Information Bulletin

Instrumentation

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Wireless Instrumentation

Why do I need wireless instrumentation?

Wireless instruments will not replace those in traditional wired (4 to 20 mA or fieldbus) installations but, in many ways, they complement traditional versions by offering an economical solution for difficult applications.

Initial applications of wireless instrumentation will be for monitoring processes and managing assets. Some time in the future, wireless instrumentation may be used in control applications but this will require modification to PID algorithms, appropriate risk analysis and good, fail-safe design practices.

Select wireless instrumentation if you need to:

- Monitor instrument condition remotely
- Re-range or carry out instrument configuration changes remotely
- Monitor process data that has been uneconomical to measure in the past
- Monitor process data over a short term to solve process problems

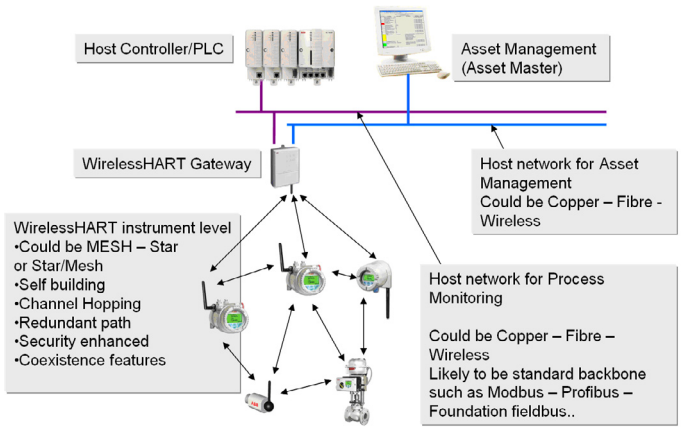

Fig. 1 Typical wireless network

ABB Limited
Howard Road, St. Neots
Cambridgeshire
PE19 8EU
UK
Tel: +44 (0)1480 475321
Fax: +44 (0)1480 217948

Low cost installation

With a self-powered wireless instrument there are no wires running from the host system to the final instrument. The cost saving is not just in the cable costs but all the associated effort required (running cable, drilling holes, work permits etc.). A wireless instrument enables you to monitor process data that, previously, was considered uneconomical.

Application

- Solve process problems (for example, blockages in heat exchangers) by adding low-cost temporary measurements.
- Reduce installation costs for remote parts of plant (for example, on Tank Farms).
- Automate manual data logging routines by adding wireless access.

Low risk upgrade

Adding a wireless adaptor to an existing field instrument (plug into spare gland or junction box) provides a separate wireless network to monitor the instrument remotely. The alternative would be to alter existing wiring and install a HART multiplexing device.

Application

- Monitor valve-position feedback and compare it to the set point sent to a positioner via a 4 to 20 mA control signal. This information enables you to monitor the valve and positioner status.
- A pressure transmitter often continues to read the process value even when the 4 to 20 mA signal is out of range. Using the HART signal via the adaptor enables you to continue to monitor the process value.
- Provide a separate network to up/download instrument configuration changes (range change) from a remote station.

Fig. 2 Wireless adapter

Reduced configuration time

With wireless instruments, access to the device configuration parameters is no longer solely available to a handheld unit that requires a technician to go to a wiring location on the loop to make the changes. Wireless provides a single connection point, via a gateway, that enables a device management application to access and configure any of the wireless devices.

Application

- Re-range multiple devices to accommodate new process requirements to meet production changes.
- Adjust parameters without incurring the risk of damaging wires or spending time finding or installing loop resistors.
- Verify impact of changes, not only to the device but to the process, by monitoring other device parameters at the same time. As an example, you can change the integral factor of a positioner PID loop and see the effect it has on the flow loop control from the flow transmitter.

Improved production

Because wireless technology taps into instruments to provide access to all of the intelligent information, it's now possible for an asset management system to receive and notify users of any device-generated alert. In many cases, these alerts can prevent unplanned downtime or outages and they lead to faster problem diagnosis.

Application

- A pressure transmitter rated for 60° C (140° F) is installed in the desert without any environmental air conditioning. The ambient temperature measures 63° C (145° F) and stays at this level for 6 hours each day during the summer. Over time, high temperatures degrade the life span of the electronics and the pressure transmitter is programmed to be aware of this. Accordingly, the transmitter generates an alert that the ambient temperature has exceeded operating limits for an excessive period and that the sensor should be replaced **before** it experiences problems.
- A pH analyzer is generating perfectly acceptable and constant pH values. In fact they're too good because the pH transmitter is programmed to sense when the pH probe is fouled and alert the operator that the sensor must be cleared of the fouling material long before the normal maintenance schedule requires the sensor to be replaced.
- A flow transmitter is generating a signal within the normal operating range of the process but it's much lower than normal. The operator is confused by this and is unsure if the flow has actually decreased or if there is a measurement problem. However, the flowmeter is programmed to sense electrode faults and alert the operator to repair or replace the electrode or flowmeter.

Improved maintenance

Because wireless technology is more economical to install, the ability to tap into a process on a temporary basis makes it pragmatic for monitoring operations where unforeseen problems have occurred that require more information to diagnose the cause.

Application

- Batch control based projects tend to evolve towards the commissioning phase as each batch project is likely to be different to another. Consequently, the final control solution may not match the initial control design and, as a result, requires modifications to instrumentation. A wireless approach enables installation of monitoring instruments where any spare cable capacity has been used.
- A reactor is not performing to its normal yield output and there is concern that there is a hot spot in it that is creating an undesirable temperature gradient. Even though the reactor was designed for monitoring the temperature, the signals were never wired into a control system. Temporarily adding wireless transmitters enables these signals to be monitored remotely to determine if such a gradient exists to help determine the cause. Once the problem is determined, the transmitters can be removed and used in other areas of the plant.

Conclusion

A wireless network offers a low-cost way to monitor process conditions and manage assets in the field. This document has suggested a few applications for both a self-powered (battery) instrument and an upgraded (via an adapter), loop-powered instrument. There are certainly more potential applications as wireless extends the opportunities for HART-powered instruments. With WirelessHART devices becoming available from ABB (and others) you can start to plan projects to take advantage of this flexible and low-cost technology.

It may be that you decide to run a small trial at your site by adding adapters to existing instruments. This provides a low-cost, low-risk solution that would give you valuable experience of wireless technology and the benefits it can provide.

USA

ABB Inc.
125 E. County Line Road
Warminster
PA 18974
USA
Tel:+1 215 674 6000
Fax:+1 215 674 7183

Germany

ABB Automation Products GmbH
Borsigstr. 2
63755 Alzenau
Deutschland
Tel:+49 800 1 11 44 11
Fax:+49 800 1 11 44 22

UK

ABB Limited
Howard Road, St. Neots
Cambridgeshire
PE19 8EU
UK
Tel:+44 (0)1480 475321
Fax:+44 (0)1480 217948

Italy

ABB SACE
a division of ABB S. p. A.
Via Statale 113
22016 Lenno (CO)
Italy
Tel:+39 0344 58111
Fax:+39 0344 56278

China

ABB (China) Ltd.
35th Floor Raffles City
(Office Tower)
268 Xizang Zhong Lu
Shanghai, 200001
Tel:+86 21 61228888
Fax:+86 21 61228892