

Plant safety can be improved by making available important information to the relevant crew members at the right time. Smart sensing in this regard can improve the situational awareness of plant staff and as such improve operational effectiveness and safety. By [Jonas Berge](#), director of Applied Technology, Emerson Process Management

Smart Sensing:

Situational Awareness

We sometimes read about plant disasters in the news, and every so often the cause has been a manual valve which was believed to be closed but was actually open. The information did not get passed on to the new shift crew at the shift change. Had they known the valve was open, had they had that crucial piece of information, the disaster might not have happened. We tell ourselves 'had I only known,' and we also say hindsight is 20/20.

WirelessHART technology provides a way to add important measurements and feedback to the operators to improve situational awareness. As such, enabling them to make better informed decisions based on actual information rather than having to deduce

or infer information from other variables. Transmitters using this technology can easily be installed in older plants.

Heightened Situational Awareness

IEC 62591 (WirelessHART) is the international standard for wireless in process applications. It is already being used in many maintenance-related application such as monitoring the health of heat exchangers, blowers, fin fan coolers, process pumps, valves, and other assets as well as reducing operator rounds.

The standard is also used to help improve operations providing new visibility for operators. This will enable them to make process adjustments that can extend asset

life, reduce energy consumption, and improve personnel safety.

For example, pump cavitation that goes unnoticed will lead to pump damage that causes unscheduled downtime and requires costly repair or replacement. Plant operators that are not aware when a pump is cavitating will not do anything about it.

To avoid this problem, a pressure transmitter can be installed to measure pump discharge pressure. Essential asset monitoring software calculates and monitors the standard deviation of this measurement to detect the early signs before pump cavitation.

Additionally, a vibration transmitter with PeakVue vibration

acceleration detection is useful for isolating developing faults before there is any significant increase in overall vibration velocity.

With a pump monitoring solution based on these tools, operators can get an early warning of the problem. This will enable them to make the necessary process adjustments to prevent problems from occurring, as such ensuring longer life of the pump and reduced downtime.

Consider the case of fans used in cooling towers. In cases where excessive cooling tower capacity is available, it is sometimes possible to meet cooling demands even with one or more fans shutdown to reduce power consumption. However, operators are often reluctant to shut down fixed-speed fans because they have no visibility of how many of the cells are needed. Nor do they know what speed to set for the variable speed fans to provide sufficient cooling.

In this situation, transmitters can be used to provide the inputs to essential asset management software that analyses the cooling tower efficiency. It also gives the operators visibility of the cooling efficiency and heat load on the cells. Software will suggest which fixed speed fans operators

can shut down, or the optimal speed setting to balance the load across variable speed fans. The objective is to provide sufficient cooling while minimising power consumption, as such reducing energy cost.

A third example relates to personnel safety. In the event chemicals splash onto a person in the field, the worker will seek one of the safety shower and eyewash stations. The person may not be able to radio for help at the same time. As such other personnel are unaware and cannot come to the person's assistance.

By fitting discrete transmitters onto the safety shower and eyewash stations, operators in the control room can be made aware as soon as the stations are activated. They can then call on first responders to assist the person in distress, as such reducing the time to respond.

Fourth, remote sites such as unmanned offshore platforms or well pads often have no monitoring or automation for the well heads because no power is available at site. Therefore, operators at central operations do not know which wells are producing and which ones are not without traveling to the remote locations. This happens very infrequently because of the time, cost, and sometimes hazards involved in making such a trip.

Similarly, operators of sites with injection wells for water and chemicals or gas lift and water wash for Enhanced Oil Recovery (EOR) typically have no visibility into how much injection is increasing production. They can therefore cannot optimise the injection process to improve results and reduce costs.

However, installing pressure, differential pressure, and temperature transmitters on each wellhead can enable operators to monitor production and injection

from a central location. Awareness of which wells are producing and which ones are not, and how the production changes as a result of injections, allows optimisation of production and reduction of cost. Several other measurements are possible, such as choke valve position or well casing pressure to detect leaks as well as monitoring of separators and storage tanks.

Finally, operators typically cannot be sure of the actual position of manual valves without going to the field to verify if the valve is opened or closed. An experienced operator can sometimes tell from other process measurements whether a valve is opened or closed, but an inexperienced operator may not.

Occasionally mistakes or accidents may happen because some valve is in the wrong position. But by mounting position feedback transmitters on important valves, actual position feedback can be provided to the operators so they can know for sure what the position is.

In short, WirelessHART technology offers a number of ways to increase situational awareness so that operators can make more-informed decisions.

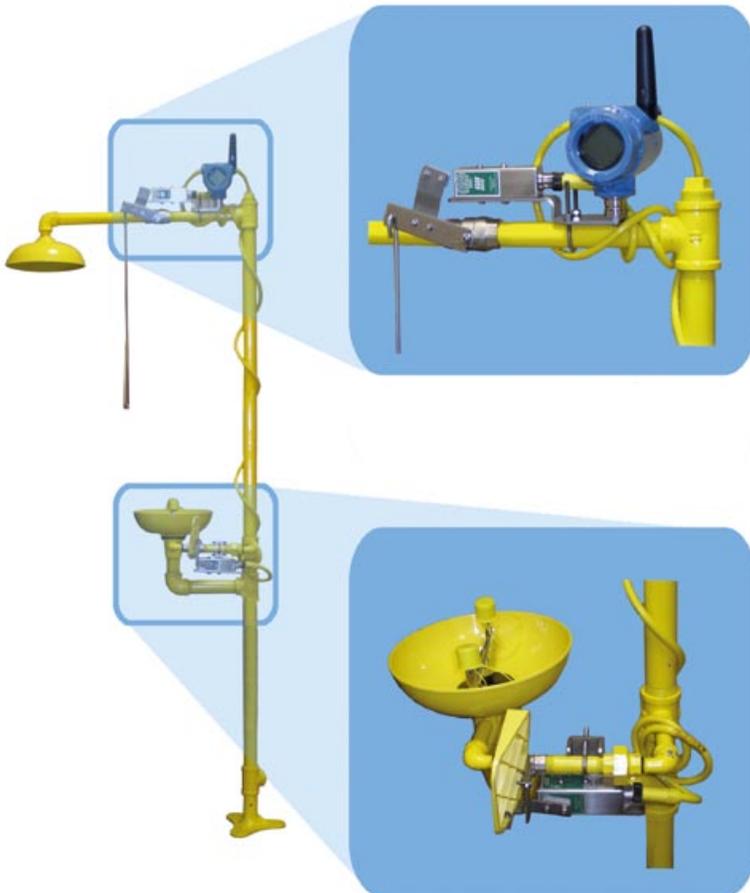
Fits On Any System

Gaining these benefits of WirelessHART typically involves integrating the information they provide with control systems. That is especially true in large-scale plants and fields that can approach 1,000 wireless transmitters.

But what if the existing control system does not offer native WirelessHART support? It still makes sense to manage these smart sensors plant-wide from intelligent device management software in an asset management system. How can users get the information to where it is needed for that to happen?



WirelessHART vibration transmitter.



WirelessHART discrete transmitters on safety shower and eyewash station.

Fortunately, Modbus/RTU, Modbus/TCP, OPC, and the HART-IP protocol can enable integration of process variables. They can also enable all setup and diagnostics information from WirelessHART transmitters into any system.

Process Variable Integration

Process variables from the transmitters can be used in control systems like a Distributed Control System (DCS), Programmable Logic Controller (PLC), or Remote Terminal Unit (RTU). They can also be used directly in software such as a Human Machine Interface (HMI) or for asset monitoring, machinery health monitoring, or a historian. Since there are many ways to get process variable data from the gateway, no system is too old to accept such data.

One method is to use RS485 network cabling to integrate the gateways with a host system having a serial interface card that supports the Modbus/RTU protocol. Multiple gateways can be connected to the same RS485 network for plant-wide applications. This is the most common way to bring in the standards signals on older control systems.

The process variables and status desired from each transmitter are selected in the gateway. Import and export functions enable faster bulk edit and faster system configuration.

Ethernet provides a second option. It supports multiple protocols in parallel on the same port for integration of the gateways with host systems having an Ethernet interface

card. Multiple gateways can be connected to the same Ethernet for plant-wide applications. For instance, they can interface to systems supporting the Modbus/TCP protocol. This is the most common way on modern control systems.

The Ethernet ports on the gateway can also be used to interface to systems supporting the EtherNet/IP protocol, for instance some PLCs.

OPC-DA is a third protocol option. OPC is a protocol between software applications. OPC proxy/server software on a workstation communicates with the gateway and makes data available to any OPC-DA clients such as HMI software or a system database.

Intelligent Device Management Integration

The transmitters can be managed from intelligent device management software for daily maintenance and turnaround planning. There are two aspects to doing this: Getting the information from the device to the software, and then displaying or using the information (especially if devices are from different manufacturers) within the software.

The same handheld field communicator used for 4-20 mA/HART and Foundation fieldbus devices can be used to configure and check the health of transmitters. But for installations with lots of transmitters, centralised monitoring is more practical. Modbus, EtherNet/IP, and OPC-DA are suited for process variables, but do not support intelligent device management software.

The HART-IP protocol provides the ability to access all the configuration and diagnostics information in the transmitters, beyond the process variable, from intelligent device management software on third-party systems.

The HART-IP protocol uses the same Ethernet cable as Modbus/TCP, EtherNet/IP, and OPC-DA. It also uses the same standard commands as 4-20 mA/HART and WirelessHART and therefore requires no data mapping in the gateway or in the software. This makes it easy to manage the vast amount of configuration settings even for huge numbers of transmitters.

There are two ways to graphically display device setup and diagnostics data in the intelligent device management software: Electronic Device Description Language (EDDL) and Field Device Tool/Device Type Manager (FDT/DTM).

For IDM software based on the EDDL device integration technology, the EDDL file for each device type is simply loaded. It therefore enables the IDM software to access all the information in the transmitters through the gateway over HART-IP.

For IDM software based on FDT/DTM device integration technology, a commDTM and gatewayDTM can be installed for the gateway as well as a deviceDTM for each device type. As such, it enables the IDM software to access all the information in the transmitters through the gateway over HART-IP.

Putting The Technology To Work

Transmitters for flow, level, valve position, pH, conductivity, vibration, temperature, pressure, and acoustic as well as level switch and input for on/off contacts are now available to provide operators with visibility where there was none before. These are usually applications beyond the P&ID.

Thanks to WirelessHART gateways, plants with systems lacking native support for

WirelessHART are still able to benefit from the capabilities that this technology brings. The result is lower maintenance cost, energy savings and increased production.

A good way to start modernising the plant is by conducting an

audit of the plant assets and current work practices to identify the opportunities where asset and process monitoring should be added. 

ENQUIRY NO. 4502



Memory Trouble?

ifm electronic's IO-Link compatible Memory Plug is the ideal way to store & or copy parameter data. Making it ideal for OEM's who need stored data to be transferred to multiple sensors of the same type, or when exchanging a defective unit.

The memory plug reads & stores the data from a connected IO-Link sensor. If the user then connects another sensor of the same type, the data record stored in the memory plug is immediately copied onto the new sensor... No more errors re-setting parameters! Sound interesting? Inquire to info.sea@ifm.com

Our local SE, Asia sales & services teams look forward to serving you.

ifm electronic - close to you!

www.ifm.com

ENQUIRY NO. 583