Moore Industries' range of PC programmable temperature transmitters can be both panel and field mounted. The TRY DIN block (left) is intended for locating in an IP65 enclosure while the LH transmitter combination (right) is intended for field applications

TEMPERATURE TRANSMITTERS take the lead over direct wiring

Transmitters are now comparable in price to direct wiring

BY ROB STOCKHAM

Users have traditionally had two ways to get process temperature measurements to the control system. Sensor extension wires can carry the low-level signals (ohm or mV) generated by field-mounted sensors. The alternative is to install temperature transmitters at or near the measurement point. The transmitter amplifies and conditions the signal and transmits it over a twisted wire pair to the control room.

Maintenance headaches

Direct wiring has generally been considered less expensive and sometimes easier. Transmitter use, because of cost, was often reserved for important loops where signal and loop integrity was a must.

Today, highly functional, yet affordable, microprocessor-based field-mount temperature transmitters are comparable in price to direct wiring.

When the additional advantages of using intelligent transmitters are considered, most users will also save considerable time and maintenance headaches.

Direct wiring sensors to a control system necessitates the use of fragile sensor extension wires which also cost three times more than the common shielded copper wire used for a temperature transmitter's 4-20mA signal. This implies that transmitters can pay for themselves in wire and conduit costs alone on long wire runs.

However, in retrofits, there may be a mistaken belief that new copper wires must be run. In reality, temperature transmitters can be installed at the sensor and the existing RTD or thermocouple extension wires can simply be used to transmit the 4-20mA back to the control system with no additional installation time or material costs.

Today's temperature transmitters are no longer fixed-range. Temperature transmitters with intelligent diagnostic capabilities find and diagnose sensor failures. If a wire breaks or otherwise stops sending a signal during operation, the transmitter sends the output upscale or downscale to warn of trouble. Furthermore, they can tell the user which wire has broken. Specific fault messages eliminate the work of removing the sensor or checking all of the lead wires to diagnose a problem.

Radio frequency interference (RFI) and electromagnetic interference (EMI) are common in nearly every industrial environment and can negatively affect process signals.

Long distance transmission

In a direct wiring scheme, 'weak', low-level sensor signals are susceptible to the signal degrading effects of RFI/EMI. Worse, sensor extension wires can behave like an RFI/EMI antenna by actually drawing plant 'noise' to the wires.

Conversely, a temperature transmitter filters out incoming RFI noise, and amplifies a sensor's low-level signal to a high level which can accurately withstand long distance transmission through a noisy plant.

With direct wiring, the sensor must match input-specific DCS and PLC input cards.

Since numerous sensor types are used in a plant, a large number of different input cards must be specified and stocked as spares. This can be expensive.

Modern temperature transmitters can be easily configured to accommodate nearly any sensor input type. Their 4-20mA output signal is control-system ready. This allows the user to standardise on less expensive 4-20mA DCS and PLC input cards while matching the best type of sensor to each particular process point.

Protect against inaccuracies

In place of numerous sensor lead-wire and DCS/PLC input board combinations, engineering designs need one wire type (twisted wire pair) and one input board type (4-20mA).

In addition, a transmitter's input/output/power signal isolation will protect against signal inaccuracies caused by ground loops. In place of costly isolated RTD and thermocouple input cards, far less expensive 4-20mA cards can be specified.

Using temperature transmitters can substantially enhance measurement accuracy. DCS and PLC systems measure readings over the entire range of a sensor. Measuring a narrower range produces far more accurate measurements. Transmitters can be calibrated to any range within a sensor's capabilities, giving more precise measurements.

Users should always specify a temperature transmitter that is able to accept a true four-wire RTD input. While the cost is virtually the same as a three-wire RTD, the fourth wire in an RTD circuit cancels out all errors due to resistance imbalance between leads.

If you are still using direct wiring strategies, you may want to reconsider. The enhanced functionality and lower price of universal temperature transmitters make them a much better choice.

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