Wireless Solutions for the Power Industry

Wireless technology offers benefits beyond just wiring cost savings. With a multi-functional, plant-wide wireless network, utility and power generation facilities can improve safety, reliability and efficiency through optimized employees, equipment and processes.

Today’s Environment

Power plants implementing wireless systems do so for the same reason as the designers of the first telegraph system—cost savings. Utilities look to wireless to add real business value, both in terms of installation costs and optimized operations from increased data availability.

Just as Marconi’s technology eliminated the need to erect poles for wired communication, modern wireless solutions simplify installation requirements when compared to conventional wired networking, while also improving reliability and productivity.

An ultra-secure and ultra-reliable wireless field infrastructure supports not just wireless instruments, but also IEEE 802.11 WLAN applications and mobile clients such as hand-held computers and mobile Human-Machine Interfaces (HMIs). A single wireless network, supporting multiple wireless technologies and classes of service, can handle diverse tasks ranging from communicating sensor information back to a host system, to closed-loop control, information, HMI, video, communication, and enterprise applications. Wireless technologies developed for building management and security can also be utilized in process plants to support both asset management and personnel tracking.

Modern wireless networks are formed with a series of wireless access points, or radio nodes, placed strategically in the facility. Many networks support a ‘mesh’ infrastructure where each radio node communicates to at least one other in range, providing backup communication should communication from one be interrupted. The coverage area of the radio nodes working as a single network becomes a mesh “cloud.”

Most importantly, wireless networks can be designed to support multiple communications protocols, as well as existing applications and standard TCP/IP communications, so that legacy investments do not have to be discarded.

Applications for the Power Industry

Modern wireless solutions improve productivity by enabling the right people to be at the right place at the right time. Process and asset information can be extracted, viewed, and processed where the data resides to enable more accurate and timely decisions. Access to the right process data can significantly enhance operational efficiency and extend access to critical process information beyond the control room.

A wireless system can include anything from a network of transmitters monitoring a single, specific application, to a full-scale wireless network deployed across an entire site to handle multiple applications including monitoring and supervisory control.

In the evolution of wireless technology, the first generation of products was sensor specific and not designed to cover entire plants, which resulted in smaller implementations. Today’s generation of products is more appropriate for wider plant deployment.
Wireless Technology Delivers Value to the Power Industry

For example, wireless mobility tools provide a fully functional PC environment that personnel can interact with directly from a handheld device while performing maintenance rounds, data collection and inspections. These solutions are optimized for specific end user applications, ranging from read-only access over the Intranet by multiple casual users, to secure system access for mobile operators. This wireless collaboration can improve decision-making, production uptime and process monitoring, and incident avoidance.

Handheld access to process data allows technicians in the field to view the latest plant information to help identify failures and causes that may previously have gone unrecorded, and can open the door for further investigation of a system’s reliability. Users can integrate field data with data from multiple other sources, including production, control, and work management systems. They also provide mechanical and engineering data and support calibration of instrument databases. On-site computing helps management improve the tracking and reporting of inspections, tests, and repairs for pumps, actuators, valves, vents, pipes and other plant process equipment.

The new breed of wireless transmitters enables employees to obtain data and create information from remote and hazardous locations without the need to run wires, where running wire is cost prohibitive or the measurement is in a hazardous location.

There are countless remote applications in power plants that can benefit from wireless technology. For example, one Nebraska power plant is using wireless technology to monitor their remote oil tanks. In addition, they are now able to efficiently monitor water run-off where electricity is not available. Their battery-powered transmitters transmit over long distances back to a powered node.

Other plants are considering applications such as:
- Supervisory control and data acquisition
- Emissions monitoring
- Flame sensing with transmitters or even a remote wireless video
- Control applications, such as turbine control, boiler control, or motor control
- Monitoring the health of rotating assets

Another specific example comes from a power plant in Bulgaria that used wireless temperature transmitters to measure steam used for heavy oil burners. These were entirely new measurements that were not available previously. They replaced a wired solution that would have taken two months just to procure, with a wireless solution that took just two days. Now that this network is in place, they will expand to detect gas at their water treatment plant with wireless detectors and send the signal 300-400 meters to their system.

Another remote example applies to large areas such as wind farms. Many have ineffective or no means to determine wind speed or kilowatt/megawatt power production. Battery-operated wireless devices provide the opportunity to gather data and effectively calculate production.

Furthermore, wireless multiplexers provide a simple and reliable means of implementing a wireless solution for applications with high-density I/O concentrations, providing the lowest cost per wireless measurement point that enables new applications that save millions of dollars on wiring costs. This can help with substation monitoring and communicating information back to a central monitoring station.

Wireless technology also offers an innovative, cost-effective alternative for measuring the health of water or corrosion from fluid in tanks and pipes. For example, remote analytical PH readings provide the ability to monitor water quality. And, with a wireless corrosion monitoring system, online and real-time corrosion monitoring now becomes cost-effective. A wireless solution can carry process and maintenance data over the same network. Correlation with maintenance and operator tasks is possible by enabling mobile workers with wireless technology, eliminating sifting through maintenance logs and matching tasks with corrosion data. It can all be integrated into one set of data.

Most importantly, wireless technology enables safety. With new opportunities for integrating asset tracking, people location...
data or real-time data and supervisory control, wireless technology can provide:

A real-time location system throughout the facility to monitor employee locations and ensure safe procedural operations

- Safety shower monitoring
- An infrastructure that supports emergency responders
- Wireless leak detection and repair support
- Integration with existing control and safety systems
- Continuous wireless monitoring of equipment and field devices for diagnostic equipment health assessments
- Voiceover IP for communicating

Emerging standards represent one criterion from which to make the wireless technology choice. However, with various solutions currently on the market and on the horizon, an opportunity exists today to start taking advantage of the benefits available with wireless-enabled applications.

Power industry operations can now benefit from a wireless solution that satisfies the multiple conflicting demands of redundancy, distributed communications, flexibility, and reliability. Furthermore, self-configuring, self-healing wireless mesh networks are inherently less expensive to install and maintain as radios and microprocessors become cheaper. A significant barrier to low-cost connectivity has been removed.

To get started with wireless, and unlock the possibilities of this innovative technology, it is important to view your wireless implementation as a partnership between the plant operator, company IT department, and wireless supplier. Each party has a share in determining the outcome of this effort.

Also, it is best to manage your infrastructure as a single network. Think strategically about your wireless deployment and select a universal network meeting all of your needs. Experience has shown how a “piece-meal” system is a nightmare to manage.

Finally, always consider safety first. If you can’t install wireless safely, it’s better not to do it at all. Fortunately, with the right technology and support, you can enjoy all of the advantages of wireless while protecting your plant information and ensuring safe operations.

For More Information
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