BECOMING WIRELESS

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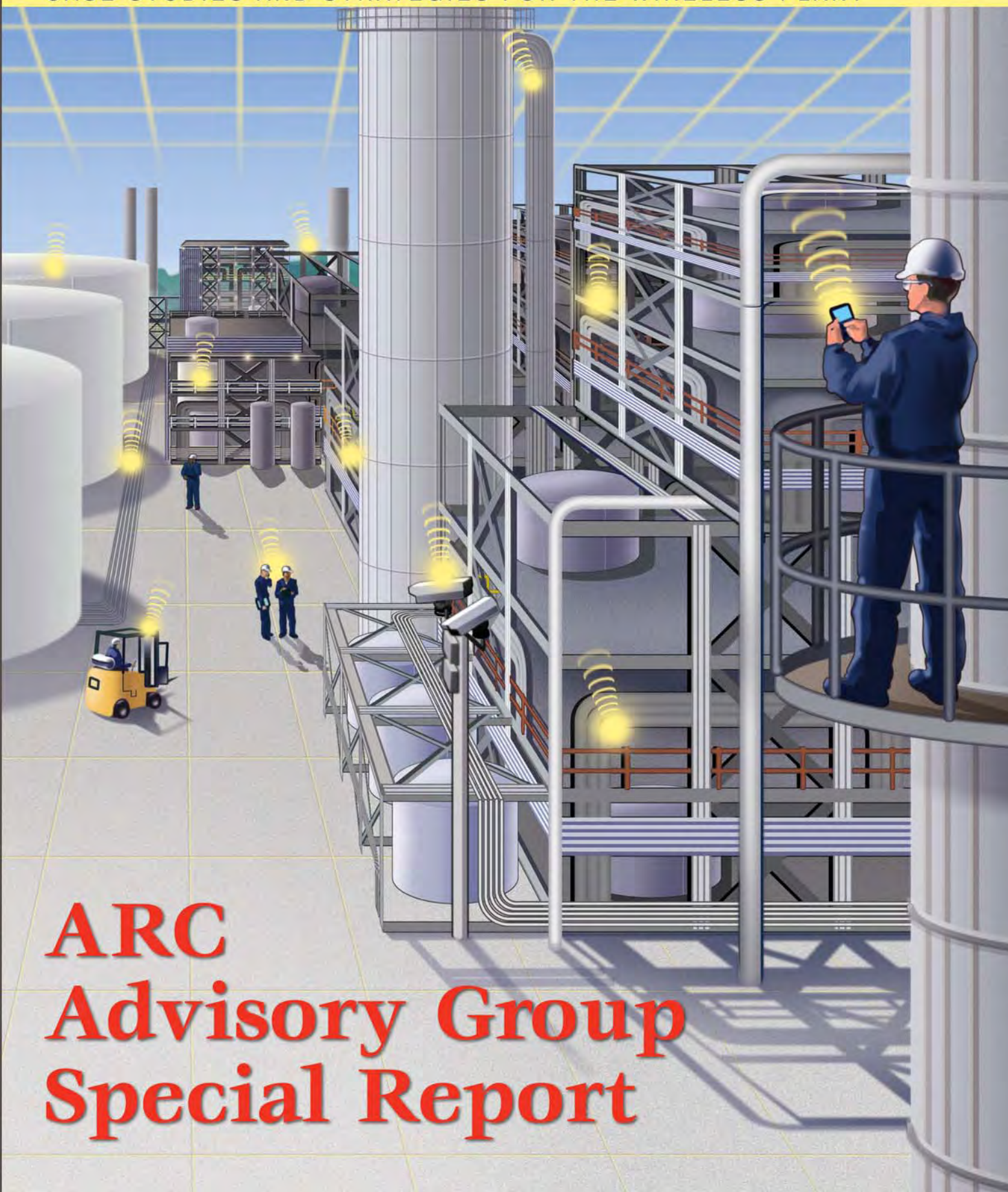
CASE STUDIES AND STRATEGIES FOR THE WIRELESS PLANT



ARC Advisory Group Special Report

Wireless:
At 'beginning of an increase in usage'

Ivan Ward knows he has a problem to solve. His company, ConocoPhillips, keeps adding onto his facility in Farmington, N.M. The problem, as he sees it, is cabling is becoming way too unwieldy—not to mention costly.

That is why his company is now "looking into" wireless.

Ward is not the only one in this situation because the industrial wireless market is still in its infancy and just starting to grow.

While every company in the industry has its own forecast, most seem to believe the industrial wireless market will soar over the next few years, with some estimates hitting $1.5 billion to $3.3 billion by 2010. That is a huge leap from just two years ago, in 2005, when the industrial wireless market reached $325 million. Let's face it, wireless technology has been on the scene for years and years (dating back to the 1890s when Guglielmo Marconi began experimenting with radio waves), but the giants are now up and running and ready to go.

"When a power plant in China is having a problem they can send their control parameters over to us. We can use the parameters in our simulation center to help improve their process control."

—Ram Balak, Principle Engineer

Market growth potential is all fine and good, and exciting fodder for those that watch the industry. However, for end users, it all comes down to finding a reason to deploy the technology.

There is an old saying in the industry that goes: You can't control what you can't measure. Wireless technology is now allowing for limitless levels of measurement. End users can put in more monitoring points at a fraction of the cost of wired sensors. For manufacturers, this will open doors for more predictive maintenance and stronger asset management. Just think about being able to monitor corrosion in a far away facility or pipeline. Or consistently monitoring the condition of a process to ensure productive uptime. How about knowing where your workers are at all times to ensure safety?

The *InTech* Automation Outlook 2008 survey had 23% of respondents saying wireless is going to be the biggest technology challenge for the coming year.

Wireless will be big next year, agreed Peter Baker, product manager at NBT in Maple Grove, Minn. "There is such a hassle in running cable. Wireless is more mobile. With wire you are stuck, and there is a big expense to move things around."

"The technology I love is wireless," said Marty Martin, senior automation engineer at Amgen in West Greenwich, R.I. "Once you have it in the plant, you can just use it from point to point."

"Wireless will become more of an issue as the technology progresses," said Carl Thompson, senior supervising engineer at P.B. Americas Inc.

Wireless comes in all shapes and sizes.

"The beauty of wireless right now, in this case wireless satellite, when a power plant in China is having a problem they can send their control parameters over to us," said Ram Balak, principal engineer for instruments and control systems for WorleyParsons in Monrovia, Calif. "We can use the parameters in our simulation center to help improve their process control." Before you know it, the plant is back running at peak efficiency in days if not hours.

Right now users focus their wireless technology on monitoring a system, but down the road, why not use it for real-time control.

"Right now it is used for monitoring technology, but as the technology becomes more deterministic, it will be used more for critical control," he said. "We are at the beginning of an increase in usage."

Talk to me: ghale@isa.org or (919) 990-9275.

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Test Drive Wireless

Industrial manufacturers can take a test drive on the road to wireless. With a starter kit, companies are proving the ease and value of wireless without an extreme investment .

Still more end users are using starter kits to take temporary measurements in areas where they need to validate a process. The starter kit serves as a mobile measurement tool which can move to parts of the plant where short term data is needed, such as monitoring vibration or flare temperatures and transferring data from existing wired instrumentation not visible in the DCS.

In one case, a Canadian pulp and paper company saw the potential for a mesh network supporting multiple applications. In the past, the inability to measure internal lime kiln temperatures in a timely manner led to quality problems. In fact, product was run through the kiln before discovering it was processed at the wrong temperature, resulting in scrapped inventory.

The company started its wireless initiative by connecting a Honeywell wireless starter kit to its lime kiln for temperature monitoring. With this real-time measurement, product quality and throughput improved. With the success of this initial application, the company decided to expand its use of wireless technology to include the Honeywell Instant Location Solution for emergency mustering.

Corporate research centers are finding wireless starter kits helpful for understanding wireless technology before it's rolled out corporate-wide. A North American refinery materials integrity group tested wireless technology to monitor plant-wide corrosion. The plant learned it can continue to add sensors based on critical need rather than the convenience of wire placement. Since corrosion can be a localized phenomenon, the ability to monitor more locations provides greater accuracy, and with the network in place the group can add wireless worker applications.

A starter kit is the perfect solution to test drive:

- Leak Detection and Repair Monitoring
- Inventory Management
- Corrosion Monitoring
- Safety Showers Monitoring
- Pressure Monitoring
- Mustering and Safety Procedures
- Mobile Operators and Field Personnel
- Rotating Equipment Monitoring
- Remote Sensing and Monitoring
- Plant Cooling Water Monitoring
- Tank Level Monitoring
- Vibration Monitoring
- Wireless Video
- Pipeline Pressure Monitoring

To stay updated on how companies are using wireless technology, visit www.honeywell.com/ps/InTech. ■

Wireless Around The World

Honeywell started shipping wireless solutions in 2003. Now with over 500 installations, this map shows just some of those sites benefiting from improved safety, reliability and efficiency.

Asia Pacific customers started installing wireless solutions in 2007 with Honeywell's global 2.4 Ghz offerings.

Putting Wireless Into Action: Notes from the Field

By Stephen Carper
ENglobal Project Manager

As an Engineering Procurement Contractor Project Manager, I have recommended wireless networks for years, yet it has been difficult for people to understand the reliability of wireless. Many people I speak with don't understand that wireless technology is now developed and is a "real" technology.

Earlier industrial wireless technologies were more problematic in terms of temperature and humidity, but the technology has matured, offering significant opportunities to solve manufacturing challenges.

I've worked on many projects—from military airplanes, to SCADA systems for monitoring and control—and once we prove the value of the system, people will jump on the bandwagon. For example, while most end users are considering wireless monitoring systems, I see control applications on the horizon.

To be successful with wireless implementation, you must realize that each wireless network installation is unique. They're custom, and we must think about what the end user needs and how to tailor the technology accordingly.

A recent example highlights the use of wireless technologies for monitoring remote locations. A Texas refinery is installing a wireless network to measure water quality in its cooling towers. These towers are spread over several hundred acres, many in areas where no cabling currently exists.

This company needed better data for managing the tower water quality and will be integrating conductivity, pH, ORP, and corrosion data into the control room system. Water conditions affect all boilers, heat exchangers and if corrosion is high, equipment life is negatively affected. Improving the control of these systems will extend the life of their assets.

Plant management realized wireless offered a more economical solution to gathering essential data. They had several concerns about ensuring uptime—including security and interference. Since Honeywell's encrypted solution is based on military grade technology, it easily answered the security concerns. We also trusted Honeywell's T1 technology and spread spectrum solution.

Honeywell created a site survey assessment that provided us with a clear path for establishing a reliable and scalable network. And, with that assessment, management agreed that this was an appropriate project for a wireless solution. We expect the solution to be fully implemented by mid 2008. ■

Ready for Wireless?

Top 10 considerations when selecting a wireless solution

By Jeff Becker
Honeywell Process Solutions

The benefits offered by wireless technologies go well beyond the cost savings created by eliminating wires. When used as a strategic investment, wireless can improve overall plant safety and reliability and increase operational efficiencies.

Before implementing wireless solutions, manufacturers should consider many factors to determine which technology will best meet their needs today and in the future. A company must take a researched, strategic approach that considers everything from functionality and speed to scalability. Following is a check list of critical factors companies should consider before installing wireless solutions:

1. Single versus multi-purpose network: Single-purpose networks may appear to be the most cost-effective approach. However, there are very few plants that have only a single use for wireless technology. A multi-purpose network (i.e., one that supports multiple types of applications for multiple departments) will be a more efficient and effective solution for the long-term.

2. Network compatibility: Will field workers need access to the data or interface with servers? Will standards-based field instruments be used? What about Ethernet? Any system selected should support Wi-Fi, wired Ethernet, and have a migration path to the ISA100 standard.

3. Reliability and availability: How reliable is the network? Can your plant afford to lose, for example, 10% of the data transmissions? Is it important the data is available within the scheduled update time, or is data timeliness not important? Different applications have different requirements, so to ensure future flexibility, look for a system that can provide 99%+ data reliability inside the update rate availability window.

4. Speed of information transfer: Certain applications may require fast transmissions, while others will tolerate slower transfers to conserve battery life. A high-speed backbone is needed for data-rich applications like video, mobile workers and Ethernet backhaul. A network that accommodates multiple speeds over the same network at the same time will match specific applications to speed requirements.

5. Alert or alarm frequency: Many sensor networks report information on a periodic basis, such as every five minutes. However, many applications need to quickly transmit an alert or alarm when a specific threshold is exceeded. Additionally, for slower operating rates, operators may require a reading before a scheduled update. As such, a system should allow you to choose regular and on-demand updates.

6. Power management: When selecting battery-powered wireless products, determine the required reporting rate and then ask for the battery lifetime at that rate. Most plants use a five-second update rate as a good baseline.

7. Control application requirements: While operators may not be ready for wireless control today, open-loop control for non-critical assets should be considered. It is easier to use a control-ready system for monitoring than it is to upgrade a monitoring-only system in the future.

8. Maintenance predictability: The expense of swapping batteries could negate the cost savings from eliminating wiring. Determine the length of time the devices should be self-powered. Most users expect a battery lifetime of three-five years. Consider whether a system will consume battery power at a deterministic rate or a more unpredictable rate.

9. Scalability: Find a network that can accommodate the number of devices needed today, and that will expand as the business grows. Select a network that offers scalability, as some device signals will degrade as the number of devices added to the network increases.

10. Application interfaces: To protect the wireless technology investment, wireless networks must support today's applications as well as future protocols. The network should easily interface with legacy applications and ensure support for the entire operation – not just a single department.

The decision to implement wireless technology can provide significant benefits beyond reduced costs. With a strategic, well-designed approach, companies can improve overall safety, efficiency and reliability, optimizing the entire plant. ■

WIRELESS STRATEGIES

The decision to implement wireless technology in an industrial facility is a strategic one, enabling an infrastructure that improves plant safety and efficiency. Consider these strategic features:

- ❑ Multi-functional mesh – Standardize on a single network with end-to-end security supporting both sensors and 802.11 Wi-Fi applications for simple network management.
- ❑ Open – Provide choices based on existing 802.11 standards for cost-effective solutions and an upgrade path to ISA100.
- ❑ Reliability and availability – Optimize performance by sharing the airwaves and prioritizing messages to critical information is received first. Look for a system that is not only reliable but has latency controls to make the data available before the next update.
- ❑ Multi-speed monitoring – Support different update rates simultaneously based on the application. Choose a high-speed backbone to manage traffic aggregation and high bandwidth applications.
- ❑ Measurement-based alarming – Receive alarms immediately when thresholds are exceeded with no waiting for the next scheduled update.
- ❑ Smart power management – Balance battery life and reporting rates with a long battery life at five seconds or faster reporting rate.
- ❑ Control ready – Prepare for safe wireless control with a robust architecture including latency control and redundancy.
- ❑ Maintenance predictability – Reduce maintenance costs with predictable battery consumption.
- ❑ Scalable – Customize to your current and future business needs, from a single sensor to a plant-wide network.
- ❑ Multi-protocol and application support – Allow connection to any plant system and inherently support transport of existing protocols and legacy applications.

Where No Wire Has Gone Before

Extending the control network to remote enclosures

Refineries often have multiple remote control locations or separate control rooms throughout the plant. Many operate as islands with little connectivity between them. But, as more companies seek to consolidate their control rooms, they are realizing the importance of automating remote locations and consolidating data into a centralized area. A refining facility in the western United States is facing such an issue.

Strategically consolidating its control rooms, the company is automating parts of the plant that once relied on manual intervention. The facility currently has multiple flow stations throughout the plant with valves that are still manually managed. Sending an employee to move the valves reduces productivity and introduces variability.

As the process is automated, they plan to establish multiple remote instrument enclosures (RIE) to service these flow stations. And, the flow stations will have data connectivity back to the control room, approximately half a mile away, to integrate into the blending and movement automation system.

The unmanned RIEs will host redundant Honeywell Experion C300 controllers with the goal of connecting 1,600 to 2,000 total devices, including motor-operated valves and Foundation Fieldbus transmitters for automating the blending and movement.

Engineering the data connections for the remote sites was one of the greatest challenges. The facility's existing fiber optic cables were overloaded, and there was no existing cable in the area where they needed the RIE, which made it impossible to install cable and keep the project on-time and within budget.

Wireless offered the most efficient alternative. However, the company had several system requirements that needed to be met. They needed high availability and reliability for supervisory control from their advanced blending and movement applications. The terrain around the facility site posed several challenges to maintaining throughput over the interferences and long distances. And, the site is located in a residential area, which could pose additional interference and security challenges.

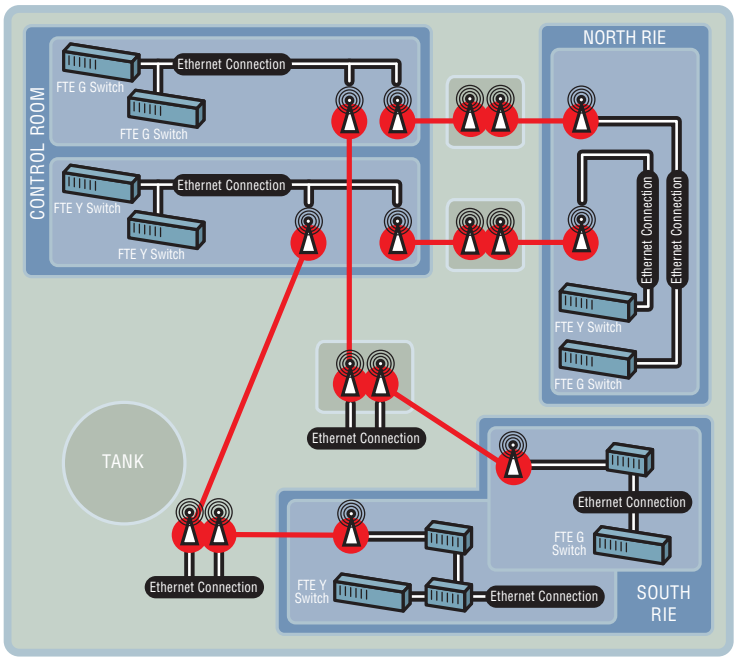
They chose Honeywell's Experion Process Knowledge System (PKS) as the distributed control system (DCS) for the central control room. Experion offers the ideal system for central control room support, integrated wireless support, and efficient Foundation Fieldbus device management and implementation.

Next, Honeywell took on the wireless network implementation. To address the requirements for high availability and reliability, Honeywell suggested establishing a wireless Fault Tolerant Ethernet (FTE) network to the RIEs. Honeywell's FTE establishes two active paths that load-share between the two and survive multiple faults, not just dual faults. This functionality is maintained even with a wireless implementation.

To ensure high throughput of device and system messages (including alarms), the team established a creative way to reduce the number of wireless hops to avoid hills and a high density metal building. Honeywell connected two multinodes together via wired Ethernet so the two units could work together to eliminate the throughput loss at that hop (or bridge) point.

Honeywell performed several pre-test exercises to prove reliability and availability. The corporate IT group reviewed the security methods and approved the solution. Among the features they most appreciated were the ability to optionally disable Wi-Fi and sensor connectivity and the encryption of sensor communication messages within the wireless field I/O device itself prior to being sent.

In the end, the Honeywell solution not only helped the facility with their schedule and budget requirements, but established a network that can be used to expand with other wireless applications, such as backhauling gas analysis data, supporting mobile workers with hand-held computers, and integrating wireless video. With the wireless network in place, employees will be more efficient and can be allocated to more essential tasks. The company can also utilize the additional data available to their advanced applications to further optimize the facility's blending and movement process. ■



Extending the control network to remote enclosures provides an efficient and reliable way to automate more areas of the plant.

ARC Advisory Group Special Report:
Honeywell's OneWireless

A Platform for Wireless Process Management

By Harry Forbes
ARC Advisory Group

The following is an excerpt from an ARC Advisory Group whitepaper. Download the entire document at www.honeywell.com/ps/InTech.

Nucor Steel's operation in Tuscaloosa, Ala., produces a wide range of carbon, HSLA, and pressure vessel steels. The company operates two furnaces with a capacity of 150 tons each. Their scrap melting furnace consumes 110MW of electricity, and melt rate is further increased by supplemental firing of natural gas within the furnace.

Keeping instrumentation functional in this environment has been an ongoing challenge, and the lack of adequate measurements can limit the unit's ability to produce. Especially critical is the ability to measure temperature at various points on the outside shell of the furnace. These measurements indicate blowback to the side of the furnace and are needed to prevent furnace damage. Without this real-time measurement, the furnace's internal heat release must be reduced, causing lost production. A full suite of wired instrumentation was designed and installed on the original furnace, but the operating conditions are such that these measurements were never reliable.

Instrumentation on the furnace shell is subject to intense heat, mechanical impact from steel scrap that falls outside the furnace, as well as occasional open flame. The instruments are protected in cooled enclosures surrounded by ceramic fiber blankets. But conduits from wired instruments are inevitably a weak point in the system. Protecting the conduit runs and wiring is simply impossible. In a very short time the measurements fail. Cable and conduit needs to be replaced, which cannot be done during normal production.

Wanting to solve this problem, Nucor installed Honeywell's XYR 5000 wireless transmitters. Nucor surveyed the area by moving a transmitter around to find locations where wireless communication failed. They had trouble finding one. Eventually they found a spot where communication stopped, but it was outside the building, inside a silo, and behind a steel beam. Within the critical furnace area, wireless communication was not a problem, despite the interference from metal components and over 100,000 amperes of electric current applied to the furnace.

Installing wireless temperature transmitters has improved measurement reliability. Maintainability is also enhanced. The company can replace any failed measurement in a few minutes, compared with hours for trouble-shooting and repair of wired systems.

The wireless installation was so successful Nucor later agreed to a field trial of Honeywell's OneWireless mesh network and XYR 6000 transmitters. The new mesh network covers the entire furnace area of the mill and enables a number of other process and operating improvements.

Because this is a multi-use infrastructure, it supports automation and enterprise applications, such as mobile computers that host the plant's operator HMI anywhere in the melting operation. This capability speeds up maintenance operations and reduces interruptions of control room operators to support maintenance teams. Nucor reports they "don't use the portables on a 24/7 basis, but when we need them they are indispensable." Nucor maintenance crews now have access to the company's maintenance management system through these mobile PCs.

The addition of a wireless infrastructure has also opened the door to other improvements at Nucor. With the network in place, new measurements can be installed without cable, conduit, or hard-wired I/O, reducing both cost and time to install. Nucor reports "the difference in the wiring, conduit, PLC I/O, and time is unbelievable." The company reports they are "always working on their biggest hit projects" in terms of return on investment. The new infrastructure enables Nucor to be extremely flexible, since they now can simply add measurements anywhere there is coverage.

In the immediate future, Nucor is testing the Honeywell Instant Location System to track when vehicles carrying molten slag enter areas normally occupied by personnel. This can improve both operational efficiency and safety, again by utilizing their new network to serve other applications.

Nucor's experience illustrates two important trends in the emerging market for wireless systems in manufacturing. First is the value of wireless measurement and the way they can serve more reliably in applications where wiring brings added cost and high maintenance and unreliability. The second trend is the valuable "network effect" of a wireless network infrastructure. Nucor's single new network supports many types of applications from closed-loop measurement, automation, and HMI, to enterprise asset management.

Wiring is a chronic weak point close to a harsh steel furnace.

This wide range of applications allows Nucor the freedom to expand any of these applications as needed. While such networks are still uncommon in process manufacturing, the value of the flexibility, new applications, and the capital savings are now being recognized by many manufacturers who are eager to build such unified wireless networks, but recognize their operation will inevitably become mission critical almost immediately.

What is OneWireless?

OneWireless is the brand Honeywell Process Solutions uses to encompass its entire wireless portfolio. There is a serious reason behind the use of the word "One." It reflects Honeywell's understanding of what its customers want from their future plant architecture. Honeywell has researched these "voice of the customer" demands through its extensive and intimate customer contacts, which includes 500 wireless site users, as well as through external sources such as ARC Advisory Group. Honeywell received a message that process manufacturers envisioned a wireless network as a single "wireless cloud" with critical requirements from an architectural standpoint. This wasn't just any old cloud.

The requirement for a single infrastructure is at the center of Honeywell's response. The concept is to provide an ultra-secure and ultra-reliable network infrastructure that supports all types of applications, including closed loop control. In Honeywell's view, the wireless network needs to be able to support future applications as a normal service. Honeywell designed the network so end users can install a high performance network for monitoring applications with the flexibility to move to more critical applications if and when they are ready. It is easier to take a control-ready network and make it do just monitoring than it is to take a monitoring network and make it do control.

There is one single network, but it has multiple characteristics and will be used for multiple tasks. These include backhaul of sensor information, closed-loop control, information, HMI, video, communication, and enterprise applications. These services will require multiple wireless technologies, which customers expect the network to be able to support. It also supports different classes of service so it can be used for a variety of automation tasks with different dynamics, such as flexible reporting rates. It can support multiple protocols, including the polyglot of existing industrial communications, so existing investment does not have to be discarded. Customers want the network to be "open" so it can support existing applications and standard TCP/IP communications.

Customers also need "one throat to choke." Process manufacturing customers are unwilling to act as system or platform integrators so they look to suppliers such as Honeywell to perform this function. This includes not just providing equipment and support services, but also managing the platform over the long term so rapidly developing new technologies and applications can be quickly and inexpensively added. They also look to their supplier to manage the embedded technology, so their systems remain up to date and skirt around technological dead ends without causing undue discomfort. Automation suppliers will have to embrace the role of technology and platform integrators, but that is an area of Honeywell experience and one the company readily accepts.

Why OneWireless?

Honeywell said first what has now become a cliché, that the advent of wireless networking represents an "inflection point" in the development of automation. It is a case of a critically important and potentially valuable technology—yet a technology that is also rapidly developing and changing. How can the potential value be realized by process manufacturers who measure their asset lifetime in decades, not months or years?

Technology has advanced since Honeywell introduced the DCS in the 1970s, but what is the same about today's situation is Honeywell's conception of its role with respect to customers. Honeywell insists real-time automation and process management is its central mission and views new technology as a means to that end. Technologies and the scope of automation systems have expanded, but Honeywell still views itself as the firm that develops and supports integrated automation solutions, regardless of the technology employed.

This means Honeywell's core business remains creating products that serve process management applications and delivering them to process manufacturers. The wireless "inflection point" will not change that strategy at all. Honeywell is assuming the platform integration role and betting its reputation that it can deliver the "universal, simple and efficient" wireless systems that its customers say they need.

OneWireless Universal Mesh Network

Honeywell views the network as a critical resource for all types of tasks and a central piece of its wireless solution. The company partners with other firms to obtain critical networking technology, but it fully manages OneWireless network solutions. The company partners with other firms to deploy valuable wireless applications that use this network, such as equipment health monitoring, and location solutions.

Honeywell's customer research showed that scalability was a critical asset for their future systems to avoid constraints on their future operations. Their need for operational flexibility is critical. Future production, regulatory, and compliance requirements will change. New and potentially valuable applications and technologies are always emerging. Having a highly scalable automation infrastructure allows manufacturers to respond quickly and effectively to these inevitable changes.

One important aspect of scalability is the support of multiple applications. The development of wireless sensors required some form of network infrastructure. Likewise Honeywell's mobile operator products used a secure Wi-Fi wireless network. Location technologies rely on wireless networks. New and existing applications were also jumping onto wireless networks and wireless sensor networks.

Therefore the network itself is a central component of OneWireless, and it is present to some degree even in the smallest configurations. This will be a single multipurpose network for Honeywell and third party products and services. Honeywell's design goals for this network included cost, compatibility, performance, security, and support for mobile workers.

In summary, OneWireless is a long term strategy by Honeywell to extend its leadership into the coming era of wireless process automation. The building blocks of the strategy are wireless sensing and wireless workers, combined with a growing suite of new applications. These applications exploit unique capabilities of wireless, while integrating their existing wired counterparts. All these solution components are supported by a single new mission critical wireless mesh network. Honeywell's strategy is to focus on managing this technology solutions portfolio and deliver it in whatever size and sequence fits the needs of individual manufacturers and plants. ■

The OneWireless Plant

Honeywell's innovative OneWireless™ solutions turn valuable data into knowledge, helping plants:

- Keep people, plants and the environment safe
- Improve plant and asset reliability
- Optimize through efficient employees, equipment and processes

Wireless Technologies Monitor Machine Conditions

By Ed Bondoc
SKF Condition Monitoring Center

Advancement in wireless technologies is transforming vision into reality in industrial environments.

Until now, companies continuously monitoring critical machine conditions were dependent on hard-wired on-line systems. These systems required a sizeable investment, mainly due to the large amounts of cabling and conduit required to install and operate. Innovation in permanent or temporary wireless installations makes it possible to continuously monitor machines that were previously impractical or impossible to monitor, such as machines that are inaccessible, difficult, or dangerous to reach or run cable, equipment with suspected problems, during build out, or while operating in transitional facilities. Using wireless condition monitoring systems means increased benefits combined with cost savings, since a wireless on-line system can mean a 30% to 60% reduction in cable installation costs.

Condition monitoring, the process of monitoring parameters in machines that can indicate a failure condition, allows maintenance to be scheduled and performed before catastrophic failure occurs, increasing reliability, cost-effectiveness, and safety. Equipment typically monitored includes rotating assets (pumps, fans, motors, compressors, spindles, gearboxes, and turbines) in virtually every industry. Measurements include vibration, temperature, and other key parameters.

Continuous monitoring by using on-line monitoring systems to automatically collect data several times a second to several times a day is most often used for critical machinery such as turbines, high speed compressors, paper machines, gear boxes, and pumps.

Traditional on-line systems consist of permanently installed data collection electronics dedicated to a specific machine. While the benefits of on-line monitoring are significant (frequent collection, immediate notification of potential failures, and less manpower than walk-around methods), permanently cabled systems also have limitations. While traditional continuous monitoring required sensors connected via wires through conduit between the on-line system and the plant network so data collected can be stored in a database, wireless connectivity offers new possibilities and significant benefits.

Using wireless on-line systems, sensors connect to machine either permanently or via a temporary method (like magnets) with the data collection electronics mounted on the machine close to sensors. A wireless receiving station is located in a convenient place where a network connection can be found. Reliability is improved as long cables take a significant amount of abuse and faulty, loose, or broken cables can prevent data collection or produce false data. Specific applications include spindles drilling out motor blocks that turn the motor in many different directions; bearings on top of cranes; mountings on trains with cars that connect and disconnect; and many others.

By combining reduced costs and increased benefits, using wireless condition monitoring is likely in the future to become the "best practice" for many machines, environments, and industries. ■

Wireless at Sea

Solution helps energy company protect employees and operate at full capacity

Industrial facilities contain hundreds of pieces of rotating equipment, which slowly wear down over time. This equipment is only occasionally monitored manually or, oddly enough, not monitored at all.

Maintaining rotating equipment is even more critical on a floating tanker. Imagine a pump breakdown in the middle of the sea or at a risky point of transporting oil. In the oil and gas industry alone, the failure of rotating equipment causes approximately 40% of all unplanned downtime.

An energy company operating in the North Sea faced a rotating equipment challenge. The company needed to protect assets on its oil tanker, improve its ability to operate at full capacity, and proactively manage its long leadtime maintenance schedules. With over 500 points, manually monitoring the rotating equipment could only gather data from each asset once every three months.

Many of the company's assets have long purchased lead-times, making it hard to balance spare parts inventory levels. Additionally, some critical assets are in the engine room where it's not safe for employees during operation.

Because the company could only safely gather limited data, it was unable to predict failures, which can lead to operating the ship at a more conservative performance level instead of at full capacity.

The company realized it needed an online system. Adding wires would have cost over $100 per foot, however, and with a ship almost 900 feet long by 150 feet wide, wires were not a cost-effective solution.

To install a wireless solution, Honeywell completed a wireless network design assessment. Implementing a wireless solution on a metal tanker is not an easy task - few propagation paths exist and inherent vibration can affect readings. Honeywell assessed the interference points, considered how the equipment would behave with a sensor attached and planned around the ship's steel by deploying powered wireless access points and configuring the sensors so they would not create interference.

With Honeywell's new system installed, the company will be able to read and historize real-time data at least five times a day. The company also plans to add other wireless applications to the existing network. This will help better protect employees, proactively schedule maintenance, manage resources, and operate confidently at full capacity. ■

Using Mobile Devices to Stay Ahead of Plant Incidents

By Charles Mohrmann
SAT Corporation

Proactive decision making requires proven technology that delivers the right data at the right time. Just ask the operators at a leading Houston-based chemical company.

Three years ago, field operators used paper check sheets to monitor and track field conditions and equipment status. Data was manually entered into production and process control data spreadsheets from multiple sources creating time delays for data entry and supervisory reviews.

In 2004, the company upgraded its plant with new field data collection work processes, to better capture, track and integrate field data with backend support systems. They selected Honeywell's IntelaTrac PKS, an integrated mobile software solution that collects field data, empowers field workers through focused advice messages based on best practices and provides intelligent asset management through improved decision support.

The IntelaTrac PKS solution provides field operators with ruggedized handheld computers running mobile workflow software, RFID tags and peripheral devices such as wireless Bluetooth enabled temperature guns, vibration probes and pyrometers.

The company found that IntelaTrac PKS helps fieldworkers proactively stay within equipment operating envelopes, maintain proactive maintenance based on equipment condition, and ensure regulatory compliance inspections are cost effective and auditable. As a result, the project delivered a payback in less than six months. The new system increases the integrity of data downloaded in the field with time and date stamps for better accuracy. This information also integrates with their process historian data to ensure a more complete knowledge set for analysis.

IntelaTrac PKS also helps companies comply with EPA Title V emissions and OSHA process safety requirements. Field activities are documented, enabling operators to generate proactive day-to-day compliance summaries available on the desktop and through web based exception reports.

The company has also realized significant energy optimization through improved furnace monitoring. With IntelaTrac PKS, coking rates are easily trended using field and historian data to proactively pinpoint and mitigate fouling effects.

IntelaTrac PKS also helps address retiring workforce concerns by providing a framework to modify roles and improve on-the-job education through mobile learning. New work processes, combined with the IntelaTrac PKS mobile framework for executing best practices, to help ensure strong business performance. ■

Honeywell's IntelaTrac PKS helps manufacturers change from inflexible paper based checklists to improved work processes.

Setting the Standard for Wireless:

End-Users Are Driving ISA100

By Patrick Schweitzer, ExxonMobil
ISA100 Standards Co-Chair

Since becoming the ISA100 co-chair in September 2007, I've been impressed with the over 400 committee members, 60 of them volunteering almost full time. We have the privilege of working with the smartest industrial wireless experts and a diverse end-user community.

End-users understand the importance of having a wireless standard. As plant networks are consolidated, it is difficult to manage more than two wireless networks. The supplier community is listening to end user recommendations, making this a market driven standard.

A wireless standard can also encourage supplier innovation, including interchangeable devices and new devices that solve old problems. Suppliers can use the standard's common physical layer to provide end-users with options.

We Hear You

End users understand the value they can gain from wireless technology, so now they're considering deployment. They're concerned about ease-of-use and robustness, with many discussions centering on provisioning.

They feel confident that wireless networks can be made secure; it just cannot interfere with operations.

The ability to manage a device's battery life and utilize different forms of power is also important.

And, robustness is key. In the process control world, we can't reboot—everything needs to be available. End users need to know that their network won't go down and want wireless performance to replicate what happens in the wired world.

Next Steps on the Standard Path

The ISA100.11a working group, a subset of ISA100, reviewed and edited the preliminary draft standard in December. We expect the standard to be ANSI approved in 2008. This will deliver a globally accepted standard for worldwide deployment.

We want ISA100 to be a level playing field where everyone can participate. For example, in October, we formed a joint committee with the HART Communication Foundation to accommodate the WirelessHART specification and the ISA100 standard. To integrate the WirelessHART protocol for the first release was a daunting path, so, we're taking phased steps. We'll finalize methods for accommodating both protocols in release 1 and are developing the method for integration by a future release.

Join Us

ISA100 will be a family of standards. New working groups are being formed to address more manufacturing-oriented applications, asset and people tracking and trustworthy wireless. We welcome all end user participation and our meetings and conferences are open. ISA100 is about joining together to create something that will have a huge impact on the industry. For more information, visit www.isa.org/link/ISA_100. ■

Examining a Universal Wireless Network – Many Protocols; One Network

Plants require a broad choice of instrumentation to meet their unique needs. This is challenging as more companies eye integration as a key strategy to streamline operations, increase production and boost business performance.

In the age of the "smart" plant, integration requires tight interoperability between devices made by different suppliers. This is also apparent as plants consider wireless technology. Competing protocols have paved the way for technologies designed to beam information from previously inaccessible areas to an operator's console or hand-held tablet. These protocols, however, can also limit users' instrumentation choices.

Many plants, for instance, use proprietary tools that configure devices to communicate over specific protocols such as HART and FOUNDATION Fieldbus. While these tools will work for any device that speaks their language, they become hurdles when plants include instrumentation that communicates through different protocols. Additionally, companies may be hesitant to adopt technology that will require their operators to learn a new system for configuring devices.

The key to overcoming this challenge will be in adopting a universal solution that will allow field I/O devices of any protocol to communicate with existing applications. In 2008, ISA will release the ISA100 standard, the first to offer support for multiple wireless communication protocols including HART,

Profibus, CIP, and FOUNDATION Fieldbus.

An example is the use of non-HART wireless field I/O interfacing with applications for HART wired devices. A universal device protocol approach will allow a non-HART device, for example, to appear as a HART device. This can be accomplished by embedding a HART gateway into the network. This gateway maps a non-HART protocol and enables it to communicate with foreign devices on the same network.

A universal protocol device is one whose native wireless protocol can encompass the features and information of the wired protocol, protecting critical information. ISA100 proposes a protocol that can encompass major device protocols so that both existing wired devices and new ISA100-based devices can be configured and accessed over the wireless network. Wired devices can have their protocol mapped to the ISA100 standard, or in some cases their messages can be encapsulated as-is and transported over the wireless network. The new ISA100-based wireless devices can mimic wired protocols by mapping the wireless protocol to the user-chosen wired protocol in the gateway.

The benefit is four-fold: First, plants can maximize their investments and make use of existing infrastructures. Second, the distributed control system and business applications can immediately access data from these devices without any physical changes to the equipment or new interfaces. Third, plant personnel are not required to learn a new configuration system. Finally, the plant can streamline inventory costs by standardizing on a single wireless field device type for their entire plant.

Manufacturers that plan ahead and invest in a universal solution will ultimately give their plants the greatest flexibility in selecting instrumentation and the tightest integration. ■

Using Physical Location to Become a Smart Facility

By Soroush Amidi
Honeywell Process Solutions

The remote identification of assets has received considerable interest recently, thanks in part to Wal-Mart's radio frequency identification (RFID) program. Improved industrial technologies have helped companies quickly identify and track critical assets to improve sites' operations efficiency, security and even personnel safety.

Manufacturers must consider several factors when selecting the most appropriate technology: infrastructure requirements; detection range; detection accuracy; reliability; RFID tag battery life; update rate; and cost. There are many technologies to consider:

Wi-Fi. Using battery-powered tags and off-the-shelf access points, Wi-Fi systems are best for applications that require approximate location information in outdoor and indoor environments and are ideal for facilities with existing Wi- Fi networks.

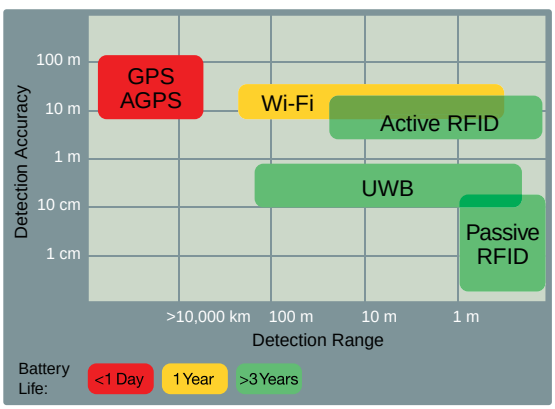
Pulsing 5.8 GHz Active RFID. This is a precise location system best for applications in harsh multi-path outdoor or indoor environments. The system's multi-year battery-powered tags emit pulsed signals at the 5.8 GHz ISM band that are captured by receivers.

Ultra-Wide Band (UWB). UWB is another precise location system designed to locate assets in harsh multi-path outdoor or indoor environments. Multi-year battery-powered tags emit pulsed signals at high frequencies (6-8 GHz) that are captured by receivers. UWB uses frequency ranges not regulated globally.

Global Positioning System (GPS). GPS does not require infrastructure and consists of receivers that calculate positions by measuring the distance between themselves and three or more GPS satellites.

Some solutions can integrate UWB, Wi-Fi, Active RFID, and GPS into a single platform. Other advanced features include the capability to associate RFID tags and GPS devices with equipment or personnel, create business rules that trigger automatic notifications, and create queries and view reports.

Incorporating this real-time location data into an overall process knowledge system gives users—from field operators to managers—greater insight into overall operations. This brings the plant a step closer to becoming a "smart" facility. ■



Manufacturers must consider several factors when selecting the most appropriate positioning system for their application.

Ensure It's Secure

Validated security protects your wireless network

By John Jacobs
3e Technologies International

Remember the scene from Ocean's Eleven, when hackers broke into the computerized security system at the Bellagio, letting thieves walk away with millions of dollars? Threats to security are not simply fodder for motion pictures—they are a reality that must be dealt with proactively and aggressively. A data compromise at the hands of hackers could prove disruptive to operations—not only in slowing valuable production output and draining financial resources, but also in putting intellectual and physical property at risk.

For example, in a short film created by Idaho National Laboratories, they show results of a simulated attack on a power network, including a turbine that dramatically overheats and shuts down. The simulation demonstrated the devastating impact of the shut down—a type of situation that can be avoided through wireless equipment monitoring.

When Honeywell and 3e Technologies International (3eTI) teamed to create the mesh capabilities of the OneWireless universal network, providing state-of-the-art security was a top design consideration from the outset. The 3eTI multinode module creates an integrated, secure mesh network designed specifically to prevent breaches of data security without adding complexity to the OneWireless solution.

ADAPT to Emerging Threats

Today's threats to data integrity are very real and require a proactive, multipronged approach to total network security. The multinode was designed to ADAPT to the most challenging security dangers.

Access is the first step in controlling who is allowed on the network. While a proper system design gives access only to authorized users, that access needs to be layered with authentication to ensure the true identity of the person on the network. Authentication is achieved via the use of passwords, digital certificates, control lists, and EAP-Transport Layer Security.

Denial of service prevents outsiders from jamming or interfering with a network. To stay ahead of hackers, techniques such as frequency hopping, spread spectrum, and RF beam steering are used. Denial of service can be achieved via the placement of directional and polarized antennas, and by ensuring perimeters are secure.

The implementation of the security algorithm is as important—if not more important—than the algorithm itself. In wireless networks, WPA and 802.11i are known to offer true Layer 2 (LAN networking) protection.

Authenticity—also known as anti-spoofing or repudiation—is a means of refusing network access. Effectively denying access requires both authentication and ongoing monitoring. Examples of functions used to ensure authenticity include HMAC, or Hash Method Authentication Code.

Privacy is a primary goal of network security—providing data only to those who need it, ensuring confidentiality and preventing hacking. Privacy is achieved via encryption, system planning and design, and system monitoring. Some common examples of encryption algorithms are AES and 3DES.

Testing devices against proven standards by independent third parties is a best practice in ensuring network security, since not all security is created equal. The implementation of the security algorithm is as important—if not more important—than the algorithm itself. In wireless networks, WPA and 802.11i are known to offer true Layer 2 (LAN networking) protection. It is also important to independently certify the security works to the extent it claims to work, which is why the U.S. Department of Defense and many international users now require 802.11i and FIPS 140-2 Validation of encryption devices.

Proven Security in Hostile Environments

Because the Department of Defense requires the utmost in wireless networking security, only those solutions with proven track records of safeguarding data are implemented in military applications. 3eTI's mesh nodes have been proven to withstand the rigorous requirements of one of the most challenging environments: aboard vast war-fighting ships traveling in dangerous open seas.

Confidential, secure wireless communications aboard navy vessels are essential for sailors performing the thousands of tasks associated with ship operations. 3eTI designed a shipboard wireless local area network (WLAN) that allowed installation of sensors on critical equipment to report status in real time. The system—which also enabled sailors to send data securely over a wireless network—is ideal for use in industrial applications requiring streamlined, secure operations.

The WLAN designed for the U.S. Navy meets the Department of Defense's requirement for the FIPS 140-2 Validated security needed to protect soldiers and critical assets. 3eTI was one of the first companies to have its WLAN infrastructure FIPS 140-2 Validated, and has since had more than 14 wireless products validated to the standard. ■

3eTI High Performance Mesh for Industry

The mesh network design begins with a root node that acts as a gateway to the wired network. As nodes are added, they are automatically discovered by the mesh, and secure virtual bridge connections are established to each new node. The mesh intelligently selects the shortest, "lowest cost" paths, which are continuously optimized. If a node should fail, the mesh detects the failure and automatically reconfigures the network around it. As the mesh network grows, redundant root nodes can be added to enable expansion to cover additional geography throughout an operation.

An Extra Set of Eyes

Applying wireless technology in a tank farm environment

Tank farm monitoring poses challenges to manufacturing facilities, whether from exposing employees to a dangerous environment or in monitoring tank levels from miles away. Industrial wireless technology, though, represents an opportunity to streamline these tasks and improve overall efficiency.

Tank farms can be located anywhere from 500 feet to two miles away from processing plants, presenting a challenge for a company that needs to maintain a close eye on what happens across all of its operations. Traditionally, companies have addressed this challenge by utilizing at least two operators – one in the field and another in the control room. And, often, there are safety risks that make monitoring impossible.

One way a company may address this challenge is to deploy a wired monitoring system. Because many tank farms are considered an explosive hazard area, workers may be precluded from using electrical devices and wiring that aren't labeled intrinsically safe. For regular wiring, a company can expected to pay between $25-$40 per foot. For intrinsically safe wiring, the cost could range from $80- $100 per foot.

A wireless infrastructure, however, can provide a more affordable –and more efficient–alternative.

Affordable, Efficient and Safe

A wireless alternative reduces installation costs. Without any wiring or conduit to install, the implementation is easier for vendors and less expensive and intrusive for operators.

Wireless also adds value to the operation itself, allowing companies to more easily track its inventory, streamline throughput and optimize operations. For instance, companies can gain real-time access to tank level information rather than relying on a field operator to provide intermittent readings, which they then manually call into the control room operator.

Additionally, a plant that uses manual inspections may only partially fill its tanks to avoid any risk of overflow. Wireless instrumentation enables operators to monitor the levels more accurately and thus increase the throughput without the worry of a spill. This translates to safety as well as efficiency.

The most obvious benefit of a wireless solution in a hazardous area is reducing the need for workers to physically put themselves in harm's way to monitor data points. Less wiring also means less chance for a deadly spark, which could ignite the flammable vapors and cause harm to the company's facilities, its employees, and the broader community.

Real-World Applications

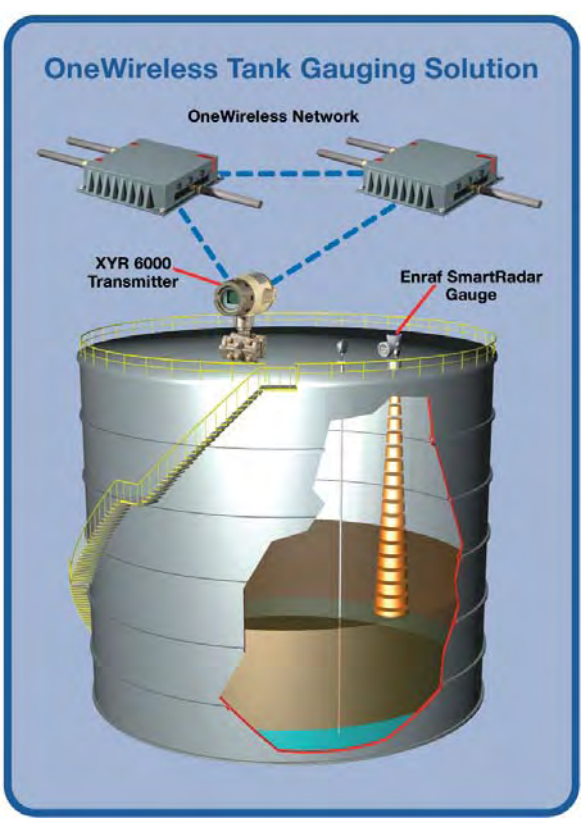
Wireless technology can help protect against the hazards of working in a volatile environment, as well as bring plants closer to compliance with government and industry regulations.

One pharmaceutical customer, for example, was searching for a way to better monitor its alcohol tank levels and reduce safety risks to employees. The old measuring method required employees to walk up narrow stairways to the tops of the storage tanks, open a six-inch portal, and lower measuring sticks into the alcohol.

A wired solution would have required 300-400 feet of cable or conduit—an expensive proposition. The more appealing wireless solution included a wireless base located 300 yards from the storage tanks with pressure transmitters that sense the alcohol's weight. This data is transmitted to a programmable logic controller (PLC) where employees can view it in real-time.

The new system reduces safety risks to employees and the environment. The company now emits less alcoholic vapors into the air because workers no longer have to physically open the tanks to take measurements.

The efficiency of the new wireless system has the customer exploring other possible uses, such as introducing wireless technologies into the plant's actual processes. Wireless applications would also eliminate clutter and reduce the time employees spend maintaining the area. With fewer cables and conduit, the area is also easier to keep clean, eliminating locations that collect dirt and dust.



OneWireless tank farm solution – An XYR 6000 transmitter communicates with a Honeywell Enraf SmartRadar gauge.

A Strategic Investment

Monitoring and controlling tank liquid volume helps ensure data accuracy used for financial statements and for planning and scheduling. Inaccurate measurements may result in suboptimal capacity usage, accounting errors, and even environmental incidents through spills. The most ideal solution involves proven measurement with a plant-wide wireless infrastructure to improve business performance while also saving costs. ■