

# Taking the bus

Fieldbus control systems promise potential advantages in lower costs, ease of installation, greater flexibility and improved diagnostics

by Jake Ten Haken and Jeff White

“Fieldbus” is a generic term for a digital, two-way, multi-drop (i.e. multiple devices connected to a single fieldbus cable system) communication link between intelligent control devices. The technology has become commonplace in the automotive, food and beverage and petro-chemical industries and holds potential advantages for the flour milling and grain handling industry as well.

Fieldbus differs from most conventional instruments, like valves, pressure transducers, and flow switches, which typically use analog or discrete signals to communicate; these systems allow only one-way information flow. A digital signal differs from the analog signal in that it is not a continuous signal; it is a series of “ons” and “offs,” much like the Morse code and provides two-way communication that allows the control system to respond to information received from the instrument.

With traditional analog and discrete devices, a separate cable needs to be run between the end device and the control system because only a single analog or discrete signal can be represented on the circuit. Fieldbus connects all sensors located in the same area to the same cable.

There are technologies currently used in the grain industry that are very similar to fieldbus applications. Some common uses of similar technology include various industrial busses that adhere to RS-485 or other serial communication applications used on scales and flow metering equipment. These industrial busses can be applied with a multi-drop system to monitor and control numerous parameters on each scale on the system.

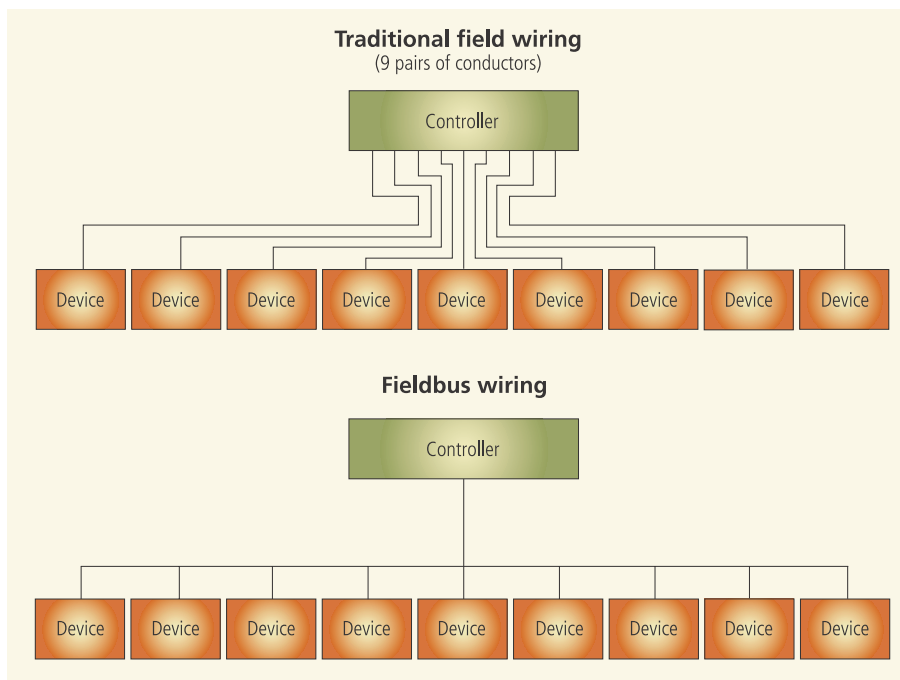
In addition, instruments such as continuous level monitoring devices may incorporate a remote I/O (Inputs/Outputs) communication standard as a method of communicating data to a control system. Rather than hard-wiring I/O from the devices individually to the physical controller I/O rack, the device itself serves as a logical I/O rack.

Although these applications are not fieldbus technology, they provide some insight to the potential benefits of fieldbus because they utilize some of the same characteristics that fieldbus technology utilizes.

## POTENTIAL APPLICATIONS

Fieldbus offers the grain industry an opportunity to take advantage of a technology that has the ability to reduce electrical installation costs, provide greater data accuracy and integrity and allow for greater future flexibility.

Applications that warrant consideration by the grain industry include:



— Flow sensors (switches) and level switches located on leg conveyors, bin levels, etc. In grain elevators there are frequently large numbers of these sensors located in close proximity to one another. A fieldbus system would theoretically allow up to 30 of these switches to be connected by a single bus cable. The special fieldbus cable, while more expensive than standard conductors, has the potential to replace up to 30 pairs of conductors. The conduit size and the number of connections to be made in the control cabinet would both be reduced.

— Motor control centers. Many of the manufacturers offer "smart" motor control center (MCC) options. In addition to monitoring and diagnostic improvements, connecting MCC buckets with fieldbus reduces the number of terminations to be made and reduces the number of wires needed between the control cabinet and the MCC.

— Power monitoring equipment in MCCs, switchboard, switchgear, and other power distribution equipment could be placed on a fieldbus network to transmit the data to a central system.

— Scales and flow controllers typically provide multiple levels of data for monitoring by a central yield management system.

## POTENTIAL BENEFITS

The use of fieldbus I/O interface modules creates an opportunity to utilize additional types of devices that may not be available as "smart" fieldbus devices (devices that have the ability to internally process data). This will allow a plant to utilize the same device types installed in other areas of the plant and therefore maintain a smaller spare parts inventory.

Some of the key benefits that may be realized with these applications in the grain handling industry are:

— Expansion of a grain elevator could require less construction effort and be less expensive if a fieldbus installation already exists. For example, the installation of a couple lift line sensors onto an existing system could involve connecting these devices to the nearest available existing device on a fieldbus segment, without the need to wire the new devices back to a centrally located control room.

— The advantage of reduced control system enclosure sizes may be a huge advantage to facilities where floor space is at a premium and possibly not available for the control equipment. The reduction in I/O cards necessary for a fieldbus application will allow the user better space utilization for the control panels.

— Several of the applications listed above are specifically intended to reduce wiring costs by taking advantage of the multi-drop and multi-variable capabilities of a fieldbus. For example, a diverter valve with two solenoids and two limits

## Not for everyone

Recently, Interstates installed a fieldbus system in a soybean processing plant as part of an expansion at a plant they had built in 1995. The company was interested in seeing if fieldbus could offer the kind of installation savings and operational efficiency they had heard about, and Interstates was able to work with them to develop and install a system that would provide benefits for their operation.



This soybean processing plant recently installed the fieldbus system as part of a plant expansion.

But Fieldbus may not be for everyone. "The technology is still developing, and a fieldbus may be more complex to maintain. Getting the proper balance between design and installation is crucial," explained David Kraehling, director of business development for the Interstates Companies.

Kraehling says that with InterStates' control system design and electrical construction expertise, their role is to offer their customers the best approach to incorporating fieldbus technology — or perhaps, electing not to utilize it.

may traditionally require six wires brought back to a control panel for power and I/O requirements on a conventional system. The fieldbus network would address all of these needs on the single pair of bus wires.

— Additional data would become available for monitoring critical machines in an elevator without the need for additional wiring. This may involve data that is currently available from scales, flow controllers, etc., but not utilized because it would require extra wiring and costs. Fieldbus provides a way to readily obtain this data without the additional wiring requirements.

— Power monitoring of electrical systems has recently become a higher priority at many facilities. Power monitors can transmit data to a central control system without the use of fieldbus; however the use of fieldbus may allow the plant a means for obtaining a greater amount of this data without additional wiring. This additional data may allow the control system to perform functions such as initiating load shedding or monitoring critical load for unusual operating characteristics as part of a preventive maintenance program. WG

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