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FEBRUARY 2010

WIRELESS COMES OF AGE

PROVEN SUCCESSES AND EXPANDED CAPABILITIES
PROPEL IT INTO THE MAINSTREAM

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Closing the Loop on Wireless Control

Full redundancy and a wireless-friendly PID algorithm facilitate critical control without wires.

WIRELESS INSTRUMENT networks have laid claim to what is arguably the fastest industry penetration of any process automation technology in history. Wireless has proven that it can deliver significant business benefits quickly and easily, relatively inexpensively and with little or no implementation risk.

“Wireless has been adopted at thousands of customer sites globally,” says Bob Karschnia, vice president, wireless, for Emerson Process Management. “Plants using wireless realize savings and become smarter through simpler engineering and construction, flexible startup, faster deployment and project completion, and the ability to respond to changing automation needs.”

Until recently, however, wireless was recommended only for the open-loop monitoring of non-critical measurement points. But the technology has come of age quickly, with users demanding—and suppliers such as Emerson now providing—wireless technology suitable for many closed-loop control and critical monitoring applications.

Two key advances making control over wireless a reality are fully redundant communication pathways and a new PID algorithm, developed by Emerson Process Management, that allows control loops to accommodate “reporting by exception” of the process variable being controlled, a feature of the WirelessHART communication standard intended to extend transmitter battery life.

REDUNDANT COMMUNICATIONS OFFERED

“Now available with the DeltaV S-series digital automation system, full redundancy protects the wireless network from any single point of failure, ensuring that data is always delivered even if there is a malfunction,” Karschnia says.

Recent enhancements to the company’s Smart Wireless lineup include redundant wireless I/O, redundant power and communications, and redundant Smart Wireless Remote Links. The Remote Links are Class I/Division 2 devices that provide a redundant, wired connection from the wireless field network to the DeltaV I/O. “The new full redundancy furthers strengthens Smart Wireless technology as a complement to wired and bus approaches on capital projects,” Karschnia says.

Customers need proof that control with wireless is viable, Karschnia continues. “We’ve responded with real-world Smart Wireless installations featuring one-second updates, enhanced PID and battery management over WirelessHART,” he says.

The new redundancy and robustness provide confidence to customers to now extend the use of Smart Wireless in critical monitoring and control applications—without sacrificing flexibility and ease of use.

REAL-WORLD FUNCTIONALITY DEMONSTRATED

Two recent installations demonstrate the effectiveness of Smart Wireless for control over Wire-



Researchers at the University of Texas at Austin have demonstrated closed-loop control of a distillation column using wireless, with performance virtually undistinguishable from that of wired transmitters.

THREE PROCESSORS NAMED SMART WIRELESS INNOVATORS

To recognize creativity and business value from applications of its Smart Wireless solutions, Emerson Process Management announced the winners of its 2009 Smart Wireless Innovators Application Contest at the 2009 Emerson Global Users Exchange in Orlando, Fla. A cross-industry panel of end-user judges selected CalPortland's rotating cement kiln monitoring application as Most Innovative and CHS and Severstal Wheeling as co-winners for Best Business Results.

CalPortland, a manufacturer and distributor of cement and concrete used Smart Wireless to monitor a rotating 540-ft-long, 13-ft-diameter cement kiln at its plant in Colton, Calif. (See photograph below.)

The wireless devices rotate with the cement kiln at almost two times per minute and help the company meet nitrogen-oxide emissions regulations. The rotation, extreme temperature, cement dust and location of the kiln made using a wired solution impossible.

The co-winners of the business-results award demonstrated dollar savings in operations, installation savings compared to a wired approach, time savings with wireless implementation and safety or environmental-impact improvements.

Oil-refiner CHS used Emerson Smart Wireless technology to improve the reliability of a tank monitoring application at its Laurel, Mont., facility. The installation cost savings was \$500,000 compared to a wired solution, and will prevent tank over-fill

and tank repairs and the resulting repair/remediation efforts.

"Many of the operations people told me the accuracy is better as well," says Ken Paulson, refinery process engineer. "We've been able to get this redundancy in a very cost-effective manner."

Co-winner in the best business results category, Severstal Wheeling, the U.S.'s fourth largest integrated steel producer, recently expanded use of Smart Wireless technology to improve process, fire safety, and environmental monitoring at its fully integrated, 80-inch hot strip mill in Mingo Junction, Ohio.

Emerson's Smart Wireless solutions, initially employed by Severstal Wheeling to monitor production, prevented roll failures valued at \$300,000 and improved mill efficiency. This gave the company the confidence to deploy three additional cost-effective Emerson wireless networks to further fine-tune process control and to monitor its fire safety system and oil storage tanks.

"The success we saw in the first installations gave us the confidence to go forward," says Gary Borham, Severstal Wheeling engineering manager. "Now that we've used this technology, it's like anything is at our finger tips if we want it."

One of the additional applications uses Rose-mount wireless temperature transmitters to check bearing lubricant on backup rolls in the plant's finishing mill, reducing maintenance costs and downtime. *(continued on page 4)*



CalPortland's innovative application of wireless to monitor temperature distribution in a rotating kiln 540-ft. in length helped the company meet nitrogen-oxide emissions regulations and bag the top prize in Emerson's Smart Wireless Innovators contest this year.

(continued from page 3)

"Since we installed the wireless network, we've not needed to replace backup rolls because of overheating bearings and damaged rolls," says Borham. "It takes four hours to change a roll and costs could reach \$200,000. We can now see when bearing temperatures rise and can shut down to perform maintenance, which only takes an hour."

A second application uses Rosemount wireless pressure transmitters to monitor the water pressure of the fire safety system protecting the plant's oil cellar.

The network has detected two water leaks, enabling quick repairs that returned water pressure to a safe level. Severstal Wheeling was also able to discontinue clipboard rounds once made to check the system, which extends 1,500 feet through a series of tunnels.

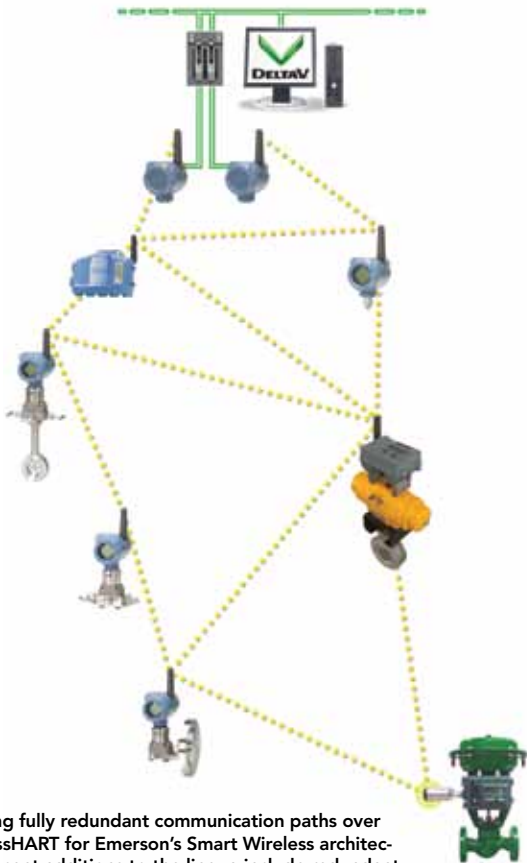
The company had to upgrade its fire safety

system to comply with insurance requirements but estimated it would cost \$60,000 to \$100,000 to install a hard-wired monitoring network.

"The hard-wired installation cost estimate was outrageous and with the economy the way it is there was no way we could do it," Borham says. "The cost of installing the wireless network was 60 percent less than a hard-wired solution."

In a third Smart Wireless application, the company installed Rosemount wireless transmitters on 11 oil storage tanks located inside and outside its facility. The devices are connected to and convert the 4-20 milliamp signals from existing hard-wired pressure transmitters that measure tank levels.

"If there is a spill, we know exactly which tank and what time it occurred," Borham said. "We can immediately work to contain it. We can also use the level data to monitor when to order more oil."



Enabling fully redundant communication paths over WirelessHART for Emerson's Smart Wireless architecture, recent additions to the lineup include redundant wireless I/O, redundant power and communications and a redundant Smart Wireless Remote Link.

lessHART networks. At bioprocess technologies supplier Broadley James, wireless pH and temperature transmitters control a single-use disposable bioreactor. "We conducted batch runs using mammalian cell culture," says Scott Broadley, Broadley James president. "The observed pH and temperature control using wireless measurements was equivalent to that achieved using wired transmitters."

Similar results were seen at another installation at the University of Texas, Austin, where stripper and absorber control is being done using WirelessHART transmitters. Column pressure control and heater stream flow control over wireless provided the same dynamic response and comparable performance to that achieved using wired transmitters, according to Frank Seibert, technical manager of the UT Austin separations research program.

A modified PID control algorithm makes this possible, explains Randy Balentine, DeltaV product marketing manager for Emerson Process Management. "We understood how WirelessHART devices provide non-periodic process variable updates, and how we could accommodate that in the PID algorithm," he says. The technology is available to address most control applications, with scan rates as fast as one second, supported by WirelessHART devices, the Remote Link, and the DeltaV digital automation system.

"Yesterday, you couldn't do PID wirelessly," says Balentine. "Today, that's no longer the case." »

Better Intelligence Means Improved Performance

Manufacturers turn to wireless to better understand and optimize their processes.

THROUGHOUT THE history of process manufacturing, incremental improvements in process performance often have hinged on the availability of more complete process information. The more thorough one's picture of what's happening in a manufacturing process, the better one can improve efficiency and control variability—and avoid the occasional nasty surprise.

But the gathering of better process intelligence has long been constrained by the cost of instrumentation: Any incremental measurement entailed the cost of the transmitter itself, as well as the time and labor required for engineering and implementing the installation, the running of wire back to a central control room and the distributed control system input/output (I/O) hardware itself. Over the years, the cost of transmitters has decreased, as has the cost of I/O. It's the stubborn middle part of the engineering, installation and wiring, that has stood in the way of our better understanding, controlling and anticipating the performance of our manufacturing processes.

Because of the high cost of wiring, many secondary process variables have long gone unmeasured, and expensive pieces of critical rotating equipment remain uninstrumented. But with the advent of wireless instrument networks, many of those pesky middle costs are dramatically lower or gone altogether, and the economics have shifted in favor of incremental measurements that can translate to improved process performance.

Indeed, thousands of process manufacturers world-

wide have implemented wireless solutions in the past several years, and for many of them better process intelligence has meant documented improvements in efficiency, fuel consumption and throughput, as well as the lowering of emissions, prevention of downtime and avoidance of safety incidents and equipment damage. Here, then, is a brief global tour of some of the results being achieved.

In This Story

10 WAYS WIRELESS USERS HAVE IMPROVED PROCESS PERFORMANCE

1. Improved energy efficiency
2. Increased throughput
3. Prevented downtime
4. Improved safety
5. Reduced emissions
6. Protected equipment
7. Boosted quality
8. Decreased cycle time
9. Eased troubleshooting
10. Streamlined maintenance



THROUGHPUT IMPROVED AT AOC

Among those manufacturers relying on wireless to improve control of their processes is AOC's Perris, Calif., resin manufacturing facility, where Smart Wireless technology from Emerson Process Management has

ABOVE. As part of a major modernization program recently awarded to Emerson Process Management, Poland's Belchatow power plant, the largest lignite-fired power station in Europe, is among the many plants worldwide implementing wireless instrumentation networks to improve plant performance, increase availability and reduce environmental impact.



Emerson Process Management's Smart Wireless Field Starter Kit is a complete wireless automation kit you can order today. The kit is a configurable assortment of 5 to 100 devices, including wireless pressure, temperature, level, flow, vibration, discrete switches and pH devices, as well as wireless enabling devices: Smart Wireless THUM Adapters and wireless valve position monitors. Requiring no site survey, no special tools and providing seamless integration with wired networks, the Starter Kit includes a secure Smart Wireless Gateway, AMS Device Manager software to manage predictive diagnostics from your wireless devices and SmartStart Services to get things up and running smoothly. Visit EmersonSmartWireless.com/FieldKit to request a quote.

allowed the company to boost throughput by 10% and increased employee safety in the process.

The secure, self-organizing network ensures proper mixing of AOC's intermediate resin products with micro-additives at target temperatures to achieve customer-specific formulations and quality. Smart Wireless eliminated clipboard rounds that were an inefficient use of operators' time, subjected personnel to a safety risk and lengthened time to market.

"If staff found the temperature was not at target, it required additional time and resources to heat or cool the mix tank to the target temperature before adding temperature-dependent micro-additives or loading the product," says Tou Moua, AOC product engineer. "By replacing manual sampling with on-line measurements, we were able to decrease cycle time up to 10 percent. We also improved operator safety and freed up operators' time to improve on other areas of the plant."

AOC chose reliable Smart Wireless technology because it required minimal wiring; the wireless transmitters can easily be moved from one location to another; and it was more cost-effective than wired technology. Setup and commissioning of the network was quick and easy, taking only 12 hours, according to Moua.

EFFICIENCY BOOSTED AT ENCANA

At EnCana Corp.'s oil sands project at Christina Lake in northern Alberta, Canada, Emerson Smart Wireless technology is credited with improving the efficiency

of several heat exchangers. The self-organizing wireless mesh network delivers better temperature data for heat exchanger efficiency calculations, enabling improved maintenance and efficiency.

EnCana uses steam injection in a steam-assisted gravity drainage (SAGD) process to recover petroleum from the McMurray formation oil sands reservoir. The heat

"We were pleased with the ease of installation of the Smart Wireless network, which is operating perfectly."

—Stephan Meerman, instrument supervisor, EnCana

exchangers are used to recover heat energy from the heavy oil in order to raise the temperature of the boiler feedwater used to produce steam for the injection system. Efficient heat exchanger operation is essential to reduce fuel consumption, enabling the company to conserve energy.

Getting the system running was simple. Emerson's Smart Wireless network was installed, commissioned and operating in just two days. The inlet and outlet temperatures on several heat exchangers are measured with Rosemount wireless transmitters, providing continuous, up-to-date information for determining the efficiency of

WIRELESS@WORK: GAS PRODUCER IMPROVES PROFITS, PROTECTS ENVIRONMENT

Tecpetrol, a natural gas producer in Argentina, quickly needed to collect real-time gas flow data in order to track gas venting, comply with environmental regulations, measure gas sold to third parties and perform AGA3 calculations needed for economic balancing of its three facilities.

The company turned to an Emerson Smart Wireless solution "because it's a secure, robust, self-organizing network. It's reliable and easy to install, expand and use," says Odin Fernández, automation and energy head, Tecpetrol. "The wireless applications saved us a total of \$34,000 in installation costs compared to installing a wired solution, a 27% savings."

Ten each of Emerson's Rosemount wireless pressure, DP and temperature transmitters are installed in the orifice plates at gas wellheads across three of the company's facilities. The devices transmit data every 15 seconds to Smart Wireless gateways installed at each facility that forward the data to the company's DeltaV digital automation system.

The wireless network monitors the gas balance of the treatment plants, including dew point, primary separation, compression stages contracted, consumption and plant venting. Some of the data points tapped had never been monitored before. Other points had been checked manually by staff reading local gauges.

"We needed to closely watch our gas balance because excessive gas venting can impact our company's bottom line through lost product. Our



Currently using wireless to monitor wellhead conditions, Tecpetrol plans to expand its use of wireless use to test measurements taken during well drilling.

gas-venting levels must also comply with environmental regulations," Fernández says.

"One of the advantages in using this equipment is that our process is very variable and involves piping modifications, compressor layouts and primary separation, among other things," Fernández says. "We can move the measurement points when we need to and do not depend on pipes, cabling, etc."

those units in transferring heat to boiler feedwater. The information from the wireless devices also gives insight into tube fouling and damage.

Installation and startup of the wireless network by plant personnel were fast, enabling improvement of heat exchanger operation to begin quickly. EnCana avoided the cost of running cable and wires as far as 200 meters, saving an estimated \$40,000 versus mounting conventional wired instrumentation.

According to Stephan Meerman, an electrical and instrumentation supervisor at EnCana, "We are now able to maximize heat exchanger operation and maintain the tubes more effectively to prevent heat losses and avoid devastating tube ruptures. We were pleased with the ease of installation of the Smart Wireless network, which is operating perfectly."

EMISSIONS REDUCED AT MET-MEX PEÑÓLES

At Met-Mex Peñoles in Torreon, Mexico, the largest non-ferrous metallurgical complex in Latin America, company management had promised the community that the plant would reduce sulfur dioxide atmospheric pollution caused by stack emissions, as well as provide better quality reporting to the responsible environmental agency.

The company turned to Emerson Process Management, installing Smart Wireless instrumentation on the 50-meter stack at its lead foundry. Prior to the installation, the plant estimated the amount of sulfur emissions coming from the stack based on a number of sources. Emissions were inferred using an opacity meter and sulfur dioxide analyzer on the stack, along with an annual flow measurement taken by a contrac-

tor who would climb to the top of the stack. This person was exposed to extreme heat and emissions during the measurement.

Met-Mex installed a Smart Wireless network and field instruments including a Rosemount Anubar onto the stack at 25 meters above ground with a Rosemount wireless DP flow transmitter to measure stack gas flow, as well as a Rosemount wireless pressure transmitter and two Rosemount wireless temperature transmitters. The reliable, self-organizing network sends data every five seconds to a

Emerson's AMS Suite predictive monitoring software allows users to easily monitor device and equipment status, as well as overall health of a plant's wireless communication networks.



Smart Wireless gateway, which is installed outdoors approximately 65 meters away.

The gateway is integrated with the plant's DeltaV digital automation system, and plant staff use Emerson's AMS Suite predictive maintenance software to manage the new devices, including configuration, diagnostic checks, and monitoring alarms and alerts.

"The new data allow us to take preventive actions within our processes to reduce emissions instead of shutting down the plant to avoid fines," says Juan Manuel Perez, smelter plant instrumental department chief, Met-Mex Peñoles. "A plant shutdown can cost up to \$100,000 an hour."

Met-Mex intends to expand its wireless network by installing more devices to tap into additional data from nearby processes, making further operational improvements, and expects this will bring total installed cost savings to \$40,000 compared to installing wired instrumentation.

PUMPS PROTECTED AT DYNOL NOBEL

At Dyno Nobel's ammonium nitrate production facility in Louisiana, Mo., wireless now protects 20

hazardous-duty chemical pumps, yielding a significant improvement in plant safety, increased operator awareness of the condition of these pumps, and reduced the potential for plant or environmental damage due to a fire and/or chemical release. In addition, the company saved \$30,000 to \$40,000 on system engineering and installation costs compared with a wired alternative.

The new WirelessHART network, comprising 20 new Rosemount wireless temperature transmitters and 20 new Rosemount wireless discrete switches, plus dual-element temperature sensors and high-temperature switches, extends about 1,500 feet from end to end. The transmitters are connected by a self-organizing wireless mesh network to a Smart Wireless gateway that relays the data to a DeltaV digital automation system for monitoring, alarming and trending purposes. The wireless discrete switches transmit system fault and high-temperature trip signals from the temperature switches to the DeltaV console, where operator graphics display temperature and switch data for each pump along with a wireless network overview and status screen for operations and maintenance personnel.

If the discharge temperature of a pump rises beyond the safe operating setpoint, a high alarm is issued by the DeltaV system. If the temperature continues to rise, the DeltaV system issues a high-high temperature alarm to notify operators that the temperature at that pump is reaching a dangerous level. If the temperature rises still further, the local high-temperature switch shuts the pump off before it reaches the critical temperature at which the ammonium nitrate could begin to decompose. Operators are alerted to a safety trip fault by a signal from the discrete wireless switch.

Emerson's AMS Suite predictive maintenance software sends predictive diagnostics generated by the smart field devices to operations and maintenance so a high-temperature alarm condition can be addressed before a safety trip is required. In addition, the AMS Wireless SNAP-ON application aided with planning, installation and diagnostics of the wireless network. All of the devices on this network were powered up and commissioned in just one day in July, 2009.

According to Dyno Nobel plant operations manager, Sam Correnti, "All the factors of security, reliability, ease of installation and ease of use were considered in our selection of this technology and our confidence in the solution."

Having this wireless network in place offers some unique advantages that the company plans to exploit in the future, Correnti says. For example, safety shower flow alarms will soon be added, and planning is underway for additional temperature and pressure monitors in another area of the plant. »



Wireless Reshapes Work Processes

Better process control is just the start for wireless. Benefits are encouraging changes in business practices too.

AMONG THE earliest justifications for in-plant wireless networks was the ability to add incremental process measurement points that previously had been uneconomical or impractical. More measurements allow plants to understand and control their processes more closely, in turn boosting efficiency, throughput and other quantifiable aspects of process performance.

But as wireless networks have proliferated in the process environment, users are finding that incremental gains in process performance are only the beginning. Just as importantly, wireless is allowing process manufacturers to redesign their work processes and business practices, even allowing the easier experimentation with new ways of doing business—at minimum cost and risk.

BOOSTING WORKER PRODUCTIVITY

In the arena of personnel productivity, wireless is streamlining—and in some cases eliminating—formerly routine tasks. And with the increasing prevalence of mobile access to the plant’s control and information systems, plant personnel are no longer shackled to their desks or the control room and can be more productive wherever they might be physically located.

In This Story

10 WAYS WIRELESS USERS ARE REINVENTING WORK PROCESSES

1. Testing new measurement and control strategies
2. Deploying more flexible process units
3. Providing local and mobile data access
4. Eliminating manual data-logging
5. Responding more quickly to process upsets
6. Moving to predictive maintenance strategies
7. Extending instrumentation verification intervals
8. Reducing operator rounds
9. Streamlining start-up and commissioning
10. Adding wireless infrastructure to capital projects



ABOVE. The typical process plant has hundreds of uninstrumented manual valves, often in remote, hard-to-reach locations. Emerson’s Fisher 4320 wireless valve position monitor allows operators to remotely verify that valves are in the proper position without entering hazardous areas or climbing ladders to check the valves’ state or position.

WIRELESS@WORK: LIBERATING STRANDED INFORMATION

At the Chevron Phillips chemical plant in Sweeny, Texas, Emerson Process Management's new Smart Wireless THUM adapter is enabling extra capabilities for Micro Motion Coriolis flowmeters that are used in fiscal accounting of product transfer between Chevron Phillips and an adjacent petroleum refinery.

"The required proving for fiscal transfer flowmeters is time consuming and a big expense for the plant," says Stephen Fair, instrument measurement planner at Chevron Phillips. "To ease this issue, we plan to confirm our ability



Emerson Process Management's recently introduced THUM Adapter (as shown on a Micro Motion Coriolis meter) is a WirelessHART device that can be retrofitted on almost any two- or four-wire HART device without special power requirements to enable wireless transmission of measurement and diagnostic information..

to extend the time intervals between meter provings by trending data from the Micro Motion meter verification tool against data from proving reports. Adding to the extended interval savings, use of the Smart Wireless THUM Adapter on the remote flowmeters is making it possible for us to launch meter verification from the plant control room rather than making trips to the field. The adapters will also act as repeaters for other devices being added to the wireless network. "

The Smart Wireless THUM Adapter extends predictive intelligence into new areas throughout the plant, opening the door for a vast range of process improvements in these key areas:

- Gaining access to advanced diagnostics
- Enabling enhanced valve capabilities
- Remotely managing and monitoring devices
- Making any HART device wireless
- Efficiently gathering data from multivariable devices

The THUM Adapter can be purchased alone or as part of the Smart Wireless Field Starter Kit (see sidebar, p.6, for details) that comes pre-configured out of the box to immediately form a secure, robust self-organizing network. The Starter Kit includes a Smart Wireless Gateway, a 25-tag license for AMS Device Manager software, 5 to 100 wireless devices and Emerson-supplied SmartStart installation services.

Sun Chemical's facility in Kankakee, Ill., is among those companies not only eliminating operator rounds with wireless, but also improving product quality in the process. The world's largest producer of printing inks and pigments uses Emerson's Rosemount wireless transmitters to measure differential pressure drop across filter housings used in ink production. The pressure increases as the filters become clogged with particles, and alarms sent to operators signal when filters should be changed. Periodic staff rounds to check gauges on the filter housings are no longer necessary.

"Now that we can make sure that we don't over-pressurize the filter housing, we can provide better quality ink to our customers," says John Dwyer, Sun Chemical process engineer. "We have saved thousands of dollars in eliminating material rejects."

At a Petrobras gas compression facility in Sao Mateus in northeastern Brazil, staff no longer make clipboard rounds to two of the seven compressors on-site to check local readings and record the data by hand in spreadsheets—a task once performed every three hours, 24 hours a day. "We now have online access to real-time data about the compressors' operation and can review historical data and trends," says Gabriel Lopes, Petrobras Sao Mateus maintenance operator. "Alarms are generated when problems occur, enabling staff to take fast action in an abnormal situation."

"Alarms are generated when problems occur, enabling staff to take fast action in an abnormal situation."

—Gabriel Lopes, maintenance operator, Petrobras

Lopes continues, "Connecting the existing monitors on the compressors to the central control system with cables was not financially feasible because of installation and maintenance costs. Furthermore, because the installation is in a flood-prone area, a wired installation would be less reliable and require extra maintenance."

The installation's 56 wireless devices include 50 pressure and temperature transmitters as well as six Emerson CSI wireless vibration transmitters. The system also cost an estimated \$200,000 less than its wired alternative.

At the Novartis biotech production center at Huningue in northeastern France, a plant-wide wireless network is helping to improve maintenance and operator efficiency. Emerson's DeltaV digital automation system with a fully integrated Wi-Fi network

and mobile operator stations are providing process and plant information to operators and maintenance staff throughout the facility.

Localized control is essential to the efficient management of the process, which is spread over three production levels, as well as being geographically dispersed. Novartis implemented a distributed architecture, based on Emerson's DeltaV system. Therefore, operator stations

"Because of the wireless network we do not need to systematically invest in new control stations."

—Patrick Boschert, automation expert, Novartis.

can be located near the main areas of the process such as the bioreactors and tanks. To further maximize operator efficiency, Novartis recognized that it needed a control architecture that enabled operators to be fully mobile.

"In 2000 we introduced wireless technology and recognized that it was well-suited to our needs. The most recent developments in Emerson's DeltaV system have enabled us to implement a plant-wide wireless solution," says Philippe Heitz, head of engineering, Novartis.

The mobile operator stations provide Novartis with complete flexibility to control its manufacturing processes. To meet the standards required for sterile zones C & D, the mobile operator stations have a stainless steel enclosure that houses the central processing unit. The devices are equipped with a USB connection to the usual keyboard, monitor and mouse for this type of environment and connect to the network of Wi-Fi access points.

Operators can move from one level to another with their mobile station and still maintain an overview of the process. This has not only significantly improved operator efficiency, but it has also made it possible to reduce the number of workstations required by 50%.

There have also been efficiency improvements in the area of plant maintenance. For example, by using a mobile workstation it is now possible for just one person to calibrate the instruments, when previously it would have required two. Should any workstation have a fault, there is no longer a need to shut down a process while the station is fixed or replaced.

"Because of the wireless network we do not need to systematically invest in new control stations, even if the production of new products requires a change to the plant equipment or layout," explains Patrick Boschert, automation expert, Novartis.

WIRELESS@WORK: KEEPING TABS ON MANUAL VALVES

At Harcros Chemicals in Kansas City, Kansas, a network of Emerson Process Management wireless position monitors are keeping an eye on valves previously unconnected to the plant's control system. Harcros uses manual valves for sampling, directing, injection and extraction processes at the chemical production facility. Many of the valves are in remote, hard-to-reach locations too costly to access with wires.

"Monitoring them was a difficult process, requiring operators to enter hazardous areas or climb ladders to check



"Total savings were far beyond the direct cost savings of a 'no wires' installation." Harcros Chemicals' Lloyd Hale on the company's use of Fisher wireless valve position monitors.

the valves' state or position," explains Emerson's Terry Buzbee, president of Fisher. "Searching for an easier, safer way to monitor valve performance, the managers

at the Harcros site installed the new Fisher 4320 wireless position monitors."

"Most process plants have situations similar to Harcros Chemicals," Buzbee says. "They might have hundreds or even thousands of valves that are not connected to the control system because of high wiring costs. These valves therefore provide no feedback on their actual positions, even though incorrectly positioned valves represent a significant cause of safety-related incidents."

According to Lloyd Hale, director of manufacturing at Harcros, the facility has documented numerous benefits from the wireless instrument applications, and total savings were far beyond the direct cost reductions of a "no wires" installation. Sample and drain valves, for example, are opened and purged before and after each batch. Some product could be released or leaked during this process, and a new batch begins every eight to 16 hours. "Adding 22 wireless position monitors to these isolated valves enabled Harcros personnel to identify inadvertent emissions before they could result in costly fines or delays," Hale says. "Downtime, rework, clean-up and disposal can cost the facility up to \$25,000 per incident. The wireless monitor units helped us avoid three such incidents, saving at least \$75,000, not including fines."

"Besides applying the Fisher wireless position monitors to more of our manual valves," Hale adds, "we are considering Emerson Smart Wireless technology for tank-level management, rail-car monitoring and a host of temperature, pressure and flow applications at our Kansas City site."

AVOIDING SAFETY INCIDENTS, DOWNTIME

Wireless is helping to improve plant work practices and reduce undesirable outcomes such as safety incidents and process downtime. On the safety side, elimination of routine monitoring tasks has reduced the need for personnel to visit inconvenient and potentially hazardous areas. Meanwhile, access to equipment status and diagnostic information is helping manufacturers to avoid accidental emissions and to redesign their maintenance practices around predictive rather than reactive strategies.

Samarco, one of the world’s largest exporters of iron ore pellets, has seen a 12% increase in production at its Germano Mine in Mariana, Brazil, through the application of wireless technology to improve plant availability and protect key assets. Wireless flow and pressure transmitters are used to monitor the seal-water injection system of a dozen centrifugal pumps that remove reject material during the iron ore refining process. Fresh water is constantly injected into the operating pumps to prevent the highly abrasive reject material from coming into contact with and damaging pump shafts.

Operators now can easily review flow and pressure

“We needed a very flexible network architecture that is easy to modify, develop and expand.” Chematur Engineering’s John Selinder is shown with a portion of the company’s new Biostil bioethanol pilot plant, which features the latest automation technology from Emerson, including Wi-Fi, WirelessHART and Foundation fieldbus communications.



data through Emerson’s AMS Suite predictive maintenance software, looking for trends that indicate problems and adjusting the process or scheduling preventative maintenance before asset damage or plant stoppages occur.

“We can better protect our pumps from damage because we’re now able to identify potential faults in the pump seals,” said Luis Carlos, technician at the mine. “We avoid reactive maintenance and plant shutdowns. We’re also able to see how much clean water we’re using in the process.”

THE FLEXIBILITY TO EXPERIMENT

Perhaps the greatest appeal of wireless from a work process perspective lies not in its ability to accommodate new ways of doing things, but in its inherent flexibility to accommodate constant experimentation and innovation—again with minimal risk.

At Chematur Engineering’s pilot ethanol processing plant at Karlskoga, near Stockholm, Sweden, flexibility is core to the company’s use of Smart Wireless technology in its “Biostil” demonstration unit. Because the layout and function of the pilot plant is intended to be modified over time, as improvements in the Biostil process take place, it was essential that the network architecture be very flexible.

“We aimed to show that Chematur Engineering is at the forefront of process plant design by implementing the most advanced process automation technology available,” explains Johan Selinder, manager, electrical & control design, Chematur Engineering AB. “At the same time we needed a very flexible network architecture that is easy to modify, develop and expand.”

The pilot plant features the very latest automation technology from Emerson, including its DeltaV digital automation system, open-standard WirelessHART products as part of Smart Wireless solutions for field instrumentation, Smart Wireless solutions for plant-wide operations based on Wi-Fi networking, and a broad range of Foundation fieldbus intelligent devices. The DeltaV system enables the entire plant to be controlled from a single operator station.

“Hands-on experience helped us get an understanding of where wireless technology can be successfully applied,” says Selinder. “Currently we see the benefits in monitoring applications accessing data from remote or difficult to reach parts of the plant. Installing cabling in these places can be cost-prohibitive, especially if there are just one or two instruments to be connected.”

“A plant-wide wireless network offers enormous benefits by bringing the control room out into the plant,” adds Selinder. “This kind of power in the hands of operators produces much greater worker efficiency. Of course you still need a central control room, but for maintenance and especially during commissioning and start-up phases, it becomes an excellent tool.” »

Don't Build Your Next Plant Without It

Wireless earns its place as essential capital project infrastructure.

THE CASE for implementing wireless in existing facilities has been well made and has justified thousands of applications in process plants worldwide over the past several years. If a few incremental measurement points are needed, and you can avoid running new conduit or armored cable to the field; if you can avoid the need to add new cabinet space; if you can avoid the need to expand I/O capacity—installed cost per incremental measurement point can be reduced by an order of magnitude using wireless instrument networks.

But for a significant capital project—a new greenfield unit or a significant brownfield expansion—the wireless value proposition may not seem as clear cut. Few would propose to eliminate wires altogether in a new process plant, so if some number of wires must still be run, when does it make sense to install a parallel wireless infrastructure as well?

Increasingly, the answer is “all the time.” And not primarily because of installed cost savings either.

Rather, it's the forward-looking flexibility of wireless that allows the addition of measurement points and the change and evolution of control strategies and work practices that has earned wireless a place alongside fieldbus and traditional point-to-point hardwiring in the preferred mix of process automation network technologies for capital projects.

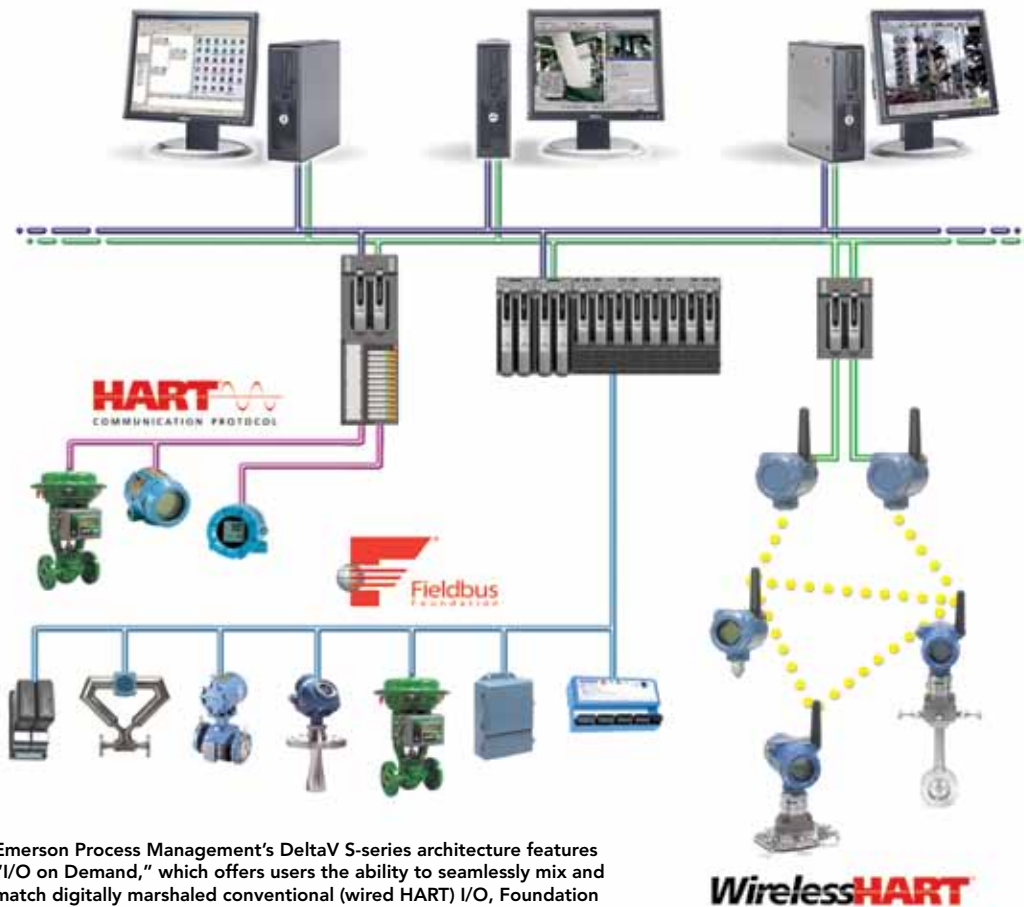
Two recently updated cost analyses performed by Emerson Process Management—one for a greenfield aromatics plant and the other for a newly constructed offshore production platform—readily demonstrate why wireless earns a place in the project engineer's portfolio.

WIRELESS VS. CONVENTIONAL HARDWIRING

In the first study, a head-to-head comparison of conventional 4-20mA hardwiring against a mixed of conventional wiring (for control signals) and WirelessHART (for most monitoring signals) yielded a total installed instrumentation cost savings of 16%. In total, 44% of



Today's wireless instrumentation technology can trim control system installation costs on a new offshore platform by up to 7%, or \$1.4 million USD. (Photo © StatoilHydro.)



Emerson Process Management's DeltaV S-series architecture features "I/O on Demand," which offers users the ability to seamlessly mix and match digitally marshaled conventional (wired HART) I/O, Foundation fieldbus and WirelessHART networks.

the measurement points for this greenfield aromatics plant were deemed suitable for wireless, according to Dan Daugherty, fieldbus and wireless consultant with Emerson Process Management and study author.

Further analysis showed that if the current state-of-the-art in wireless multi-point temperature transmitters (TMUX)—which each can wirelessly communicate up to four individual temperature measurements—are used rather than individual temperature transmitters, instrumentation installed cost savings jumped to 36% relative to conventional hard-wiring.

In a second Emerson study for a manned offshore platform, a more conservative set of assumptions resulted in only 17% of measurement signals being deemed suitable for wireless. Still, this more limited use of wireless shaved 5 to 7% from installed costs for the *entire* platform control system—a total of \$1 to \$1.4 million USD.

Considering only the measurement points on which wireless was used, installed savings relative to hard-wiring were 40%, says Emerson's David Newman, global oil and gas marketing director and study author. Further, wireless saved up to 129 square meters of platform deck

space that would otherwise be needed for cabling, cable trays, junction boxes and cabinets, Newman says.

WIRELESS VS. FIELDBUS

When Foundation fieldbus is added to the communication mix, wireless is no longer necessarily the clear winner based purely on initial installed costs, with considerations and assumptions becoming more subtle.

In the aromatics plant study, for example, total installed cost for a full fieldbus implementation was calculated to be marginally *less* expensive (2%) than with wireless. This result was due to the relatively large number of temperature measurement points in the project, combined with the current availability of 8-point fieldbus TMUX versus only 4-point TMUX available with wireless. Together, these considerations tip installation economics in the favor of fieldbus.

In the case of the offshore platform analysis, temperature multiplexers were not considered in the design in order to eliminate the possibility of common-cause failure of multiple temperature measurement points. As a result, adding Foundation fieldbus to the mix did not result in lower installed costs.

WEB SEMINAR SERIES EXPLORES WIRELESS APPLICATIONS AND LATEST I/O ADVANCES

A new series of web seminars developed by Emerson Process Management shows how digital technologies—including wireless and electronic marshalling—can help industrial end users to maximize output and reduce costs.

The series runs March 2010 to May 2010. Each seminar is in English and is repeated on consecutive days to accommodate multiple locations and time zones. For more information, follow the link at EmersonProcess.com/SmartWireless.

The 45-minute web seminars will profile typical applications based on existing installations to demonstrate how digital technologies such as wireless can improve plant efficiency, increase the effectiveness of operations and maintenance staff, and improve awareness of impending

WEB SEMINAR SERIES SCHEDULE

| | |
|---------------|--|
| March 1 & 2 | "Improving Production with Wireless" |
| March 15 & 16 | "More Reliability and Less Maintenance with Wireless" |
| March 29 & 30 | "Wireless in Projects: A faster, cheaper, manageable infrastructure" |
| April 12 & 13 | "Doing More with Less with Wireless" |

ing process incidents and upsets. Tailored to the needs and interests of plant management as well as projects, operations, and maintenance personnel across the process industries, the seminars will be fully interactive, enabling participants to pose questions directly to the presenters during the event. Visit EmersonProcess.com/SmartWireless to register.

"The conclusion drawn is that a wireless installation will be lower in cost than fieldbus in every monitoring area other than multi-point temperature transmitters," explains Daugherty. "Ultimately, however, wireless will also have an 8-point TMUX," he adds, "and the Foundation fieldbus advantage over wireless will disappear."

COST-EFFECTIVE OVER SHORT DISTANCES

And while both studies confirmed the intuitive conclusion that the longer the wires eliminated, the bigger the wireless savings, they also demonstrated that significant savings are possible even when distances are short.

"Wireless need not be restricted to scenarios where it is cost prohibitive or impossible to use wires."

—Dan Daugherty, wireless and fieldbus consultant,
Emerson Process Management

Because conduit (or cable tray) and the labor to install it, as well as the wiring terminations between the local junction box and the device, are the greatest differential cost contributors, even when average wire length is extrapolated to zero there is a savings with wireless.

"The studies indicate that wireless technology need not be restricted to the limited number of scenarios

where it is cost-prohibitive or impossible to deploy wired technology, nor is it only cost-effective in long-distance applications," says Daugherty.

WHY NOT WIRELESS?

Both of the analyses cited above are based on the relatively conservative application of wireless instrument technology, which continues to rapidly evolve in scope and capabilities.

Indeed, recent innovations such as Emerson Process Management's fully redundant wireless infrastructure components and WirelessHART-capable PID algorithm continue to expand the scope of "wireless-suitable" measurement points to include critical monitoring and even closed-loop control applications.

By now it should be clear that converting some portion of monitoring points over to a wireless infrastructure as part of your next capital project is at worst a breakeven in terms of installed costs—and at best represents a significant savings. But with wireless it's important to realize that any installation cost savings are just the tip of the iceberg compared with its inherent ability to facilitate more flexible manufacturing strategies that will continue to pay off for years to come.

"Having a wireless infrastructure alongside Foundation fieldbus segments is an advantage for incremental addition of new monitoring points," says Daugherty. "There is no adverse effect to the capital expenses bottom line, and there is added value in future maintenance and incremental additions over time."

So, in the end, why *wouldn't* wireless be part of your next capital project? »

Getting a Vision for Smart Wireless Applications is Now a Click Away

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