this technology to hit the market in 2020.

Integration
Another topic highlighted in the Working Group is horizontal/vertical integration—which focuses on reducing the effort to gain access to manufacturing line data and harmonize it for additional use. To that end, PI plans to release its Profinet/OPC UA Companion Specification by mid-2019.

Of course, machine-to-machine (horizontal) integration is nothing new for Profinet. In fact, the very first version of the protocol was used in this fashion before being expanded to I/O data exchange. With this history in mind—plus the knowledge of OPC UA's capabilities and widespread acceptance—the I4.0 Working Group determined OPC UA to be the best way to integrate Profinet from controller to controller. In combination with TSN, OPC UA allows best-in-class machines from various vendors to communicate deterministically.
For vertical integration applications, the Profinet/OPC UA Companion Specification will begin with a mapping of Profinet diagnostics and asset management records to OPC UA objects. With such data made available via OPC UA, it can be accessed more easily by higher-level systems. For example, with diagnostics mapping, the alarms and conditions functionality of OPC UA could be leveraged.
by Profinet. For asset management records, the goal is to further advance the concept of the administration shell within the context of digitalization. The ability to gather detailed asset management records from Profinet devices via OPC UA will help in the creation of a digital twin for any given machine.

Whenever the topic of vertical integration is discussed, the first question always raised is about security, and this issue is being addressed by PI’s I4.0 Working Group. The challenge with industrial control system security is to strike a balance between going too far and not going far enough. With this in mind, since the first security implementations were demonstrated in April 2018, the Working Group’s initial focus has been on mitigating potential man-in-the-middle attacks.

Given that most Profinet traffic is transmitted at Layer 2 of the ISO/OSI Model, its packets are distributed according to MAC address. By definition, packets at this level do not traverse different subnets and are not routable according to IP addresses. Therefore, a malicious actor would need to be inside your network to do something nefarious with these packets. Of course, if a hacker is inside your network, there are bigger problems to worry about. However, because Profinet
uses IP addresses in certain instances to route traffic that is not time-critical, these instances could be more susceptible to man-in-the-middle attacks. That’s why the Working Group’s efforts to secure the protocol are being focused here first.

**Process**

If the TSN advancements will be felt most in discrete manufacturing, then the advancements to Ethernet known as Advanced Physical Layer (APL) will be felt most in continuous process control applications. The reasons for the difference here are that TSN mechanisms operate at Layer 2 of the ISO/OSI Model, whereas APL operates at Layer 1. The ultimate goal for the process industries is to bring Ethernet down to field-level instruments in hazardous areas.

As instruments get more complex and more data becomes available, the need for increased bandwidth to access this data becomes apparent. Ethernet provides this, with the added benefit of being a well-known standard. The forthcoming APL will be based on single-pair cabling, already familiar from the Profinet PA world. Similarly, both power and communication will be transmitted via these wires. Finally, APL will exceed the 100 m limit currently imposed on common 100Base-TX Ethernet networks.
Since this is an advance of Ethernet itself, and not just Profinet, PI is collaborating with other fieldbus organizations on this work. Therefore, the timeline for APL is a bit longer than that of the TSN implementation or the OPC UA Companion Specification. Work on APL is not expected to be completed before 2020 or 2021.

We all know that in manufacturing markets, things don’t happen quickly. But in reality, these technologies will be here before we know it.

For more information, visit PI North America at us.profinet.com.
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Using IIoT for Predictive Maintenance Is Nearer Than You Think

BY PHIL MARSHALL
CEO, Hilscher North America

Once considered a technology out of reach for many industrial companies, predictive maintenance is coming to the mainstream thanks to next-generation chips that allow for easy cloud-enablement and use of communication protocols like OPC UA and MQTT that permit quick and efficient data transmission between devices and the cloud.

Allow me to introduce a new approach to field device maintenance—one that uses Industrial Internet of Things (IIoT) technologies to achieve predictive maintenance. Not only does it offer a low-cost way of deploying IIoT in plants today, but it also presents a new business opportunity for device vendors.

Intrigued? Then please allow me to explain.

No one doubts the value of predictive maintenance. Identifying potential problems in advance instead of waiting for them to happen...
Using IIoT for Predictive Maintenance Is Nearer Than You Think

is key to optimizing any manufacturing process. But predictive maintenance systems are expensive, aren’t they? From an end-user point of view, it might seem like you have to be IT-oriented and possess big budgets to get involved. And it probably seems like any technology supplier offering predictive maintenance capabilities would need to be a major player with software packages that only large companies could afford. Right?

Wrong!

To better understand why, ask yourself this: Where does most of the data needed for predictive maintenance come from? From our field devices, of course. Given this reality, who would be the most knowledgeable about those devices? Why, the device vendors themselves.

Unlock IIoT data in field devices

Slave device vendors know what parameters contribute to an understanding of a device’s condition and how that information could be used. These parameters include current draw, device temperature, number of cycles completed, speed and changes over time. But this information is mostly locked up within plant-floor devices today.
Obtaining this data is often referred to as data mining. Thanks to next-generation chips, devices can easily be cloud-enabled. And using lightweight communications protocols known by the magic acronyms OPC UA and MQTT, you can transmit that data quickly and efficiently between devices and the cloud over any standard real-time Ethernet protocol.

Adding MQTT and OPC UA is easy with interface chips such as Hilscher’s netX 90, which is a system on a chip (SoC). It even includes standard sensor protocol connectivity and advanced security options to offer a complete and secure bridge between a slave device and a real-time Ethernet network.

Once you’ve made a device cloud-friendly, there remains the issue of how communications between device and cloud will be handled. It might be appealing to get the data direct from the programmable logic controller (PLC), since it is the main source of data in a plant. But that goes against everything we believe IIoT should be for two reasons: 1) The PLC is already committed to doing what it was meant to do, i.e. control the plant; and 2) the PLC should not be overloaded with spurious roles that it was never designed to undertake. In addition,
EDGE COMPUTING MADE EASY

The influx of data generated from manufacturing technologies and devices is driving the need for a new edge computing infrastructure.

That solution is here. Stratus ztC Edge is a zero-touch, fully virtualized and self-protecting computing platform, specifically designed for industrial edge environments.

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upgrading it to handle the demands of predictive maintenance using IIoT could be disastrously costly.

That’s where an edge gateway comes in—but not just any edge gateway. It must be one that is passive, with no presence on the network as far as the PLC (or any other active devices) are concerned. Plus, it should present no security risk to control devices because it will be isolated from the control functions. Implemented properly, this edge gateway should just sit there gathering data from field devices during network free time and pass that data to the cloud. In some cases, it can even be used to process data locally.

**Edge gateways and predictive maintenance**

The edge gateway function described above is called data aggregation. For IIoT-based predictive maintenance, the edge gateway becomes a vendor-branded appliance. It can be added to the network at any time and its task is to act as middleman. Many vendors have personalized edge gateways, scanning only for the known MAC addresses of their own devices. These data are then passed on by the edge gateway and fed to the data management layer, which is basically a predictive maintenance app that could be located in the cloud or on premise.
Using IIoT for Predictive Maintenance Is Nearer Than You Think

Once you’ve made a device cloud-friendly, there remains the issue of how communications between device and cloud will be handled.

If vendors IIoT-enable their devices as discussed here, and customize their own edge gateway and remote monitoring app, they are in an ideal position to offer a device monitoring service to end users. This takes maintenance responsibility for field devices away from the user and places it in the hands of the individual vendor. This does, of course, require appropriate maintenance strategies to be agreed upon with the end user but, when properly deployed, an IIoT-based approach could relieve the user of a heavy load in terms of costs and staffing. This makes it a service users will be prepared to pay for.

Building off of this base, a cloud-based monitoring app will also be needed to fulfill the approach. And today there are many options, including established supervisory control and data acquisition (SCADA) technologies or even via the creation of a special app. The vendor you select might already offer an asset management package.

IIoT-based predictive maintenance keeps upfront and ongoing costs low for the vendor. Plus, hardware costs are minimal while design costs become one-off issues. Once built, the strategy can cover a complete product family and encompass an entire installed base in the field. For both reasons, costs can be amortized widely.
If I’ve piqued your interest in the current possibilities for IIoT-based predictive maintenance, send me an email (pmarshall@hilscher.com) and we can discuss this idea further.

For more information, visit Hilscher North America at www.na.hilscher.com.
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To grow your business, you need to not only streamline operations and expand into new markets, but act on opportunities to enhance the customer experience. Epicor provides industry-specific, tailored ERP solutions to get your business set for growth and scale with business demand, fast. Together, we are the Grow Getters.

Get your business set for growth at:
epicor.com/getsetfor growth
The adage “What gets measured gets managed” is an old one, and we’ve all heard it many times. A director of mine in a previous job had his own unique spin on it: “What gets measured gets managed gets improved.”

That last bit about improvement is of the utmost importance in today’s environment. But, so many times, we often follow just the first two points, or only the first.

Here’s how this happens: Many facilities capture every bit of data they can. Then, when management evaluates the data, they can’t see...
What Gets Measured Gets Managed...Gets Improved

the forest for the trees. The huge amount of data gathered makes it impossible to run any analyses, leaving us stuck with just the first part—getting measured.

To address this, businesses have begun using artificial intelligence (AI) in the form of IBM’s Watson, SAP HANA and others. These technologies have proven to be valuable tools, but the resources typically involved in integrating them into existing installations can be cost-prohibitive.

That is, until now.

With the growth of devices enabled by the Industrial Internet of Things (IIoT), the integration of AI tools is getting easier, giving more companies access to these analytical tools. This means that, instead of people sitting in a conference room poring over data, the data can be published directly to business intelligence tools that deliver real-time analytics to help improve processes. We can now actually manage the processed data and develop ways to improve.

A capable IIoT edge device

So, just what are these IIoT devices I’m referring to, and how do they make integration easier? Take a look at what can be accomplished in
an existing site by using Opto 22’s groov EPIC (Edge Programmable Industrial Controller). Using MQTT/Sparkplug to efficiently publish and subscribe to data points, groov EPIC has the ability to directly publish data to cloud resources that can interpret data for you and give you that push toward actual improvement. In this way, data...
also becomes available to manufacturing execution system (MES),
enterprise resource planning (ERP) and supervisory control and data
acquisition (SCADA) solutions so that everyone within the plant—
from the operators to the C-suite—can access pertinent information
for decision-making. All of this is made possible by one piece of
hardware and some very easy-to-implement programming features.

Using these features, you can introduce the goals of Industry 4.0 to
create your own smart factory via four key aspects:

• **Interoperability**—the communication between machines, devices
and people using IIoT. This is the first step to creating a smarter factory.

• **Transparency**—in this context, it is the use of data across different
machines and processes within the factory, and then gathering that
data for processing and interpretation. In other words, this is the
transportation of data to management, engineering or business
intelligence systems.

• **Technical assistance**—the ability to move from reactive or preventive
maintenance on machines to a predictive style, allowing operators
to have knowledge of likely issues and mean time between failure
(MTBF) data.

• **Decentralized decision-making**—using business intelligence to
allow machines and people to perform tasks for the factory at a
semi-autonomous level.
Of course, with any new technology or industry focus, there will undoubtedly be some resistance to it amid a preference for familiar, traditional automation systems. But I look at automobile safety as a great example of how new technologies have been of considerable benefit. After all, automobiles went from no restraints to seat belts to airbags to auto-stopping—all with the help of technology.

As Maya Angelou said, “Do the best you can until you know better. Then when you know better, do better.” We are at the point of knowing better; it is time to start doing better to get more out of our automation.

Using these ideas—and leveraging the power of the groov EPIC system—will give factories the ability to go beyond measuring and managing and to start improving.

Learn more about the groov EPIC system at https://op22.co/epic and access a live demo at https://demo.groov.com with username: trial and password: opto22.
Direct Field to Cloud Connection with the PFC Series Controllers

- IIoT-ready with native MQTT and TLS encryption
- Built-in VPN and Firewall for increased network security
- Simplify data routing and reduce latency
- Interface with existing controls via onboard fieldbus gateways

www.wago.us/pfccloud
Pneumatics in the Age of IIoT

BY FRANK LATINO
Product manager, Festo

Using Industrial Internet of Things pneumatic solutions to improve OEE, energy efficiency and agile manufacturing.

You can’t control what you can’t measure. That’s where the Industrial Internet of Things (IIoT) comes in. As the IIoT continues to gain traction in factories, manufacturers need a way to convert the enormous amounts of data from sensors, actuators and connected devices into opportunities to drive production efficiency—a trend that extends to pneumatics. You heard that right—pneumatics. Industry’s tried and true motion control technology remains relevant in the age of IIoT. Here’s why.

To improve your operation with IIoT technologies, it’s important to deploy solutions that can deliver on three key metrics over the course of your product’s lifecycle: overall equipment effectiveness (OEE), energy efficiency and agile manufacturing.
To better understand this, let’s explore three pneumatic technologies that, today, leverage IIoT technologies such as an IoT gateway, an app-controlled pneumatic valve and a mobile maintenance app. These technologies not only enhance operational metrics, they can propel your operation further into the digital age.

**OEE and energy efficiency**

The Festo IoT Gateway is a device that connects our pneumatic components and modules from the field level to the cloud. It works by collecting information about connected devices via an Ethernet connection and standardized communication protocol. It then sends the information to the cloud via a second Ethernet connection using IoT protocols, such as AMQP or MQTT.

Component data is prepared and monitored in the cloud—enabling users to easily analyze trends in Festo MyDashboards. These predefined dashboards, which display energy monitoring and maintenance metrics for all products and subsystems, require no additional programming and provide a number of operational benefits. For example:

- Dashboards improve OEE by displaying valuable component metrics that can be used to enhance overall productivity.
CONTINUED

Pneumatics in the Age of IIoT

• Improving energy efficiency lowers operating costs.
• Condition monitoring and diagnostic capabilities reduce downtime and accelerate maintenance.
• Data available anywhere at any given time can be used to improve operational transparency for production managers and operators alike.
Agile manufacturing

A second example of an effective IIoT-enabled pneumatic technology is the Festo Motion Terminal VTEM, which decouples pneumatics from mechanical hardware. This decoupling allows control functions to be made available through easy-to-use motion apps. At the push of a button, users can perform a wide range of motion tasks using a single valve type—integrating complex movements, variable positioning, condition monitoring and many other smart functionalities. Thanks to these features, the VTEM leads to unprecedented levels of manufacturing flexibility. It also reduces system complexity and enables new data analysis and condition monitoring capabilities.

Like the IoT Gateway, predefined cloud-based dashboards, which display energy monitoring and maintenance metrics, are available for the VTEM—improving equipment OEE and energy efficiency as well.

Maintenance app

Festo Smartenance is one of our first exclusively digital products. This intuitive app, accessible anywhere from the cloud, enables users to schedule, monitor and evaluate system maintenance. Easy to install, Smartenance is a simple, low-cost way for manufacturers to eliminate manual, time-consuming preventive maintenance processes.
Smartenance consists of two parts. First, a mobile maintenance schedule app allows system operators to receive all necessary maintenance information directly on their smartphone or tablet. It also includes a central dashboard accessible via a web browser. This dashboard lets production managers view urgent tasks and maintenance feedback provided by the system operators. Thanks to this peer-review system, Smartenance eliminates time-consuming communication and coordination between operators and managers—enhancing equipment OEE and improving overall system reliability. Future plans for Smartenance include incorporating pre-configured maintenance plans, as well as deploying prescriptive capabilities in the form of online warnings from the dashboards.

To learn more about Festo’s Internet-enabled pneumatic technologies, including the role we’re playing in making the IIoT vision a reality, visit our website at www.festo.com.
See the IIoT in Action

Accelerate OT and IT integration with industrial edge-to-cloud connectivity solutions

Is Your Path to IIoT Connectivity Smooth Sailing?

Whether you will succeed or fail to enable IIoT applications depends on your choice of connectivity solutions for OT and IT integration. We at Moxa, an industrial-leading connectivity solution provider, provide comprehensive edge-to-cloud solutions to make the IIoT work for you.

Learn more at www.moxa.com/IIoT