

Remote Monitoring

Smart Wireless Instrumentation for Offshore Applications

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O&G Offshore operators are continuously on the lookout for ways to reduce capital and operational expenditure in an increasingly fluctuating business environment. With less weight, smaller footprint and enhanced security and reliability, wireless technology provides answers to some of these business challenges and is fast changing the industry's thought patterns. How does one extend the power of predictive intelligence into areas that were previously out of physical or economic reach and open the doors for new possibilities in process improvement? Remote locations, physical obstructions, and the high cost of engineering and integrating new technologies with exiting technologies should no longer be the barriers for this.

Decision makers today have become more comfortable and familiar with wireless technology applications offshore. In the past several years, wireless monitoring instruments have made their way into remote, hard-to-reach areas on offshore platforms where high construction costs made wired devices uneconomical. Though we have to acknowledge that traditional cabling will continue to be used in contiguous areas, as well as in

safety systems, wireless is fast gaining acceptance as a credible solution. Existing offshore facilities are taking greater advantage of wireless benefits, and new construction projects are being built with wireless in mind. This shows that wireless is now seen as capital investment and is a key component in the CAPEX plans. Facilities using reliable and robust wireless technology are realizing savings and becoming smarter through simpler engineering

and construction, flexible startup, faster deployment and project completion.

Today there are several real-world Smart Wireless installations using one-second updates, enhanced PID and battery management based on the IEC 62591 (WirelessHART®) communication standard. These can easily be integrated with existing distributed Control systems using standard communication protocols like Modbus and Ethernet LAN. Full redundancy protects the

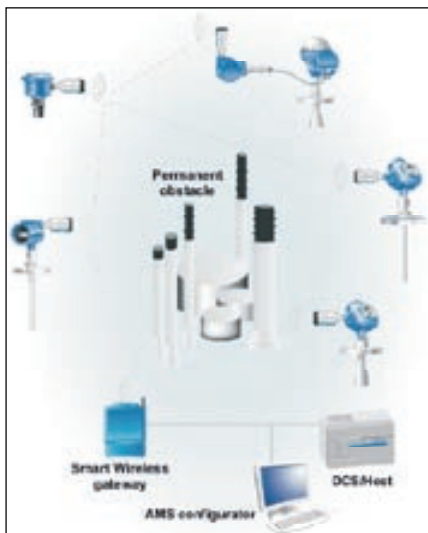


Figure-1 showing robust self-organizing IEC 62591 WirelessHART® mesh network

wireless network from any single point of failure by allowing primary fail-over to failure by allowing primary fail-over to ensure that the data are always delivered even if there is a malfunction. Other enhancements include redundant wireless I/O, power and communications, and a redundant Smart Wireless Remote Link. When offshore operators are planning for the platforms of the future, they're now thinking about a combination of new path breaking concepts like fieldbus, electronic marshalling, and wireless. Those installations who have deployed wireless are finding that wireless can be cost effective, economical, and quickly installed. It's going to prompt a mindset change about the design process with greater awareness of what customers need and what they don't really need. This is leading to paradigm shift from wired to wireless technology.

Evolution of the Smart Wireless Technology

For years, 4-20 mA analog instrumentation was the industry standard. Beginning in the mid-1990s, the search began for a digital replacement, and Foundation fieldbus was developed.

It is now widely used throughout the industry, especially for controls. The first wireless networks were limited by a line of sight requirement - a drawback that was especially cumbersome on offshore platforms. Today's Smart Wireless solution uses a self-organizing mesh technology that overcomes this obstacle. Self-organizing mesh networks continuously monitor transmissions from a variety of measurement devices that keep track of pressure, temperature, flow, pH, conductivity and even position or vibration. The network automatically finds the best communication route back to the network gateway. If a connection is temporarily blocked, signals are rerouted to adjacent wireless devices, and connectivity is maintained.

This mesh technology is the basis for the internationally accepted IEC 62591 standard. It enables users to quickly and easily gain the benefits of wireless technology while maintaining compatibility with existing devices, tools, and systems. With this technology, as you add more devices to the

network, the entire network continues to get stronger and stronger with more potential communication paths for each device to use. This is very important when you think about the ever-changing environments plant instrumentation faces each day - pumps, motors, and fans cycling on and off, scaffolding being erected and torn down, welders, and a whole host of other things happening all the time. With the network's ability to automatically reroute data, we see data reliabilities of more than 99%, regardless of process environment or application.

Impacting the Bottom Line

When Smart Wireless technology is used for 25 percent to 45 percent of total I/O on both small and large capital projects, significant savings can result. An Emerson Process Management study of an actual offshore platform with about 4,000 I/O proves wireless technology can be broadly used in process applications. Instruments would be too expensive or impossible is only limiting the realm of

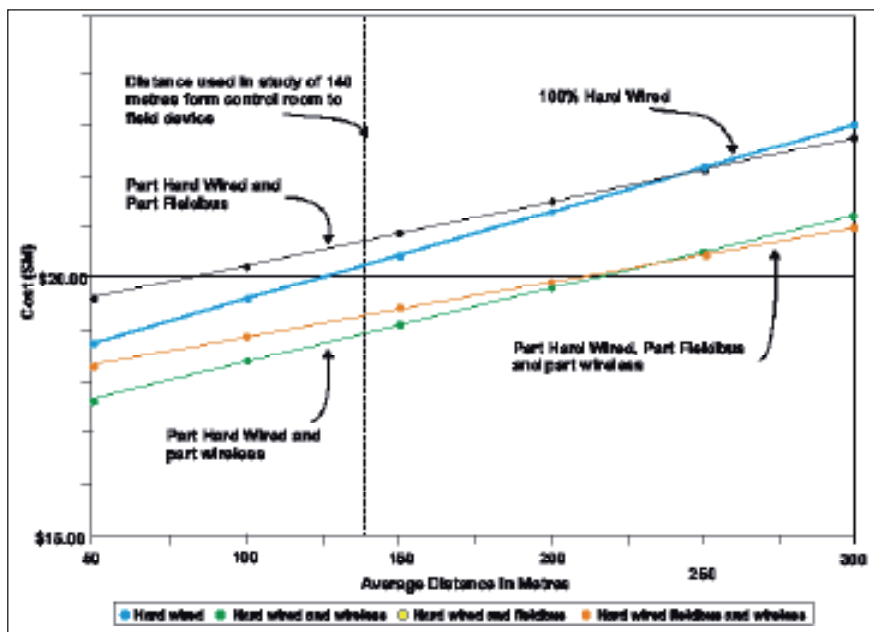


Figure-2 Studies indicate that wireless technology, by itself or in combination with analogous wired technologies, can provide substantial cost savings without increasing risk

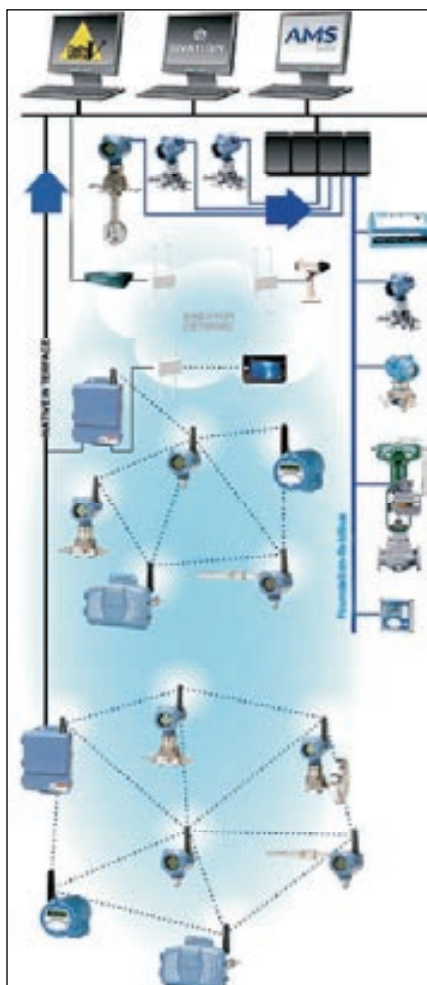


Fig3 - Smart Wireless Technology

actual possibilities.

Examination of various combinations of wired hart, fieldbus, and wireless devices, and the projected installed costs showed wireless to be cost-effective in comparison with the other communications means. For the platform studied, approximately 17 percent of signals were economically and reliably transmitted via wireless devices. In this case, installing wireless along with other technologies in the process control system can realize savings of up to 7 percent, or more than USD 1 Million. An additional saving is seen in eliminating 800 wired points, which results in weight saving of up

to 35 tons, and reduces required deck space of up to 4,556 sq. ft. in cabling, cable trays, junction boxes, and cabinets. When another study compared wireless to the traditional hardwired 4-20 mA/hart design, the savings were even more significant. They found 44 percent of the total points can be wireless, which would result in a savings of 36 percent.

Scalable Solutions Fit a Variety of Needs

The Smart Wireless technology can be adapted seamlessly to cover anything from a small field network to a full facility complex. Smart Wireless is neither a top-down nor bottom-up model. One can begin at the plant network level and work down to the field, or at the field network and work up. One can start anywhere based on what the highest priority needs are. You are not required to invest in an expensive wireless infrastructure throughout the facility to try out a simple monitoring application. Field and facility networks have different technical considerations. Wireless field networks use lower bandwidth for short, high-priority communications. Operating from batteries that last from five to 10 years, the field networks (usually many devices distributed in harsh environments) have low power demands and are secure and reliable. For facilities, Smart Wireless brings the high bandwidth, flexibility, and expansion capabilities required for business and operational applications. Open standards such as 802.11 (Wi-Fi) are used to provide these solutions. Top applications for facility networks include field data backhaul, mobile workers, video and safety mustering and asset tracking.

Field data backhaul is the most common wireless application. If a number of wireless field devices are in a remote area of the facility and there is no Distributed Control System (DCS)

rack room, a communications link (or backhaul) is installed to bring the information back to the DCS. The other three applications affect personnel and security. The business driver for the mobile worker application is worker productivity. Improvements are realized when operations and maintenance workers are able to take the control room console with them or have access to asset management tools or procedures for troubleshooting problems. Video surveillance is widely implemented as part of facility process safety and security systems. The traditional wired system is costly and takes a long time to deploy. Using wireless networks, video feeds can be delivered to the control room and office buildings with flexibility not possible with a wired solution. Video has many practical uses offshore.

One operator faced corrosion issues in its Floating Production, Storage and Offloading [FPSO] storage tanks. When they tried to determine how they were going to monitor it, wireless video cameras were the obvious answer. Also, using video conferencing with personnel on the platform has limited the travel and location risks. Safety mustering and asset tracking improve personnel safety, enhance facility security, and optimize the use of critical assets in a harsh environment. People's safety is the highest priority, providing full visibility to people's locations in hazardous areas or mustering stations is extremely critical to an efficient evacuation in case of emergency.

Technology Designed With the Customer in Mind

'Make it easy to use' was a motto during the entire product development process of the Smart Wireless technology. Customers today do not have the resources or the time to learn new technologies and buy special interfaces

and software. Plus, with Smart Wireless, you don't have to run cables to every device, making installation much simpler than for wired networks. In fact, the major attraction of this technology is that you don't have to deal with the complexity of all those wires. Because the Smart Wireless devices have the same process connections as traditional wired HART devices, existing procedures can be used to complete the installation. Sensors for Smart Wireless can be calibrated using the same configuration tools as for traditional HART devices. Sophisticated planning and costly site surveys are not necessary for field networks. As long as each device or gateway is within range of at least one other, it can communicate with the network. Site surveys are a must to define line-of-sight communication paths in traditional point-to-point wireless solutions or those where network reliability is a concern. These surveys can be time-consuming, especially if equipment or other obstacles limit available communication paths.

Adapting Legacy Systems for Wireless Use

Emerson Process Management has developed a unique product called the Smart Wireless THUM™ Adapter that helps free up diagnostics and process information from existing HART field instruments that were previously inaccessible in wired legacy system installations. Most HART instruments have rich diagnostics and process data, yet this valuable information goes unused because older legacy systems are not equipped to receive HART communications.

Since it is often too expensive and complicated to access this data through traditional wired means, upgrading transmitters with the THUM Adapter is an easy and cost effective way to 'see' the valuable diagnostic and process

information. The THUM Adapter is a WirelessHART device that can retrofit onto almost any two- or four-wire HART device without special power requirements to enable wireless transmission of measurement and diagnostic information. Devices with the THUM Adapter operate as components of Emerson's Smart Wireless self-organizing field networks.

Predictive Intelligence Expanding

- Tapping the power of in-situ meter verification for Magnetic flowmeters and Coriolis meters, enabling significant operational improvements
- Enabling enhanced valve capabilities with in-service valve testing, alert monitoring, and valve position trending
- Remotely managing devices and monitoring health by allowing customers to troubleshoot HART devices from their own desks
- Making any HART device wireless and eliminating the high cost of loop wiring due to remote locations or physical obstructions
- Efficiently gathering data from multivariable devices.

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.

So, in the end, our question to the Offshore O&G producers is: Why wouldn't Smart Wireless be part of your next capital project? ■



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