COMPANY-WIDE ASSET MANAGEMENT

Software and Smart Field Devices Let Solutia Spend Less on Startups, Operating Costs, and Maintenance. **By David Montgomery**

When Solutia Inc. was formed in 1997 from a group of chemical plants previously part of Monsanto, management was determined to respond to competitive market conditions by becoming more efficient while reducing costs. Recognizing an opportunity to take advantage of potential synergies between its 17 North American plant sites, Solutia adopted a best-practices policy as a means of improving operations at every plant by standardizing on outstanding systems and equipment.

A Process Control & Instrument Electrical (PC&IE) group was formed, including representatives from each plant, to focus on control systems and associated field instrumentation and to improve each other's processes by sharing successes. Rather than staging costly periodic meetings, we hold teleconferences whenever a promising idea is proposed (Figure 1). Any member of the group can initiate a conference by sending an e-mail message to the other members describing a successful practice, telling how it was implemented, and outlining the benefits. The entire group then discusses the subject in a teleconference. The most promising ideas are assigned to subcommittees for detailed study and evaluation to determine whether we could all benefit by universally adopting a given practice.

FIGURE 1.

IN COLLUSION

THE AUTHOR CAN TELECONFERENCE WITH PERSONNEL AT 17 SITES TO DISCUSS PROMISING IDEAS THAT COULD BENEFIT ALL SOLUTIA PRODUCTION FACILITIES.

Even before Solutia was organized, a decision had been made to standardize on smart instrumentation to take advantage of the process control benefits of the extra information these devices provide. Field instrumentation on all new projects had to comply with the HART communications protocol, and when existing instruments needed replacement, HART devices were installed. To make it more convenient to share information about the instruments in our plants, we then standardized on one or two brands of smart pressure and temperature transmitters and digital valve controllers (Figure 2).

Asset Management

In 1997, we as a group also became interested in asset management, defined as the use of information generated by smart field devices to improve the maintenance and service life of process equipment and make positive contributions to operating efficiency. Asset management changes the way plants manage their process equipment, supporting plant personnel in device configuration, calibration, and maintenance while assisting in the diagnosis of equipment problems. Benefits include:

- Faster commissioning of instrumentation.
- Saving time in routine maintenance tasks.
- Automated documentation.
- Reduced costs through reliability-centered maintenance.
- Less downtime.
- Improved product quality.

Various asset management schemes were tried in different plants before settling on one. Our decision was influenced by a successful trial of Austin, Texas-based Fisher-Rosemount's Asset Management Solutions (AMS) software at a pilot unit in the W.G. Krummrich plant near St. Louis. An average saving of $200 per field device was reported for the installation and commissioning of about 70 instruments. In addition, trial results indicated a small to medium-size production unit could save at least $8,000 annually in day-to-day instrument maintenance and troubleshooting.

We followed the development of the asset management technology for a long time, and the results of the Krummrich trial provided compelling evidence that the software would contribute significant savings in process industry plants. In addition to fitting our future needs very well, this software interfaces neatly with the Provox distributed control systems in most of our plants. The excellent projected return on investment (ROI) of less than one year helped win corporate approval for the company-wide application of the software.

Functions of AMS

In the past, extra time had to be planned for instrument commissioning tasks. Technicians typically took handheld

calibrators and transmitting devices into the field, going from one instrument to the next checking calibrations and making certain each transmitter was properly connected to a controller. This time-consuming procedure could take from 30 minutes to two hours, depending on the location of an instrument. The software shortens this time considerably by enabling one person to validate field instrumentation from a PC in the maintenance shop.

Instrument calibration can also be done in the shop. Using the instrument's tag number and specifications from the database, a technician calibrates 16 devices in the time formerly required for a single instrument. Then, when the instruments are mounted in their operating positions, the control loops can be completely checked out in a fraction of the time previously needed.

Streamlining routine instrument maintenance tasks also saves time. For example, the software is used to generate lists of instruments needing periodic calibration in our ISO-certified plants, and to download calibration data into the calibrator. Later, as-found/as-left information on calibration checks, modifications, or other maintenance is entered into the database, automating the documentation of maintenance activities. Better recordkeeping is essential in meeting process safety management (PSM) requirements as well as ISO certification standards.

Calibration records, maintenance records, and the AMS audit trail are performance assessment tools we use for faster troubleshooting of problems reported by operators. By viewing the clear, organized presentation of diagnostic data, alerts, and history, and evaluating the current condition of field devices in the vicinity of a suspected problem, technicians are often able to identify the cause without having to go into the plant. Knowledge replaces guesswork, ghost-chasing in the field is avoided, and technicians are more efficient.

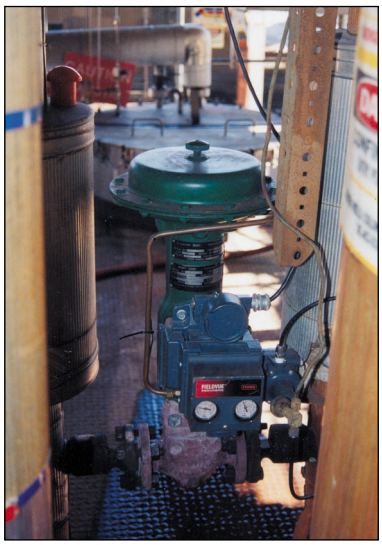
Potential problems are often caught before they become threats to productivity. Device alerts provide early warnings that maintenance action is needed. When a field device begins reporting a condition beyond its functional limit, the severity of the condition is evaluated, and a course of action to minimize downtime is chosen. Sometimes a field-fix is possible, or perhaps the condition can be allowed to exist until the next scheduled maintenance period. If the equipment is non-critical, it may be allowed to run to failure. Knowing about an impending problem well in advance and taking appropriate action is the essence of reliability-centered maintenance.

Performance benchmarks can also be established. For example, a certain valve controlling steam to a batch process cycles about 120,000 times a year, but through experience, we know the packing of that valve starts leaking at about 90,000 cycles. It then takes longer to draw down the necessary vacuum, extending batch cycle time and lowering productivity. The software can provide a warning when the valve has cycled 85,000 times, so the packing can be replaced or the valve changed at the earliest opportunity.

Valve performance can be assessed by comparing a when-new signature with actual use information, rather than going by the length of time it's been in service. The same goes for transmitters or even rotating equipment, which we hope to include in the asset management system in the future. A lot of motors and inverters are involved in the production of fibers, so this is of keen interest at several of our sites. Just as we began installing HART transmitters and smart valves four years ago, we are now beginning to do the same with motors, capturing the information a smart motor generates to assess its performance online.

FIGURE 2.

DETERRING DOWNTIME



DIGITAL CONTROL VALVES AND DIAGNOSTIC SOFTWARE ALLOW QUICK AND PRECISE RESPONSES TO SIGNS OF VARIABILITY TO ELIMINATE PROBLEMS BEFORE PRODUCTIVITY IS IMPACTED.

Savings and Other Benefits

Some benefits of asset management are so general that specific values cannot be assigned. For example, when valves are well tuned, the process gains a measure of efficiency that's difficult to quantify. The value of reduced downtime as a result of improved maintenance is equally evasive, yet anyone who has experienced the stress and cost of unexpected downtime appreciates a system that keeps critical equipment operating.

On the other hand, many maintenance tasks lend themselves well to time analysis and evaluation. For example, 10 control loops can be checked out using AMS in about the same amount of time required for five loops using traditional methods.

It's clear that the software saves substantial amounts of time. By using a hypothetical labor rate of $50 per hour, along with time saved on various functions, a basis can be established for understanding potential cost reductions in process industry plants through the adoption of an asset

management strategy.

From experience at the Krummrich plant pilot unit, plus published articles and other statements, we estimate the time saved in configuration, calibration, commissioning, and documentation ranges from 1.92 to 5.95 hours during the installation of one new smart device. This covers various kinds of transmitters as well as valves, although the time saved with valves is on the higher end of the range. Using the $50 per hour labor rate, the savings can range from $96 to $297.50 per installed smart device. The one-time cost saving does not take into account the benefit of having that device available for use from two to six hours sooner. This can make a tremendous difference in the time required for commissioning instrumentation and starting up a new unit.

Measurable savings accrued during routine maintenance and troubleshooting include faster periodic calibration of field devices (0.75-1.5 hrs. per device), quicker reranging of instruments (0.5-1.5 hrs. per device), and reduced ghost-chasing (0.5-1 hour per check). Added to these ongoing savings are the benefits of fewer valve overhauls due to better information about the condition of valves in the field, reduced downtime, and more accurate documentation. You can begin to see why Solutia management became convinced to standardize on a company-wide asset management technology.

A Vision of the Future

The control room of the future will be proactive rather than reactive, containing both distributed control consoles and PCs loaded with asset management software. Process operators and E&I technicians will work together in a predictive environment. Device alerts will advise operators of potential problems well in advance so action can be taken to find appropriate resolutions, avoiding the upsets that commonly reduce quality and yields in today's process industry plants.

Members of the Solutia PC&IE group aim to ward off upsets by identifying problems before they occur and taking timely corrective action. By sharing knowledge and regularly discussing promising new technologies, we take leading roles in identifying outstanding control systems and associated field equipment to improve operations and safety at every Solutia plant.

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