As intelligent field devices are applied with more frequency throughout plant design, design cases occur where native bus-technology devices and simple field devices exist in the same control system. This article discusses one specific case, steam drain control, which can benefit from intelligent diagnostics on the control valves, but also works quite effectively with simple level switches. It is possible for users to combine more advanced Foundation fieldbus devices with simple devices such as level switches to create a truly effective control solution.
through the piping system. If this liquid is not removed the saturation temperature for the steam flowing metal temperature of the piping components is below of liquid are formed during startup, when the bulk of the pipe causes steam to condense. Large amounts line. Liquid is formed when heat loss through the wall connection and extending downwards from the main drain pot. This is basically a section of pipe about the same diameter as the main line, connected via a tee. Steam lines are typically fitted with low-point drains, which are implemented using a piping device called a drain pot. When the high switch detects liquid water, the control system sees the change in the switch signal and sends a command to open the valve. Depending on the line pressure, this may cause a partial open command or a full open command. When the high switch and the low switch both detect no liquid present, the control system commands the drain valve to close.

The Fieldbus Design

Typically, fieldbus technology application to this control system function would involve replacing the valve with a fieldbus-enabled valve controller, and replacing the level switches with a fieldbus-enabled transmitter. This would typically be implemented with a fieldbus Analog Output block for the valve control, with position feedback derived from the BKCAL_OUT of the block, with the “Use PV for BKCAL_OUT” option selected in the IO_OPTS parameter. An analog input block for the transmitter would be added, with logic in the control system to switch the valve to either partial or full open (depending on pressure) position when level exceeds the setpoint.

What brings this approach into question is that the level switches are relatively inexpensive, and can take the system operating temperature (1100°F) and pressure (2400 psig) without requiring additional piping components. Most continuous level technology would require additional piping components to protect the transmitter from the process conditions, which would mean added expense. It was also determined by the end user in this case that the level switches possessed sufficient reliability and would benefit only incrementally from the additional diagnostics that fieldbus would provide.

The Intelligent Field Device Solution

Fieldbus-enabled valves have entered the marketplace that have extended capability, including the capability to interrogate external switches. While these were intended for use with external limit switches for valve position, these valve capabilities provide an interesting solution to the drain valve control problem laid out above. The level switches can be wired to the valve controller, and switch position can be reported back to the control system using discrete input blocks. While this allows for the wiring reduction typically associated with digital device installation, it avoids the higher device and installation cost of level transmitters.

The main drawback of the approach selected is the larger number of function blocks required. Since the speed required for system response for this application is relatively slow (approximately one second), a sufficient number of devices can still be connected on the same segment to make the digital field device wiring cost benefit easily apparent.

The Horizon

Today, direct integration of simple devices like the limit switches into the local fieldbus valve is a cost-effective solution, and a great example of how you can combine conventional sensors and switches with a fieldbus control solution. Even more direct integration of simple devices is coming in the near future as the valve suppliers add new, higher density discrete blocks. Some intelligent valve suppliers have already begun utilizing the bitwise capabilities of the discrete data type described in the Fieldbus Foundation standards to reduce the number of blocks required to transmit a number of valve conditions. Ultimately, when you minimize signals, you improve the overall efficiency and performance of the network. The Foundation fieldbus technical specification defines different ways for valves of all types, including actuators and positioners to communicate more than just open/close data.