By Suzanne Gill, Control Engineering Europe

Users of the HART Communication Protocol have known for some time that it will allow them to gain quick, easy visibility to devices in the field. However, these same users may not be aware of many of the benefits offered by today's HART technology.

"The introduction of HART 7 has improved the availability of additional data and diagnostic information from devices," says Charles Larson, Moore Industries. "It has also increased the awareness of users to the wealth of information in HART devices that can be used to increase plant efficiency."

Jim Cobb, Emerson Process Management, notes: "HART 7 brings a number of new capabilities to the HART Protocol. To realize the benefits, the customer will need to have both field devices and a system that support these new features. One important aspect is that with HART 7, devices now have complete multi-variable support, breaking the traditional concept of HART being for only a 4-20mA based, single-measurement device."

Many industry commentators believe that the most significant addition to HART 7 is the 'Report by Exception' feature. Traditionally a 'command and response' system, HART instruments would only transmit values when requested to do so by the host. With the introduction of HART 7, you no longer have to send regular commands from the host to the device. If there is a process or device status change, the device will automatically advise you. Think of the bandwidth savings of this feature!

"The 'smart' updating capability, together with Events reporting provide a much more reliable way for a system to obtain data from a HART field device," Cobb adds. "No longer are they required to poll for data but are proactively sent data only when it is required. This means that data is not lost because of measurement changes that occur in-between polls or Events that happen and return to their original state quickly. The Event reporting includes an acknowledgement mechanism that ensures the system or host receives the message."

Another useful feature provides a great way to analyze and review problems that have occurred. All HART 7-enabled instruments now add a 'time stamp' to any readings sent to the host system. This allows engineers to better track when and possibly why a problem may have occurred.

"Many of the new features enable wireless technology to be more efficient and practical. Report by exception and time stamped data are examples of features that contribute to wireless implementation," says Thomas Holmes, MACTek. "Now a device does not have to be addressed 24/7 by the host if the process measurement is not constantly changing - freeing up host resources.

"This feature allows either a time-based or measurement-based criteria trigger to initiate data publication. The report by exception feature allows the device to report when it sees a change in measurement value greater than a pre-selected value or if the device sees an internal problem. Time stamped data provides a valuable tool when evaluating the sequence of events or analyzing a process problem."

A popular feature of HART 7 is 'Synchronised Sampling', particularly in control applications where it is necessary to determine the order of execution of different elements of the system. Scenarios could include a control program that may need to first read the sensor's value, then execute the PID algorithm, and then send a signal to the valve. Complex gas flow measurements also make good use of this feature, where traditionally, the host system would have to issue separate commands for each part of the sequence. A HART 7-enabled instrument is able to do this itself.

"Devices such as Moore Industries' TCM multichannel temperature concentrator system have multiple channels and can have multiple devices on a single line. The squawk and find device features will be very useful for configuring devices in multi-drop applications," Larson says. "The new sub-device feature will also be useful on our multichannel devices so that their internal data can be more logically organized. Exception-based reporting will improve the responsiveness of multi-drop applications by reducing the data that must be transferred."

Then, of course, there is the *Wireless*HART feature of HART 7 which is interoperable and backward compatible with existing user investments in HART devices, tools and systems. Gerrit Lohmann, Pepperl+Fuchs, says, "*Wireless*HART boosts traditional wired HART, allowing features that were available since HART 5 or HART 6 to move further into focus and become more prominent to end users."

Gareth Johnston, ABB, adds, "Traditional 4-20mA field instruments have been successfully using the HART Protocol to assist during commissioning and scheduled maintenance work for many years. However, some 20 years since HART 5 became available we are still not making the best use of the remote access that HART offers.

"The result is that instrument information remains locked away for the vast majority of users. Adding remote access via a *Wireless*HART upgrade adapter provides the key to unlock this information. The original 4-20mA signal remains intact, but the user is now able to remotely access the instrument to monitor process, maintenance and configuration information."