Softing partners with YTC to launch Korea's first-ever FOUNDATION™ fieldbus field device

YTC goes FF

Young Tech Co., Ltd. (YTC), a leading positioner manufacturer in Korea, entered the growing fieldbus market when it rolled out a new FOUNDATION™ fieldbus (FF) H1 device: the YT-2500 Smart Valve Positioner. Fully certified, the new device provides a full range of FF functionalities. Thanks to Softing Industrial Automation's FBK-2 Fieldbus Kit, the Korean technology pioneer was able to reduce development costs significantly.

With customers in more than 45 countries and over twenty years' experience in control valve technology, YTC is committed to offering the oil, gas and energy industry the latest in cutting-edge products. And YTC is meeting its commitment. The first Korean manufacturer to offer positioners, volume boosters and position transmitters, when the forward-thinking technology leader became aware of the ongoing shift from 4.20 mA installations to digital fieldbus among leading process automation system suppliers, it set out to integrate the FF H1 protocol into its YT-2500 and maximize its advantages: multi-bit alert reporting, trending, self-diagnostics, predictive maintenance, alarms, additional diagnosis data as well as more accurate data processing. An important bonus: fieldbus technology is more cost-efficient than conventional communication modules.

Figure 1: The YT-2500 Smart Valve Positioner

Full FF implementation made easy

Following a thorough assessment of potential partners, YTC selected Softing Industrial Automation. As a world-leading partner for networking automation systems and control systems, Softing could offer a module specially designed to simplify the development of FF H1 field devices, thereby reducing effort, cost and time to market. Fast and simple to install, YTC was convinced the Softing FBK-2 embedded communication module (see Figure 1) was a perfect match.
The FBK-2 offers standard FF functionalities, including the FF H1 protocol stack, Link Active Scheduler (LAS) and ATEX support. In addition, its large selection of individual pre-certified function blocks facilitates the integration of function block applications into the function block shell. The FBK-2 also makes it possible to introduce other key functionalities such as alarming, simulation and READBACK parameters as well as cascading to ensure smooth operation, for instance when switching cascaded function blocks from manual to automatic. Softing was also able to customize its off-the-shelf component according to the YT-2500's specifications for integrated PID and Analog Output (AO) function blocks.
The Softing FBK-2 Fieldbus Kit's ready-to-use FF H1 hardware and ready-to-load firmware radically reduced the time it took to develop the YT-2500 smart positioner. Even so, there was still one major hurdle to overcome: How to create a transducer block able to parameterize and calibrate individual parameters, and map these parameters so that data could be transmitted seamlessly back (de-characterization) and forth (characterization) from the FF H1 network to the internal positioner representation. Softing used a complete control loop at the field level to analyze data processed by the function blocks. A diagram of a sample loop, including positioner and level transmitter, is shown in Figure 2.

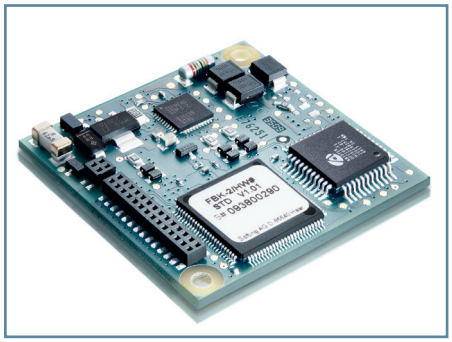

Figure 2: Ready-to-use and ready-to-load, Softing's FBK-2 Fieldbus Kit was the communication module-of-choice for the YT-2500 Smart Valve Positioner.

Designing the transducer block

YTC and Softing worked in close partnership to design the YT-2500 transducer block. As a first step, the companies held a joint workshop and training on FF technology, and held in-depth discussions on the required functions. It was during this first phase that the team of YTC and Softing experts decided to integrate the, at that time, newly introduced FOUNDATION fieldbus Positioner Transducer Block Specification. The 2009 specification from the Fieldbus Foundation™, a global nonprofit corporation, supports advanced field diagnostics and details the individual parameters a positioner should support.

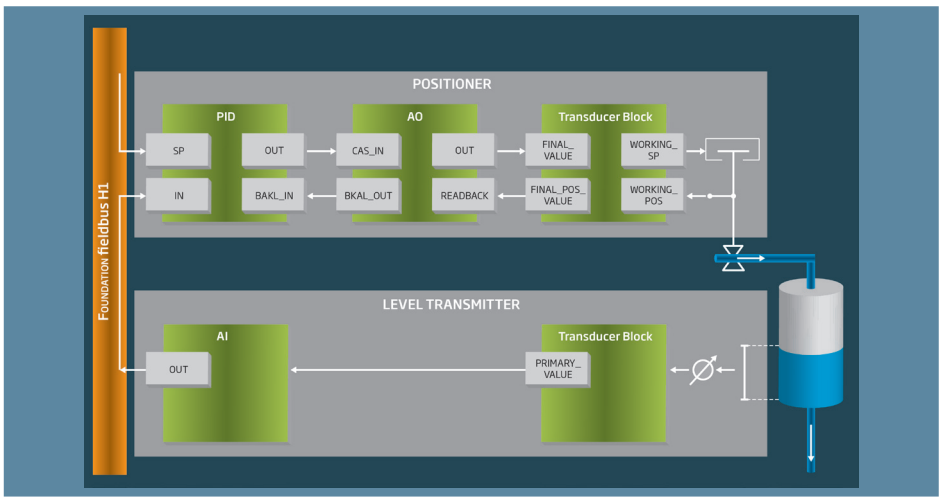

Figure 3: This standard FF application depicts the data stream through the YT-2500 smart positioner and transducer block.

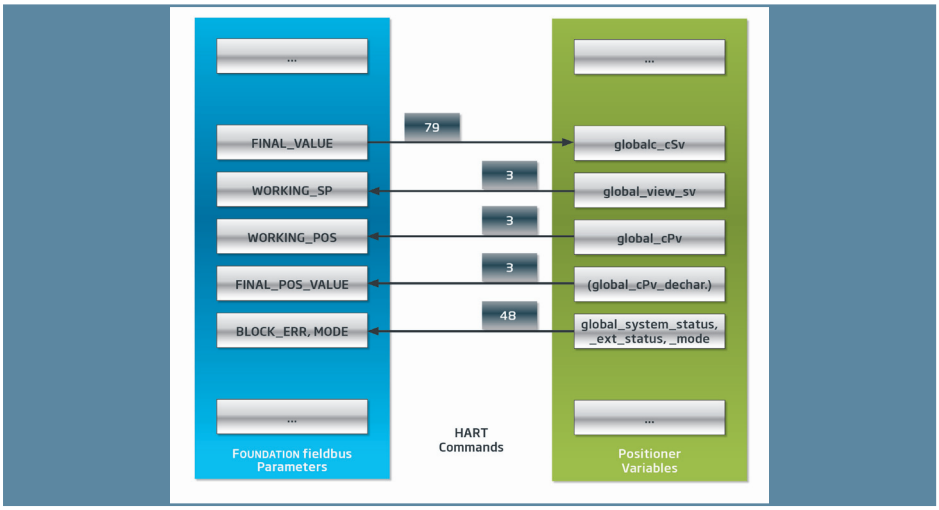

Figure 4: The transducer block uses HART commands to map individual function block parameters according to respective YT-2500 positioner variables.

In addition, the team opted to integrate YT-2500-specific calibration and configuration functions, which to date had only been executable via a local user interface. The advantage here is that they provide an alternative means of configuring the YT-2500's internal control algorithm using manufacturer-specific transducer block parameters.

Figure 3 depicts the two-way data stream through the transducer block. The set point calculated by the FF control application is transmitted from the FF network to the positioner via the PID and AO function blocks (characterization) at the same time the current position signal streams back to the AO function block's READBACK parameter (de-characterization). The YT-2500 transducer block supports more than 200 standard and device-specific FF parameters.

HART is not hard

The YT-2500 transducer block uses the HART protocol to transmit data between the FBK-2 module and the positioner's internal communication function via a serial UART interface. Preprogrammed code snippets used to define how the individual FF parameters write or read requests utilize one or several HART commands to map respective internal variables. To accelerate the development process and ensure that the most suitable HART command was used to communicate with the transducer block, YTC provided Softing with the YT-2500's internal HART communication protocol source code. Softing uses the C programming language with the FBK-2's embOS real-time operating system to communicate with the transducer block. An example of the program code is illustrated in Figure 4.

In developing and testing the transducer block, the team of experts had to address other YT-2500 functions such as diagnostic and error information handling and field diagnostics based on the NAMUR recommendation NE107 as well as mode-dependent locking of write access to parameters. In addition, the YT-2500's Device Description (DD) file was used to address mandatory tasks and coordinate the user interface presented by the FF host system, thereby replacing or, respectively, supplementing the display and push buttons used by the local YT-2500 user interface. In order exploit the FBK-2 as a piggy back to its main board, YTC integrated connectors and added a 3.15V power supply circuit to its main board so that the positioner could be powered via the FF network and FBK-2 board.

Certification made easy

Having already undergone FOUNDATION fieldbus Physical Layer Conformance testing, Softing was able to offer a communication module with a pre-certified platform, saving YTC even more time and expense. The only outstanding test to be run was for FOUNDATION fieldbus interoperability. Once completed, the YT-2500 became the first positioner certified according to the FOUNDATION fieldbus Positioner Transducer Block Specification. The YT-

2500 has already been deployed and is currently undergoing pilot tests at various customer sites.
Softing's close cooperation with YTC, has given the Korean manufacturer a deeper understanding and more know-how of the underlying FF technology used in its smart valve positioner. "We were overwhelmed by the number of parameters required for FF implementation at first," says YTC Project Manager Yong Hee Lee. "But, with each step along the way, we learned a little bit more about the standard. The next project is going to run even smoother and faster." Ilmo Koo, Softing's point of contact, says the project was a success: "Despite some minor block parameter issues during implementation, the overall result looks good to us."
YTC and Softing are already discussing their next projects, one of which is the development of a PROFIBUS PA transducer block. Another perfect match, the device's PROFIBUS PA transducer block can also be implemented using the FBK-2 Fieldbus Kit, further reducing effort and costs.

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