Wireless Devices Deliver Great Benefits for Temperature Monitoring

Temperature is certainly among the most commonly measured parameters in industry, science, and academia. Recently, the growth of wireless instrumentation technology, along with some clever innovations, has provided new ways to apply temperature measurement sensors combined with personal computers to collect, tabulate, and analyze the data obtained. For complex, multi-sensor applications, wireless devices provide a means to eliminate the nuisance of running multiple leads over long distances through harnesses or conduit to a control room, instrument panel, or equipment rack, while keeping track of which leads are which. For simpler one or two sensor applications, it means installing the wireless sensor, setting up the receiver, and being done.

There are now so many wireless transmitting and receiving devices available for temperature measurement that nearly any application can benefit from their use. In any case, it is certainly worth a closer look. As a bonus, most of the devices discussed below also work with humidity and barometric pressure sensors.

Transmitter Options

The temperature sensors most commonly in use are thermocouples and RTDs (resistance temperature detectors). The various types of transmitting units available will handle nearly any type or model, and, depending on obstructions and other factors that affect transmission, can have ranges of up to 400 feet, so there are not many applications that cannot be addressed.
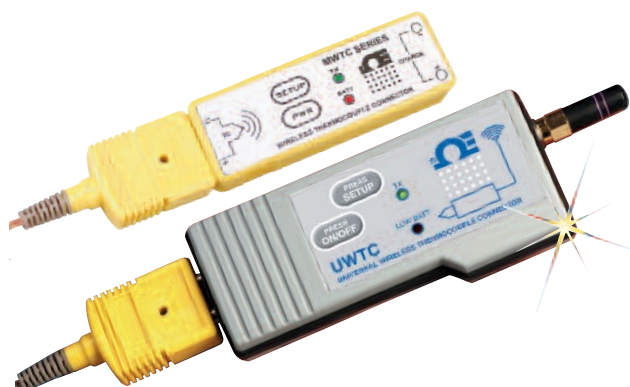

Figure 1 – MWTC and UWTC Wireless Connectors with Thermocouples Attached.

The simplest transmitting devices, like the wireless thermocouple connectors shown in Figure 1 (patents pending by Omega Engineering, Inc., Stamford, CT), accept a plug-in sensor and transmit the data to a receiving device at programmable intervals of 5 seconds to 1 minute. Depending on this sampling rate, battery life can be a year or more. In addition to temperature readings, these units transmit battery status information which help ensure timely battery replacement and prevent unexpected sensor-down situations.

Figure 2 – UWTC NEMA-Enclosed Wireless Transmitter

For outdoor applications or harsh environmental conditions, a wireless NEMA transmitter, as seen in Figure 2, can be used. These devices transmit the same data as those in standard enclosures, but have a much longer battery life (up to 3 years), since they may be installed in remote or difficult to access locations. A weather seal protects the internal sensor connections.

Figure 3 – WRS232-USB RS232 to USB Wireless Transceiver Set from Omega Engineering, Inc.

The RS232 interface has been popular in the past for sensors with built-in electronics. However, RS232 cable lengths are limited to 50 ft. For longer runs, wireless RS232 transmitter/receiver sets like the one shown in Figure 3 are available. The RS232 output is forwarded to the receiver, which converts it to USB protocol for connection to a pc. The pc can still communicate with the RS232 device as if it is directly connected. This type of wireless device is suitable for both new installations and retrofits.

Figure 4 – UWTC-NB9 Wireless Probe Assembly

When making measurements in liquids or corrosive environments, the thermocouple or RTD sensing device often needs to be protected. In such cases, a probe, which encloses the sensing device in a protective tube or shell, is commonly used. For these applications, a wireless sensor probe transceiver, such as that shown in Figure 4, integrates the wireless transmitter with the probe in a single unit.

Receivers Get Sophisticated

As useful as the wireless transmission options for temperature sensors may be, they represent only half of the story. It is the innovation in receivers that brings new capabilities for measurement and process control. Some examples follow which show the range of capabilities now available.

Figure 5 – UWTC-REC1 Wireless 12-Channel USB Receiver

The most common receivers connect to a pc through a USB port. An example is the 12-channel wireless USB receiver shown in Figure 5. The accompanying software displays the readings from each channel, as well as the sensor type, sensor designator or description, ambient temperature, units, signal strength and battery condition. High and low temperature alarms are indicated by a blinking red reading. Data can be saved to a file for purposes of charting and analysis. A typical channel display is shown in Figure 6 (Omega Engineering, Inc., TC Central™ Software).
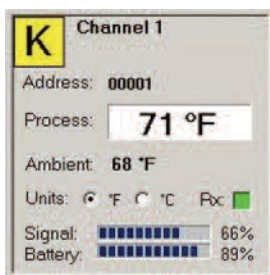
For those cases in which an analog signal is necessary to provide process feedback to a controller or PLC, receivers that include an analog output for one channel are available. A display can be added to show this reading on the unit, although it will also be displayed on the computer screen. Receivers in NEMA-rated enclosures are also available for outdoor applications or harsher indoor settings.

Figure 6 – Typical Channel Display Box

The most interesting new receivers do not require a host computer at all. They are built with embedded web servers and connect directly to an Ethernet network or to the Internet with a standard RJ45 jack. Such a device has its own IP address and serves active web pages which display real time temperature readings and charts. It is accessed for viewing and configuration using a pc with a web browser. Access can be restricted through password protection. Additional capabilities typically include alarm notification by email or text messaging.
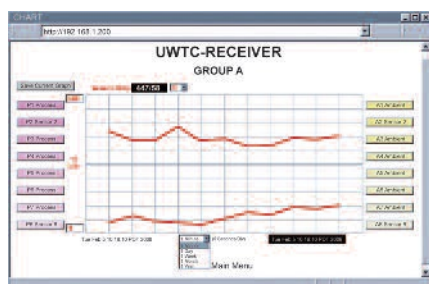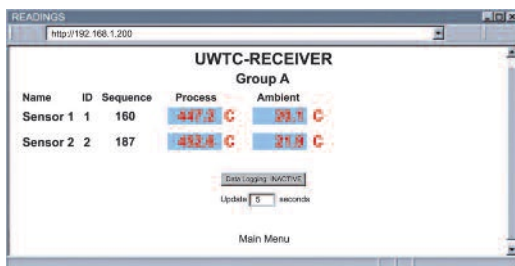

Figure 7 – UWTC-REC3 Web-Based Wireless Receiver

Web-based wireless receivers allow ad hoc monitoring using a pc from any location having an Internet connection. In addition to allowing data to be viewed from more than one location, this effectively removes any restriction on the distance of the monitoring point or control center from the temperature sensors being monitored. A typical web-based receiver is shown in Figure 7. This unit handles 32 channels.

Figure 8 - wi Series Web-Based Wireless Scanner & Controller

What about the situation in which remote monitoring is desirable, but the machine or process operator needs access to the readings locally? A wireless panel meter, like that shown in Figure 8, does just that. This web-based receiver is also a wireless scanner that displays the output from up to 8 sensors. It adds local machine or process control capability by means of relay contacts and voltage output signals.

Typical browser screens from a web-based wireless receiver are shown in Figure 9. The top screen shows sensor readings, and the bottom screen shows a chart of data that has been logged. The screens are interactive and allow configuration programming of the receiver.

Figure 9 – Typical Browser Screens from a Web-Based Wireless Receiver

Conclusion

As this brief survey of wireless transmitters and receivers for temperature measurement shows, many of the old limitations and complexities of point-to-point, mechanically interconnected instrumentation systems no longer apply. The engineer, technician or scientist can use these new devices to gain a freedom and flexibility in system design and installation that was not previously available. Control can be centralized or decentralized and data can be collected and analyzed in real time or later using readily available personal computers.

Although we are enmeshed in a web of wired devices, we seldom notice it, but just take a look at the typical telephone pole on your way home or behind your computer when you get there. Fortunately, for those involved with instrumentation, the explosive growth of wireless devices in communication, measurement and control offers a promise of escape from at least some of the entanglement in this "tyranny of wires" that we face in our day-to-day work.