

## Accessing stranded diagnostics

15 minutes

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### Overview

Most process plants have valuable diagnostic information "stranded" in instruments throughout the operation – information that could help improve the business.

This information is available from instruments using **HART** communication technology. HART is the most widely-used communication protocol for process instrumentation, with more than 20 million devices installed since the technology was introduced in the late 1980s.

This broad use of HART devices isn't surprising when you consider the potential benefits, including

- Compatibility with existing 4-20mA wiring
- Simpler setup, calibration, and commissioning
- Improved reliability and performance
- On-board equipment diagnostics

The first three benefits are easy to recognize and take advantage of. But diagnostics are a *hidden* capability that often goes unused. In effect, this valuable information is left stranded in the device. As a result, plants often miss out on the opportunities that diagnostics offer for reducing maintenance costs and improving equipment performance.

This course addresses the benefits of HART-based diagnostics, the reasons many plants don't take advantage of them, and how wireless technology can remove those barriers.



## Hint

As you go through the topics in this course, watch for answers to these questions:

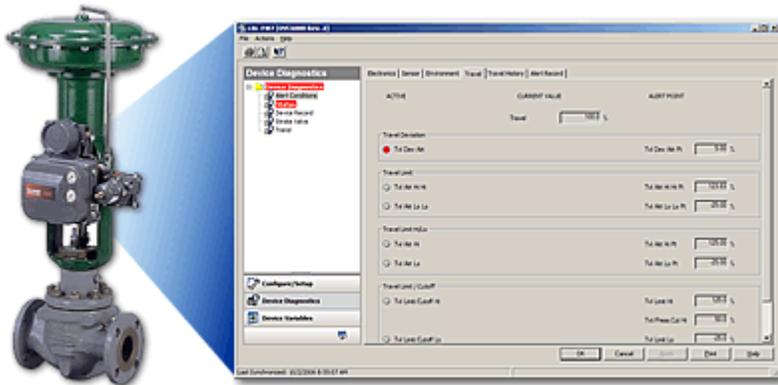
- What is the most unused capability of HART devices?
- What wiring and infrastructure changes are needed to access diagnostics in a wired network?
- How does diagnostic data get from a device to a wireless network?
- What advantages does a wireless network offer in accessing stranded diagnostics compared to multiplexers?

Next: **HART diagnostics**

## HART diagnostics

Any device failure or degraded performance can have a negative safety, environmental, or financial impact. Diagnostics help you detect or even predict such problems – reducing downtime and the cost of reactive maintenance.

In their simplest form, HART diagnostics provide basic alerts and alarms such as high/low limit alarms or valve travel deviation.



HART diagnostics provide the capability to evaluate the health of instruments and equipment such as this control valve.

In their most advanced form, instrument diagnostics use data from sensors, instruments, and the surrounding environment to provide detailed information – in real time – about the health and performance of the process and equipment.

For example, some advanced diagnostics can detect a plugged impulse line in a pressure transmitter, or identify a leaking piston ring in the actuator cylinder of a control valve assembly.

Such diagnostics can be especially valuable for instruments that require regular repair or “process crucial” devices that are vital to the unit.

So, if diagnostics are so powerful, and most instruments are capable of communicating this information through HART, why isn't every facility using them?

Next: **Barriers to using HART diagnostics**

## Barriers to using HART diagnostics

According to Ron Helson, Executive Director of the HART Communication Foundation, "Of the 20-million-plus HART-enabled devices currently installed around the globe, only 10% are delivering their full diagnostic potential."

Relatively few HART devices actually communicate diagnostic information over a HART network. Instead, barriers to accessing the diagnostic data mean that it remains "stranded" in the device.

Often the primary barrier is an older, legacy control system that doesn't fully support HART communications. Many facilities with such systems have successfully used HART multiplexers, filters, and I/O cards to get the diagnostic information into an online asset management application. But others are reluctant to use these wired options because of constraints that include

- Limited rack room space
- Concerns about breaking existing wiring connections when adding new equipment
- Insufficient funds to buy the hardware needed.

If you don't have the infrastructure to communicate HART data to the control room, a trip to the field may be the only way to get this diagnostic information. With a laptop computer or a HART field communicator, you can physically connect to the valve or transmitter.

This direct access also has drawbacks. A work permit or special clothing may be required in hazardous areas. Permits, procedures, and transportation time all add to the cost of getting to the information.

Now there is an easier way to gain the benefits of HART diagnostics.

Next: **The wireless way**

## The wireless way

As we've seen, the difficulties of accessing diagnostic data cause some plants to leave this information stranded in their HART devices – and miss out on the benefits it offers.

The solution is to create a separate HART data network using **wireless** technology. This network is for HART communication and diagnostic data only – not control. Process control remains with the hard-wired 4-20mA analog signal.

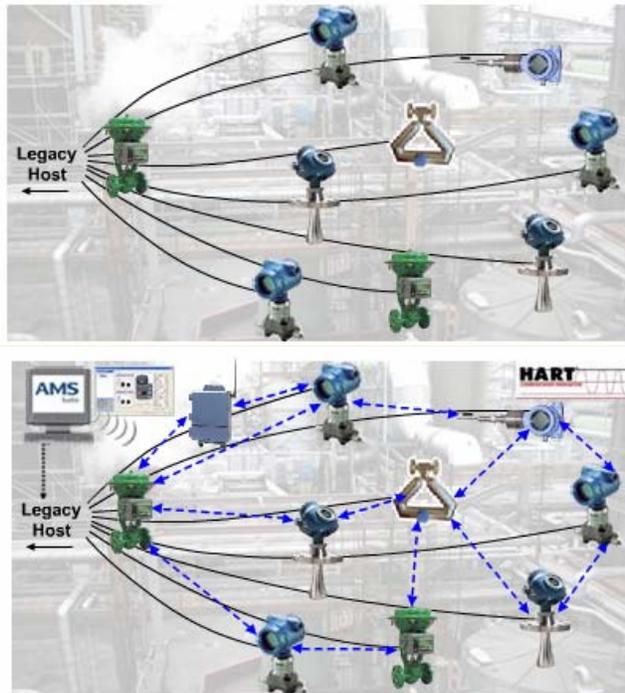
You start by installing an industrialized wireless radio often called a **wireless upgrade module** on existing HART field devices such as transmitters and valves.

The wireless upgrade module, which consists of a radio transmitter, radio receiver, microprocessor, and antenna, plugs into a standard electrical conduit entrance. It connects to the loop wiring and accesses the HART data without affecting the analog control signal.

The radios talk to each other, creating a self-organizing network. If one node in the network fails, communication continues through the others. (*To learn more about how this works, see the course on*

Self-organizing Networks.)

HART data passes through the network to a gateway device. The gateway, like a wired multiplexer, brings data from all the devices together into a central location where you can access the diagnostic information using asset-management software.



Twenty million installed HART devices have "stranded" diagnostics because some older control systems don't support digital HART communications.

The diagnostics can be unlocked by adding a wireless module to each device. The modules communicate with each other to form a self-organizing wireless network.

The wireless HART network for diagnostics can co-exist with the wired analog network that's used for control.

Next: **Adding wireless to existing HART devices**

## Adding wireless to existing HART devices

There are two basic rules to upgrading an existing set of instruments to a wireless network:

1. The devices you want HART diagnostic data from must be HART compatible.
2. Each device on the wireless network must be within transmit and receive range of at least one other device or the network gateway.

Once the appropriate instruments are selected to be part of the wireless network, a wireless upgrade module (which contains the radio) must be connected to each device. This will typically require taking the device out of service temporarily while wires from the upgrade module are attached to the termination strip on the device. This allows the module to "strip" the HART data directly from the device.

As each device is powered up, the self-organizing network will start to take shape. Any new devices that are added to the network will locate their neighbors and begin communicating through them to the gateway – which in turn is connected to a PC running asset-management software. To the software, the data looks like it's coming from a multiplexer.

At that point, the diagnostic information is no longer stranded. Instead, it's easily available to operators, technicians, and others who can use it to monitor, evaluate, and respond to changes in equipment health or status.

Next: **Wireless advantages**

## Wireless advantages

Using a separate wireless network to access HART-based diagnostics offers several benefits.

- It avoids the costs and potential headaches of adapting an existing wired network to extract HART data.

The wireless network is separate from the existing infrastructure of wires, junction boxes, and terminal panels. That means you don't have to rewire (or install) multiplexers. Because the existing wire termination panel remains intact, you reduce the risk of installation problems. In fact, all you have to worry about is installing the wireless devices within range of each other.

- It's easy to pick and choose the instruments you want in your network.

You can base the entire network on existing HART instruments, starting with a small set of critical instruments and adding nodes as the value (and your budget) grows.

Process units are generally populated with clusters of valves and transmitters, so it's easy to create a small network of critical devices.

- The more devices you add to the mesh network, the more robust it becomes. This is due to additional data paths that open up as nodes are added.

For the incremental cost of wireless nodes, gateways, and asset management software, your HART diagnostic data is unleashed so you can improve process performance and make maintenance decisions without costly trips to the field.

Next: **Summary**

## Summary

In this course you learned that wireless technology offers an easy, affordable way to capture the value of diagnostics that would otherwise remain stranded in the millions of HART devices already installed in today's plants.

Key points covered in the course include

- Instrument diagnostics are an often unused benefit of HART technology.
- Capturing this diagnostic data with a legacy control system and traditional wired network can involve additional costs and headaches.
- By adding wireless modules to existing HART devices, you can easily create a separate wireless HART data network to capture diagnostics.
- This network can start with a small set of critical devices and grow as you add nodes (and value).