Living in a connected world

Intelligent devices bring the IIoT to life
The industrial global village meets in Hannover...

In this issue of UPDATE, we’re highlighting some of the products and technologies that are helping to make the Industrial Internet of Things and Industrie 4.0 a reality. Reading about them is great, but there’s no better place to experience these technologies firsthand than at the city center of the industrial global village – Hannover Messe.

Each year more than 250,000 of the world’s brightest technical talents gather at Hannover Messe to advance the art of worldwide manufacturing. And you should be there too! Here are a few reasons why an American manufacturing engineer, manager, or executive ought to attend Hannover Messe:

1. **ONE-STOP SHOP!** Nowhere else can you experience such a comprehensive display of companies in one place. The companies that exhibit have expansive booths with in-depth product displays, and are staffed by their best and brightest.

2. **IT’S A MANUFACTURING INNOVATION FASHION SHOW!** It’s no secret that Germany is a world leader in manufacturing technology, so there’s no better place to hold a manufacturing innovations fashion show.

3. **CONNECTIONS FOR EXPORT!** Since Hannover Messe is a global gathering, it is easy to make connections with like-minded small and medium-sized companies and channel partners looking for expansion.

4. **LEARNING!** The hot topics of Industrie 4.0 and the Industrial Internet of Things will be on full display at Hannover Messe. Nothing beats firsthand interactive learning.

5. **THE ENERGY!** Each year I attend the fair and come home excited about being in a technology career, and excited about the future of manufacturing. Germany is a beautiful country, and the people of Germany are gracious hosts! And did I mention the best beer in the world??!!

Since the U.S. will be the partner country in 2016, there’s never been a better time to go! If you’re still not sure and want to learn more, visit www.phoenixcontact.com/gomesse
Get new technology first at Hannover Messe 2016

How big is Hannover Messe?

- 6,500 exhibitors
- 70 countries represented
- 220,000 visitors
- 68% are qualified decision makers

Thanks to its size, Hannover Messe can open up a world of new contacts. Find international partners or expand your business into new markets.

What will I see there?

- Industrial automation
- Energy
- Industrial supply
- Research and technology

Find inspiration in the latest industrial technologies – usually before they are available in the United States!
SCADA, IIoT, M2M and more

How many buzzwords do you need to monitor your remote pump station?

The art and science of treating raw water to drinking level quality, and of treating wastewater to environmentally acceptable levels, have been around for more than 100 years. They have provided the foundation in the United States and the rest of the developed world for our modern economy and lifestyle. Many of the technological marvels that we depend on today, such as cellular telephones, the Internet, and simple yet powerful software, would not have been developed without the advancement and adoption of water treatment processes. It’s ironic, then, that many think of the water and wastewater industries as being stodgy, and somewhat less than cutting edge.

However, the water industry is not as stagnant as some might believe. In this article, we will review a few “buzzwords” that are becoming common in the water sector and many other industries, and look at how the technologies behind these buzzwords are impacting water treatment.

SCADA

One technology that demonstrates this industry’s acceptance of modern control technology is supervisory control and data acquisition (SCADA). SCADA has been around for a while and most in the industry are familiar with it by now. Many water systems have employed wireless communications to transmit remote data back to a central control center for years.

IIoT

You have probably heard of newer refrigerators connected to the Internet (see page 7 for an example). This is an example of the Internet of Things (IoT). The IoT has moved beyond the commercial world to the industrial world, where it’s become known as the Industrial Internet of Things (IIoT).

The IIoT makes field devices smart, so they can send information anywhere that also has Internet connection.
This is a cost-effective way to improve communications infrastructure. Rather than investing in expensive equipment, water professionals can rely on third-party providers for fast and convenient data.

**Industrie 4.0**

You have probably heard about this buzzword coming from Germany. But what does it mean and how is it linked to the IIoT? The core of the Industrie 4.0 initiative is the vertical integration of business value chains and horizontal integration of production using Internet services. The objective is the ability to mass-customize products in low lot sizes.

Imagine, in the future every product will have a digital representative – a digital twin – which contains all information of the real product. The information of the digital twin parameterizes the settings of the production, enables simulation or support, and assists installation and use of the product.

**M2M**

Machine-to-machine (M2M) communications refers to using the cellular network and Internet so that devices communicate directly with one another. The implication is that there is no need for proactive human involvement (after the initial configuration of the system).

**More than buzzwords: Improving efficiency for water professionals**

**Scenario:** A water utility company must monitor chlorine residual levels at the distant end of a vast distribution system, a dozen or so miles from the plant’s main control room.

**Solution 1 – Manual monitoring**

A staff person visits the remote site daily to manually check chlorine residual levels. The test takes five minutes. The round trip takes 60 minutes. In this solution, the staff dedicates nearly five and a half hours each week to checking chorine residual levels. Small costs include the testing kit and the ongoing wear and tear on the vehicle. The biggest expense, however, is losing a staff member for five and a half hours each week, when he or she could be performing more valuable work.

**Solution 2 – SCADA monitoring**

Today, many water systems rely on traditional SCADA systems. These systems typically use wireless communications to automatically measure and report the chlorine residual levels back to the treatment plant’s staff in
Monitor remote data via a tablet or any other Internet-connected device.

The modem/router in the EAGLEi RTU accesses a private Verizon access point name (APN) on a nearby tower, and transmits data from the pump station across the Internet, ultimately back to your control room, or via the Internet, to your devices, such as smart phones and tablets.

The big benefit of leveraging the cellular carrier’s network is that you don’t need to build the wireless infrastructure associated with the radio systems mentioned above. There’s no software to buy or patch, no radio towers to build, and no servers to buy and maintain.

In addition to its affordability, EAGLEi also offers the highest level of security. Each EAGLEi RTU contains the Phoenix Contact mGuard, an industrially rugged stateful firewall/VPN device/cellular modem. The mGuard connects to a private Verizon cellular network, which is not accessible over the Internet. A secure data center, with enterprise-class servers, cyber security, and UPS and generator backed-up power supply, stores the data. Data access is password-protected, with individual rights for each user.

Solution 3 – The EAGLEi approach

Phoenix Contact now offers an option that brings the IIoT and M2M communications to the water industry: EAGLEi remote monitoring.

Most pumps in remote locations do not directly connect to the Internet, but with a properly equipped RTU, they can be connected. EAGLEi makes it possible to buy cellular-enabled RTUs that connect to a cloud-based SCADA service. This enables you to monitor your remote assets from your control room, from a computer, or the field by using your phone, a tablet, or other device.

Conclusion

EAGLEi harnesses the IIoT, so that you are not tied down to your control room. Data is available wherever there is an Internet connection and a device with a supported web browser. Alarms can be sent via email or text to those who are on call. EAGLEi makes it easy to access data on tablets, smartphones, laptops, and servers. This ultimately enables water professionals to focus on their core mission and enhance water system operations.

Dave Eifert
www.phoenixcontact.com/eaglei
Imagine your refrigerator can detect when you run out of milk. The refrigerator sends an alarm to a grocery shopping app, which in turn reports the info to your local store. Somebody at the store uses this data to add milk to your next delivery.

This is the essence of the Internet of Things (IoT). IoT describes the ability to interconnect anything and everything to better service a process, increase reliability, and improve availability. The ultimate goal is to make our lives easier. This trend has also bled over to the industrial world.

Harnessing IoT on the manufacturing floor

Remote maintenance and support have always been a key part of the business model for OEMs and machine builders. Typically, machine manufacturers will add a service contract when they sell a machine. If a machine fails, the manufacturer sends out a technician to fix the machine. This can be a costly endeavor. Flights, hotels, food, and overtime all add up to an expensive package. This is where IoT and the industrial world meet to create the idea of Industrial IoT (IIoT).

As a manufacturer, Phoenix Contact saw the potential advantages of the IIoT as a means of remote maintenance and support. The mGuard Secure Cloud (mSC) solution was designed to meet this need.

Phoenix Contact Secure Cloud solutions

The mGuard Secure Cloud is a free service that allows you to access a machine via a virtual private network (VPN) tunnel connection quickly and securely, using the mGuard hardware. The mGuard device acts as a router, providing a wired or cellular connection to the Internet. The mSC servers, hosted locally in Harrisburg, Pennsylvania, provide a bridge point between the remote machine and your office. Phoenix Contact acts as your IT department, building the configurations for your hardware and software based on a few pieces of information you provide. This avoids the complexity of setting up the network yourself. Once you have the system set up, your technicians can service the machines from anywhere in the world, as long as they have an Internet connection.

New trends in the commercial world allow us to have access to all the information we want at the tip of our fingers. In the industrial space, being able to access machines remotely to service them provides a significant advantage and enables a more efficient service provision. By enabling easy and secure access to remote machines, the mGuard Secure Cloud combines these ideas to create a solution to easily and securely get access to remote machines.

Andres Suazo Wildt
www.phoenixcontact.com/msc
There are many things we simply take for granted: the Internet, safety brakes, surge protection. It isn’t until something drastic occurs – a breach in security, a collision, a system shutdown – that we realize just how much this resonates.

With today’s Industrial Internet of Things (IoT), we always hope to have uptime for continuous communications, but it is not always guaranteed. A reliable system is critical in achieving this goal. Most manufacturers can easily obtain an uptime of 99.99%, but without surge protection to take care of the extra .009%, they won’t be able to obtain the elusive “five 9s” of uptime promise. Herein lies the brilliance of Phoenix Contact’s PLUGTRAB-IQ surge protective device (SPD).

With the PLUGTRAB-IQ, or PT-IQ, you’ll see an improvement in IIoT infrastructure, manufacturing, and energy consumption. This translates to increased efficiency, accuracy in active monitoring, and overall economic benefit throughout your company and how it interacts.
within the business world. This SPD protects measurement and control applications, while simultaneously monitoring its own state of health. The benefits of the PT-IQ are clear from the moment it’s installed, and until the end of its useful life.

To install the PT-IQ, simply connect it to a T-bus that clips onto the DIN rail. This innovative approach simplifies wiring practices and reduces installation time. The reduced labor costs are an important benefit for IIoT consumers, who demand efficiency and speed. Up to 28 individual modules then feed into a powered controller also connected through a T-bus. In less than a second, this controller runs a self-diagnostic test upon startup, ensuring that it is functioning properly.

Forward-looking monitoring

Once set, the controller will display one of three LED colors, depending on the status of all of its connected plugs. This allows IIoT infrastructure to monitor, schedule repair, and maintain according to the corresponding colors.

When an SPD module is nearing end of life, the PT-IQ displays a yellow status indication, and also sends a signal back to the control room to notify the user. With this “extra stage” in warning status, the user can decide whether replacement should occur immediately or during the next maintenance cycle.

Because the PT-IQ’s hot-swappable plugs can be replaced before permanently reaching the end of useful life, the IIoT user gains the extra .009% uptime in efficiency and can accurately replace the surge protection. Proactive replacement of these key-coded plugs decreases the risk of system failure or downtime. Coupled with hot-swappable plugs, applications using this preventive approach remain active without having to shut down the system for replacement or testing.

If the plug reaches end of life, the LED on the plug and controller will change to red. This is also sent to the control room, all in real-time, immediately notifying the IIoT users that replacement is now required, and that the connected load is no longer protected.

Energy efficiency

Because optimizing energy consumption plays a key role in IIoT, Phoenix Contact has developed a power-saving mode for the PT-IQ. In this mode, the user can turn off any green LEDs on the plugs and controller. In this alternate setting, plugs only display yellow and red status indications, with the controller reading the most critical state of its connected plugs and transmitting it back to the control room.

Phoenix Contact’s preventive surge protection device, the PLUGTRAB-IQ provides a variety of benefits to the IIoT user. With its three-stage status indication, coded base elements, remote status monitoring capabilities, and easy wiring, it is easy to see the intelligence and true brilliance of the product.

Jessica Yeh
www.phoenixcontact.com/pt-iq

Surge protection provides an effective method of limiting high-energy transients. This increases system availability.

Three LED indicators make it easy to always know the status. Red = arrester overloaded; yellow = power limit reached; green = OK.
NYC Transit operates 820 miles of track, making it one of the largest rail transit systems in the world. Millions of people ride the subway every day. In fact, in September 2014, the agency recorded five days with more than 6 million riders, breaking the previous single-day ridership record five times in a single month.

In an October 22, 2014, press release about the record-setting ridership numbers, MTA New York City Transit President Carmen Bianco said, “The trend towards increasing ridership is not expected to slow down. Improved transit services, combined with a growing population and an improved economy, have resulted in the strongest subway ridership growth occurring among discretionary riders and during off-peak times. This presents new challenges for maintaining and improving a system that operates around the clock, while introducing important innovations for our customers.”

900 MHz wireless SCADA network communicates over several miles of infrastructure

Energy management system for wayside rail application provides significant cost savings and reliability to New York City Transit

By automating the third rail heaters on the above-ground section of its railway, NYC Transit saves millions of dollars in energy costs.

Keeping the ice off the rails

The wayside third rail of a railroad is the electrified rail that supplies power to the trains. The third rail lies outside the subway tracks. A current collector shoe carries the power from the rail to the train’s electric motor.

This subway system distributes 600 V DC (nominal power) and up to 4,000 A to the third rail. The system uses a network of AC/DC rectifiers, power substations, circuit breaker houses (CBHs) and high-voltage cables to supply DC power to the third rail throughout the system. This network system taps off the 600 V DC circuits.

During the winter, snow and ice may build up on the third rail, interrupting service. To keep snow and ice off the third rail, the NYC Transit uses third rail heater elements placed in strategic locations on the outside portions of the system. Traditionally, these heaters were manually turned on in October and ran continuously through May, even when there was no snow on the ground. This consumed an enormous amount of power and money. To save energy and reduce costs, NYC Transit wanted a reliable and efficient way to remotely control and monitor these heat traces during inclement weather events.
Automated wireless SCADA system

Kapsch TrafficCom USA, Inc., working with Phoenix Contact, developed a supervisory control and data acquisition (SCADA) network system using wireless technology that allows NYC Transit to remotely control and monitor all the end points.

Powered by Kapsch’s DYNAC software, the SCADA system allows integrated management of the subway wayside infrastructure. Operators can remotely perform routine system diagnostics to ensure the heaters are ready for operation at any time, all from a single HMI interface.

At select locations, Phoenix Contact ILC programmable logic controllers (PLCs) were used to control and monitor end devices. The ILC products are compact controllers with advanced control capability. The ILC family of controllers communicate on Modbus TCP protocol, and versions include an SD card slot for ease of saving and uploading program changes.

The application included different types of interface panels. They serve as the primary link between the DYNAC SCADA master and a network of control point nodes throughout the network. Each node controls and collects, plus holds data for SCADA commands, via 900 MHz Ethernet radios.

Several hundred communication nodes spread over many miles consist of Kapsch’s NEMA 4x enclosures, including radios and controllers. The radio box holds Phoenix Contact’s low-voltage radios, controllers and I/O, relays, power supplies and transducers. For further reliability, the boxes also include Phoenix Contact’s surge protection technologies that protect electronic interfaces from high-voltage surges, which can be common in this environment.

Kapsch, in partnership with Phoenix Contact, configured the radio network. This radio communications network system provides a remote means of monitoring and controlling end-point devices over a large network. The system is designed to run either manually or automatically from NYC Transit’s control room.

Results: Saving thousands per day

To date, 526 control point nodes are automated, controlling 1,000 third rail heating elements. With the current installation, NYC Transit is saving almost $11,000 per day in reduced power consumption costs and manual operation of heater-related equipment. Because of a collaborative partnership and effort by all parties, this wireless SCADA system has achieved significant energy savings that will exceed well over a million dollars annually.

In the following phases, NYC Transit will look to control 100 percent of their third rail heaters remotely, saving energy at about $15,000 per day from October through May.

Powered by Kapsch’s DYNAC software, the SCADA system allows integrated management of the subway wayside infrastructure and allows operators to remotely perform routine system diagnostics to ensure the heaters are ready for operation at any time, all from a single HMI interface.
Integrated Industry – Discover Solutions
Past visitors to Hannover Messe say it is THE place to experience the world’s leading-edge technology

With all of the discussion about the 2016 Hannover Messe, many American engineers might be wondering what the big deal is. Why travel across the Atlantic when there are so many other trade shows closer to home?

Some Phoenix Contact customers who have attended Hannover Messe in the past shared insight on the benefits they gained from making the trip.

Tribby Warfield, senior vice president and general manager of Kaman Fluid Power, LLC, said attending Hannover Messe was a valuable experience. “I was able to visit key suppliers and see the latest technology in a world-class showcase. Hannover is unique in that it offers all areas of industry and technology. The world’s best are there, and access to key decision makers is important.”

Hannover Messe makes it easy to develop connections with like-minded companies. Small and medium enterprises can especially benefit at this venue. Warfield said she “deepened existing relationships with key suppliers and established new relationships” at the event. It is worth noting that the potential connections are not limited to European contacts; attendees hail from Asia and Latin America as well.

Compared to an American trade show, the difference is “in size, obviously, but more in the breadth of technology in one show,” stated Travis Blackburn, western regional manager at Kaman Industrial.

Fred Weaver, product development manager at Revere Control, agreed that Hannover Messe’s key differentiators are “definitely in the size and scope of products.” He added, “One has to carefully plan their itinerary to ensure there is sufficient time to see everything.”

David Tye, vice president of operations at Cogito Automation, cites the “larger variety of vendors [and] emerging technologies that are not stale.”

Each year, the most advanced industrial technologies make their debut at Hannover Messe. Tye said Hannover Messe is where he first learned about Industrie 4.0 and Ethernet-based security devices, technologies he has since implemented.

Blackburn hasn’t yet implemented any of the products he first saw at Hannover Messe, but he stated, “I can say I witnessed technology that is just finding its way to the U.S., but it appears to be more thought about and utilized already in Europe, at least in my experience.” As an example, he pointed to Industrie 4.0 and the connectivity from design to machine build to factory floor.

Many people balk at the price of attending a tradeshow in a foreign country. Of course there will be costs, but the value of attending Hannover Messe lies in its potentially high return on investment. This is especially true for the upcoming Hannover Messe 2016 event. As the official partner country for next year’s event, the U.S. will receive special attention on trends in its industry and emerging manufacturing environment.

For those aiming to expand their knowledge, experience, and connections in the world of technology, Hannover Messe is the place to go.

www.phoenixcontact.com/gomesse
CID2-listed UPS and battery packs
Phoenix Contact’s QUINT UPS-IQ family now includes both uninterruptible power supplies (UPS) and back-up batteries individually listed for Class I, Division 2 hazardous locations. By combining these components with Phoenix Contact’s CID2-listed power supplies, a designer can create an entire system that meets CID2 needs. The CID2 UPS-IQ is available in 120-, 240-, 480-, and 960-watt versions. In this modular CID2 back-up solution, any of the UPS devices can be connected to any of the CID2 battery packs without violating compliance to the CID2 approval. To increase the battery back-up time, up to five CID2 battery packs of the same type can be connected to the UPS while maintaining a CID2 listing.

www.phoenixcontact.com/quintiq_hazloc

Universal electronic housing system
The new EH electronic housings from Phoenix Contact simplify design and increase flexibility for device applications. The EH system includes seven widths, two heights, and three cover versions for more than 100 possible combinations. The EH housing works with a wide range of PCB connection technologies. This makes it easy to customize the device based on application requirements. Options for the number of PCBs and orientation ensure a high level of design flexibility. The electronics housing can be snapped onto DIN rails without tools for fast installation, or mounted directly on the wall.

www.phoenixcontact.com/eh

Energy-efficient industrial PCs
The new Valueline 2 (VL2) industrial PCs from Phoenix Contact have increased performance power and higher energy efficiency, compared with the legacy Valueline IPCs. The VL2’s design improves usability, incorporates fourth-generation Intel® Core™ processors, and has an interactive user interface. The VL2 has a unique gull-wing access door, which reduces maintenance time and also provides easy access to the PCI/PCIe card. The IPCs have DisplayPort++ for high-resolution images and streaming over a single connector. The 10-point capacitive multi-touch screen allows a more interactive user interface.

www.phoenixcontact.com/vl2

Easy power wiring with spring-cage high-current terminals
Phoenix Contact has expanded its range of Power Turn high-current terminals to include options with maximum wire sizes from 10 AWG to 250 MCM. The terminals make it easy and secure to connect the conductors, using just a standard screwdriver and a single lever movement. The conductors can also be directly inserted with the lever closed using the built-in push-in mechanism. This is useful for installation locations with limited space. Special pressure springs and a copper clamping connector ensure a vibration-proof connection of the conductor.

www.phoenixcontact.com/ptpower
Expanding business?

You will when you visit Germany’s Hannover Messe!

Get a free all-show pass! Don’t wait for tomorrow’s technology to arrive in the U.S. market. It’s waiting for you at the 2016 Hannover Messe, the world’s most important industrial show. English is the spoken language, so you can easily forge new international relationships and strengthen your connections with key suppliers.

The USA is the 2016 partner country and Phoenix Contact will be there, too. Stop by and see our electrical engineering, electronics and automation systems, components, and solutions.

For more information on how to get your free pass, visit:
www.phoenixcontact.com/GoMesse

Get your all-show admission pass FREE!
Hannover Messe, April 25-29, 2016.