

HART Protocol News for Suppliers and Users

Save Maintenance Costs with HART Loop Monitors

By Bud Adler, Director of Professional Development, Moore Industries International, Inc.

Most users of smart HART devices know how to use their hand-held HART Communicators for configuration and for the occasional loop check. Few, however, take advantage of the inherent capability of HART devices to provide valuable diagnostic and preventative maintenance information.

The HART Protocol provides for remote access to diagnostic and performance analysis information... on-line and all of the time. The key to capitalizing on this advantage is to continuously monitor and use the digital "health" (Field Device Status) information that is always riding on a HART instrument's 4-20mAloop.

Just as doctors prefer to use non-invasive techniques to diagnose human problems, there is now a growing trend for instrument technicians to use digital technology to "look inside" of smart devices to determine what, if anything, is wrong and even predict problems before they occur.

One of the most beneficial applications of this concept is continuous monitoring of control valves equipped with smart HART positioners. A recent study indicates that more than half of all valves in the process industries fail to meet the desired level of performance. Have you ever considered what happens to loop dynamics when a valve exhibits excess friction and/or sticking? The PID control algorithm is typically tuned when the valve is new to provide the correct response to changing requirements. When the valve sticks it begins a chain reaction of jumpy operation,



Smart HART Loop Monitors keep track of valve performance and condition, and report to the control system using traditional ana - log and relay signals.

process surges and the resultant loop upset. Trying to retune the PID to accommodate this friction is an impossible task. Many hours have been wasted trying to apply a band-aid to the problem instead of diagnosing the actual root cause and making a proper correction (usually by replacing the packing or loosening the packing nut).

To monitor smart valve loops, companies such as Moore Industries have developed intelligent HART Loop Monitors to keep track of valve performance. Mounted transparently onto the 4-20mA loop, their job is to continually "listen in" on the constant flow of digital information being transmitted by the smart positioner. They are most often used to determine and transmit stem position in the form of a 4-20mA signal sent back to the monitoring/control system. Additionally, they can provide relay outputs to pro-

vide insight into other conditions. These may include valve position (open/closed), low actu-*Continued on page 3...*

A View from the Trenches Puts HART on Top

By Ken Holladay, Principal Engineer, Southwest Research Institute

Trying to decide which communication protocol to implement in your instrument? There are a lot of factors to consider. How much will it cost? What is the market looking for this year? What is predicted for the future? What are your competitors doing? Is there a clear path through the industry hype?

These were the questions I was trying to answer for the Measurement, Control and Automation Association (MCAA) when I submitted a survey to manufacturers, support foundations and consulting firms to collect data for a comparison of the popular communication choices. An analysis of the responses I received show that instrument and controls engineers who are faced with moving their product from traditional analog to smart instrumentation soon discover that HART provides the best solution for gaining the benefits of smart communication.

The results of the survey were quite impressive. Across the board the HART Protocol provides the greatest savings in design time and development costs.

The survey was based on the following

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ator pressure (to indicate that the filter may be clogged), positioner temperature (too high or too low) or a change of any of six HART status bits that warn of abnormal conditions.

The Moore Industries intelligent HART Loop Monitor (Model SPA) comes in a variety of configurations, including models with up to 4 relay outputs. Each can be individually configured to provide a relay (alarm) output on a different process or health condition. An auxiliary 4-20mA analog output is typically used to provide valve stem position.

All operating parameters set up using front panel push buttons. Its digital indicator can be used to show the value of any of the HART variables, the alarm trip points, or operational status/fault conditions.

Like HART instruments themselves, smart loop monitors let you capitalize on highly functional technology, while still providing the signal types that can be readily used by in-place analog monitoring and control systems. Until you have a HART-capable system, smart control loop monitors will help you maximize the abundant smart capabilities you have today.

A View from the Trenches Puts HART on Top

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scenario:

- 1. Company X has an instrument on the market, but it does not support communication.
- The instrument is already microprocessor based (typically 8-bit technology).
- 3. The instrument's primary output is 4-20mA.
- 4. The instrument requires configuration and calibration.

The results provided here are summaries and extrapolations from the survey responses received. While there might be some disagreement about individual numbers, I have found that the relative values are very consistent. Mer

Estimating costs is difficult since there are many influencing factors. There is often a trade off between development cost and recurring cost. For example, a fully paid up software license increases development cost but reduces recurring cost. Recurring cost is also sensitive to production volume, where higher volume typical-

ly lowers cost. The survey assumed a low volume threshold of about 1000 units per year.

DEVELOPMENT COSTS

In the initial phases of design and development, consultants reported estimated fees for membership, training, tools, licensing codes, hardware design, special coding, tests and regulations. Total dollar figures show initial costs are significantly lower for HART than for the other two communication choices (see chart).

Another significant difference was the estimated time required to produce the first prototype unit. The HART estimates were the shortest at three to four months compared to about six months for both Fieldbus and Profibus.

Engineers and technicians in companies who have "been there and done that" had their own perspective on development costs which was a bit different than the consultants' view. Their estimates represent a "first time" effort, often using only internal resources, to produce a prototype for each of the communication

Consultants View (Initial \$)

	HART	Fieldbus	Profibus-PA
Membership	4500	5000	2500
Training	5000	5000	2000
Tools	4000	15000	15000
Lic. Code	15000	40000	10000
Hdw Design	20000	20000	20000
Special Code	15000	40000	30000
Test & Reg.	2000	3500	3000
Total	65500	128500	82500

protocols. Even though the total cost estimates were higher than those quoted by consultants, there was general agreement that HART was faster and less expensive to develop.

RECURRING COSTS

Recurring cost estimates are based on the additional components required to implement the communication protocol. They do not include any parts related to the analog portion of the instrument nor any possible differences in the capabilities of the microprocessor that may be required.

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For example, HART is often implemented using a relatively inexpensive 8-bit microcontroller. This may not be possible with the other two choices due to the additional memory and computing power requirements. The recurring per-unit cost estimates for Fieldbus are \$110 and for Profibus, \$50. The per part cost for HART is \$30.

MARKET POTENTIAL

One measure of the market potential for a communication protocol is to compare how many devices are currently on the market. HART also has a clear advantage here since it is the most mature of the three.

To date, the HART Communication Foundation has registered more than 200 devices from more than 75 manufacturers of HART-

based instruments. In addition HART holds the largest share of the market with two-thirds of all smart instruments in the industry today communicating using the HART Protocol.

With these survey estimates for project cost and time savings, plus HART's ease of use and compatibility with existing 4-20mA systems, it is easy to understand why HART has become the standard in the industry for smart instrument communication. Millions of HART installations exist today and applications and sales of compatible devices continue to grow rapidly.