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HART Provides Cost-Effective Alternative for Online ESD Valve Testing

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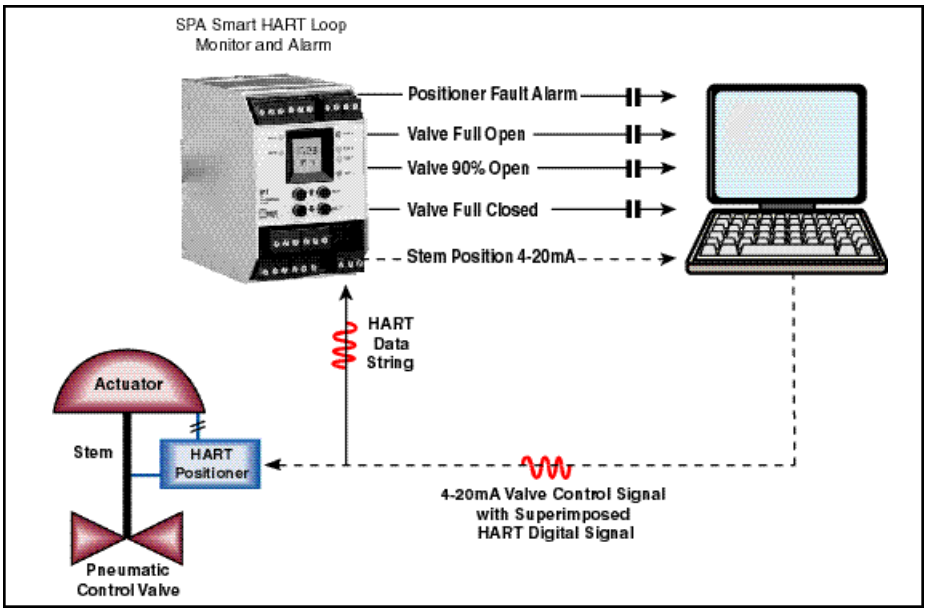

HART communicating valve positioners used in conjunction with HART loop monitors provide a reliable and cost-effective ESD strategy for emergency shutdown valves.

Smart valve positioners with HART communication coupled with HART-capable loop monitors provide an efficient and cost-effective way to test online emergency shutdown (ESD) valves and increase system integrity. The use of HART communication can reinforce the traditional weak link in most safety systems, i.e. the shut-off valves.

Shut-off valves applied to critical processes are often automated and actuated by a safety shutdown device that provides an emergency shutdown function. Governing standards for safety-related systems state that plant operators must "determine and document that equipment is designed, maintained, inspected, tested and operated in a safe manner." Valves are often the most difficult loop components to test and maintain.

A Sticky Situation

Estimates indicate that as much as 40 to 50 percent of loop operational problems can be blamed on final control elements. Avalve may not operate as designed due to process fluid contamination, corroded shafts, inadequate air supply, shorted or open solenoid coil, or in-line obstructions. This is a particularly "sticky" situation when it comes to discrete (on/off) ESD valves.

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Smart Adviser Enhances Process System

The inherent capability of HART communication devices to provide diagnostic and preventative maintenance information has proven invaluable in an installation at the Aylesford Newsprint manufacturing mill in Aylesford, England. The mill recently constructed a new de-inking and pumping plant and installed a state-of-the-art newsprint machine with some of the most advanced process instrumentation in use today.

The mill uses the Smart Adviser plant health monitor from Onix Measurement to enhance the existing process monitoring and control system and to provide significant benefits in three areas: valve maintenance; valve failure; and multiplexing.

"A large number of valve positioners with HARTcommunication are in operation at the mill; some are installed on minor applications but many perform critical safety tasks," says Peter Vincent of Onix Measurement. "The advantage of using HART-capable devices is their ability to communicate digitally on top of the traditional 4-20mA line & transmit a wealth of data rather than only one process variable at a time."

Additional parameters that can be monitored by a HART-capable valve positioner include requested valve position, actual valve position, temperature, and actuator pressure.

During normal operation, HART communication provides a cost-effective and time-saving method for identifying problematic valves and valve positioners. Instrument performance is monitored by extrapolating the digital data relating to the requested valve position and the actual valve position variables and comparing the two readings (see diagram).

"If the difference between the two readings falls outside of the normal tolerance of the valve (i.e. valve deviation), the Smart

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HART Provides Cost-Effective Alternative for Online ESD Valve Testing

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Thousands of discrete ESD valves are in service throughout the world. The typical failure mode for a discrete valve reads "STUCK." The best way to perform an in-line test on these valves is to stroke the valve from 0-100% (full open/full close), but to close a shutdown valve completely normally necessitates total process shutdown. Operations managers are not able to initiate a total shutdown frequently enough to meet the intent of the various safety standards.

Partial Valve Stroking

One alternative to test ESD valves without seriously disrupting the process is through partial valve stroking. Since a valve does not have to be completely stroked to prove that it will function, testing in this way provides a dramatic increase in system safety. In fact, frequent loosening of the valve by partial stroking actually increases valve reliability.

Partial valve stroking can be accomplished by applying a closure signal and (a) monitoring valve response visually (which requires the presence of a field technician) or (b) using limit switches (that eliminate the need for a technician but require purchasing, installation, calibration, wiring and maintenance). Partial valve stroking is not as conclusive a test as a 100 percent stroke, but it is faster and does not require the potentially expensive full process shutdown.

The Better Alternative

Using the power of HART communication, valve testing can be accomplished without a technician, without limit switches…without worry. And, the basic strategy is simple.

Install a smart HART positioner on the valve and set the DCS control signal from discrete on-off (the normal configuration for a shutoff valve) to analog 4-20mA. Install a HART Loop Monitor, such as Moore Industries' SPA, to access the HART digital data and extract stem position. (Typically, the SPA can be mounted behind the panel and permanently connected to the loop without disturbing loop operation in any way). Utilizing multiple analog and discrete output capabilities, configure the SPA to provide a 4-20mA signal proportional-to-stem position and to trigger relay outputs at up to three designated percentages of travel.

The Performance Test

As an example, suppose that the Logic Solver (DCS or PLC) applies a 90% (18.4mA) signal to the valve. When the valve reaches the 90% set point, the relay in the HART loop monitor will trip to verify that the valve reached 90%. The test signal is then returned to 100% value by the Logic Solver and the valve is reopened.

This procedure determines that the valve did, in fact, reach the 90% travel point proving that the valve is not stuck. And, because the valve was immediately reopened, the test has not impeded the process flow for very long which minimizes any process disruption. If the valve did not move to the prescribed position in a reasonable time frame, a valve failure alarm could be triggered within the Logic Solver.

A second relay trip point could be set at 100% (full open) travel to insure that the valve did reopen completely after the test. A third trip point at 0% would interlock to prove that the valve closed all the way when it was asked to perform a complete shutdown.

A final layer of safety is added by a fourth relay in the SPA HART Loop Monitor that continuously monitors the health of the positioner itself and alerts operators to any abnormal conditions. The loop monitor also provides a 4-20mAoutput signal proportional to valve stem/shaft position. This signal can be monitored over time against the as-new valve signature to provide additional diagnostic information including hysteresis, worn trim, and degraded response.

Partial stroke testing on a regular basis with HART-capable valve positioners and loop monitors can detect about 80 percent of potential problems automatically. A 100% stroke test (with leak testing) can be done during a scheduled turnaround to increase testing accuracy with minimal effect on production. The use of HART communication for online ESD valve testing dramatically improves in the safety integrity level of the loop at a minimal cost.

HART Displays WOW! ISA 2000 Show-Goers

Once again, the power of HART communication technology drew enthusiastic visitors when the HCF booth opened at ISA 2000 in New Orleans in August. The booth showcased a variety of HART applications and products from HCF member companies worldwide. Application displays featured continuous diagnostics, rapid loop commissioning, and multi-drop networking, as well as a large number of multi-variable HART-based products.

"Many new products were displayed including HART-capable control systems from Fisher-Rosemount and Siemens," says HCF Support Technician Keith Kleinschmidt. "Products for integrating HART to plant networks such as Profibus, TCP/IP Ethernet, and Modbus were also shown. All products were connected and communicating to demonstrate their capabilities."

Also being demonstrated in the HCF booth was the new HART Server, which provides a "no-programming" tag name method for accessing data in HART instruments featuring two powerful interfaces: the OPC interface and the HART pass-through interface. The HART Server makes HART device information easily available to client applications anywhere on the plant network (see related article on page 3).

"People who visited the HCF booth received a free copy of The Complete HART Guide CD-ROM," Kleinschmidt adds. "This user-friendly reference on the HART Protocol includes an animated graphic tutorial, application guide and searchable 400-plus products directory."

HCF member companies who participated in the ISA2000 booth included ABB, AMETEK Drexelbrook, Applied System Technologies, Arcom Control Systems, DeZurik, Dynisco Instruments, Elcon Instruments, Fisher Controls, Fisher-Rosemount Systems, Fluke, Foxboro, MACTek, Magnetrol, M-System, Moore Industries, MTL, Neles Automation, Palmstriernas Instrument, Panametrics, Paper Machine Components, Ronan Engineering, Rosemount Analytical, Rosemount, Siemens, Siemens-Milltronics, Siemens-Moore, Sierra Instruments, Turck, WIKA, and Yokogawa Electric.

Smart Adviser Enhances Process System

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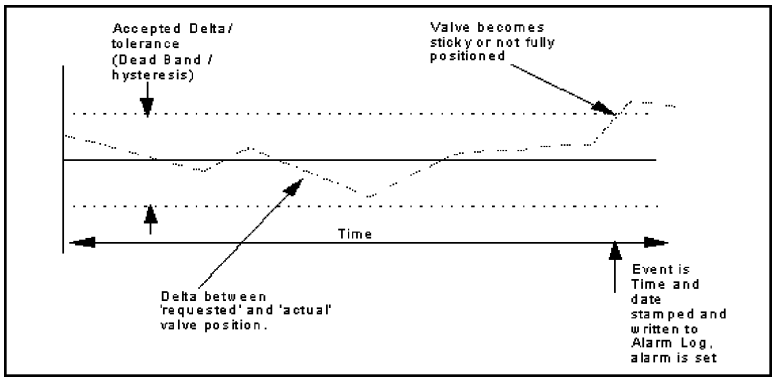
Adviser logs it as a fault. The dead band (hysteresis) facility is used to determine the 'normal' delta and this is adjustable up to 25 percent span to cover nearly all conditions,"Vincent says.

In addition, should the valve deviation exceed programmed alarm point, the critical alarm mode provides instantaneous indication of valve failure. When the maintenance schedule is drawn up, the log is studied to see which valves are frequently working outside of normal tolerances.

In addition the Smart Adviser can function as a multiplexer, collecting up to 24 channels of field data from smart valve positioners and sending it to the control system.



HART Technology Update

HART SERVER

Use of the new HART Server software component, released earlier this year, is gaining momentum. A number of HCF members have signed up for the HART Server Partner Program which provides them with tools to support application development and unlimited distribution and use rights. In addition, several companies have acquired single use licenses. Applications include instrument manufacturing, diagnostics, and monitoring/trending applications with popular HMI SCADAsoftware packages.

The HART Server OPC interface provides "no-programming" tag-name access to 21 data items in HART devices including the primary and 3 secondary process variables, engineering units, upper and lower range values, manufacturer and device status/diagnostics. This information makes it easy for software applications with OPC Client capability to access HART device information for trending, continuous monitoring of device status and diagnostics, and simple maintenance functions such as range changes.

The HART Server "pass-through" interface supports the use of any HART command. The Client application supplies the interface with the command number, the byte count and data (if any). The HART Server then handles all HART communication details for addressing, routing, error checking, etc., and returns data from the field device.

The HART Server has been tested successfully with OPC Client applications from Canary Labs, Ci Technologies, eMation, Iconics, Intellution, National Instruments and Wonderware. The HART Server supports connection to HART field devices through HART-capable multiplexers from Arcom Controls, Elcon Instruments, MTL, Onix Measurement, Pepperl+Fuchs, and Stahl. The HART Server also supports direct connection to a single HART device or multi-drop network of HART devices through RS232 HART modem interfaces.

Afully functional, 30-day evaulation version of the HART Server is available. Contact the HCF for licensing information…and "Fast Track" your HARTcommunication project.

NEW HART MODEM CHIP

American Microsystems Inc. (AMI) has announced the development of a Low-Power HART Modem chip built to current HART communication specifications. The HART chip was designed in conjunction with Rosemount Inc. The new chip is a drop-in replacement for the SYM20C15 with an industrial temperature range of –40ºC to +85ºC. The chip will be available in both a 28-pin PLCC (plastic leaded chip carrier) and a 32-pin TQFP (thin quad flat pack) package.

AMI, headquartered in San Diego, California, pioneered the development of application specific integrated circuits (ASICs) in 1966. Over the last 34 years, AMI has remained a leading ASIC supplier providing total solutions that employ the latest digital and analog capabilities.

Additional information about AMI is available at *www.amis.com.*

Meet the Staff

Johnny Dunlap has joined the HCF staff and is providing much needed assistance with HARTSupport Services. His responsibilities include dissemination of information for HART Server and responding to industry inquiries for HART information. He will also assist with updating information on the HCF website and preparing educational materials to promote industry awareness of HART capabilities.

Johnny has a wealth of experience in the process control industry and extensive hands-on experience in plant automation. His career spans more than 35 years starting as a process control engineer with Monsanto and numerous positions in applications engineering, technical documentation, and sales and marketing.

Johnny is a Registered Professional Engineer with a Bachelor of Science degree in Industrial Engineering from North Carolina State University and a Master's degree in Business Administration from the University of Florida. He is married with two sons and five grandchildren. His hobbies include caricature woodcarving, antique furniture reproduction, woodworking, fishing, classical music and playing the violin.

HCF MEMBER ALERT!

Check out *Members Area Access* at **www.hartcomm.org**….. and see what's new!

Now online: The **HART Products Catalog**

Searchable products directory that includes information on hundreds of HART-capable products. A comprehensive reference for instrument and controls engineers and technicians.

Also available online: HART Protocol information, updates, specifications, information downloads, special announcements, and more!

Log on to **www.hartcomm.org** today!

2000 HCF Calendar

October
16-18 HART Fundamentals Workshop, Basel, Switzerland

November
6-9 Writing Device Descriptions Workshop, Austin, TX, USA
13-15 HCF Working Group Meeting, Budapest

December HCF DD Library Release 2000, Number 4

Welcome New Members

AMETEK Thermox
Fluid Components Intl
Integriti Solutions Ltd.
R. Stahl Schaltgeraete

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