Don’t Rip Out Your Old Automation Just Yet

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Written by James R. Koelsch, Contributing Editor

Production of practically everything seems to be moving overseas these days, but the perception doesn’t always match reality.

One case in point is the production of manganese-based fine chemicals. Not only does Erachem Comilog Inc. continue to produce electrolytic manganese dioxide in New Johnsonville, Tenn., but its plant there also remains the primary domestic producer of this active ingredient in alkaline batteries.

A leading reason for the company’s success has been the edge that advanced automation has given Erachem over its foreign competitors. The continuing trend in the miniaturization of electronics gives players in this industry little room for error. Even subtle variations in raw materials can disturb the electrical properties enough to cause trouble. So, suppliers such as Erachem must maintain ever-stricter control over their processes, a requirement that demands continual upgrades to automation.

Yet, generating this ever-higher quality at competitive costs requires the continuous process at New Johnsonville to run uninterrupted without unscheduled downtime. Tearing everything out and starting again from scratch is not an option. For this reason, Erachem has joined the ranks of manufacturers who are devising strategies for upgrading their installed automation over time in an orderly way.

Erachem chose a four-phase strategy that allows the automation to evolve based on technology from ABB Inc., in Wickliffe, Ohio. “Using the installed system as the foundation, evolution strategies deliver continuous improvements to automation and allow system owners to meet their business objectives in an incremental way,” says Mark Bitto, ABB’s global business development manager for control systems evolution. He believes that this strategy not only keeps the risk low, but that it also permits paying for each step from annual maintenance budgets.

By contrast, “rip-and-replace strategies involve a radical step-change and provide the user with a one-time improvement,” he continues. “These strategies require large capital-budget investments and, most likely, result in major disruptions and risk to production.” He thinks that the costs usually outweigh the benefits.

To avoid the chaos and expense associated with such shocks, systems integrator Industrial Concepts Inc., of Hartsville, S.C., helped Erachem to develop and implement the much tamer evolution strategy. The plan called for laying ABB’s 800xA extended automation control technology on top of the installed System Six distributed control system (DCS). Besides installing seven Internet protocol (IP) video cameras for remote monitoring, the first phase entailed putting a Profibus card in one of the control units, adding about 150 S800 input/output (I/O) modules, and attaching them to the Profibus card to replace the outdated distributed I/O.
Easy does it

So that Erachem could begin getting used to the new software, Industrial Concepts added the two main servers, an engineering workstation and an operator workplace in the second phase, as well as eight more video cameras. In Phase Three, the integrator added redundant servers, four more operator workplaces, a second Profibus card, and approximately 150 more S800 I/O modules. “They also put in an AC800M controller and an S800 I/O unit,” reports Randy Wimberly, Erachem’s information systems manager.

The fourth phase completed the plan. “Our evolution was executed with zero downtime, while providing us with the added functionality we need to be competitive,” says Wimberly. This includes tightening quality controls and managing costs.

Inergy Services solved a similar upgrade problem in a different way at its fractionation facility in Tupman, Calif., just outside Bakersfield. Like Erachem’s Johnsonville plant, this facility also was running up against the limitations of its old DCS. The difference was that its DCS would not support the forecasted growth of the facility, and limited the amount of information that the company could extract from the instrumentation and I/O devices. The maintenance and expansion of the DCS, moreover, was extremely expensive.

“The DCS at the time was built upon 4-to-20-milliamp (mA) transmitter signals, and I/O that was tied together with analog cards,” explains Phil Sanders, instrumentation and electronics supervisor at Inergy Services at the time of the upgrade. He is currently a senior automation engineer for Contra Costa Electric Inc. (CCE), in Bakersfield, a consultant that helped with the upgrade and continues to offer maintenance services. “We felt that we could get a lot more data from the I/O if we used communications protocols like Modbus and Hart (highway-addressable remote transducer).”

The chief challenge was linking the disparate instrumentation, I/O devices and communications platforms in the plant. To get the necessary infrastructure, Sanders and his colleagues selected a hybrid solution based upon Allen-Bradley ControlLogix programmable automation controllers (PACs) from Rockwell Automation Inc., Milwaukee. “It seemed to be the easiest and most cost-effective way to tie in multiple communications networks into our existing platform and to gather the data that we had been unable to harvest from the existing instrumentation and I/O,” recalls Sanders.

Although some of the plant’s legacy equipment was compatible with the Allen-Bradley protocols, much of the instrumentation and I/O was not. The solution to this problem was the use of communication-protocol converters from ProSoft Technology Inc., a company based in Bakersfield, Calif., that offers communication products for linking disparate platforms. “The gateways that ProSoft provided tied right into the PACs without having to modify the existing I/O and instrumentation,” says Sanders.

“What I call in-rack or in-chassis modules allowed us to install Modbus communications,” he continues. The new control network can now gather the data from the process that is necessary for generating bills of lading and scheduling preventive maintenance. The tank-level controllers in storage and temperature control, however, are on a Hart network, and ProSoft’s Hart-to-EtherNet/IP gateway ties them to the PAC.

Better tracking of product was an important benefit of tapping directly into the instrumentation and tying the networks together. In the past, the flowmeters measuring the amount of product going into storage tanks...
reported different amounts than the level readings did. Hence, the management was forced to guess at daily production efficiencies and inventory levels. When the upgrade improved the reporting accuracy by between 5 percent and 8 percent for the flow rates and about 10 percent for the levels, management found that it had not been accounting for a lot of product.

Another benefit was a reduction in required maintenance on the software and firmware. The resulting lower costs for maintenance alone paid for the investment in a little more than two years. More importantly, though, the company is no longer investing in a control system that won’t support the growth that is expected for the next five to 10 years.

A continual program for keeping automation up to date is crucial for manufacturers who want to avoid the headaches and expense associated with ripping it out and starting over. “The key here is to refresh your hardware and software periodically so that it’s not a jolt when you need to make a change,” says Marjorie Ochsner, senior product manager for system migrations at Phoenix-based automation supplier Honeywell Process Solutions. “Facilities that haven’t upgraded any of their automation over a 30- to 40-year period are sometimes unable to upgrade in an orderly manner.”

She and most other experts also recommend beginning with the human-machine interface (HMI) and other aspects of the operations side of automation to ensure than you maintain a migration path. She compares it to updating your desktop or laptop computer. You need to refresh it periodically so you can use new applications and accommodate new technologies.

**Eyes vs. hearts**

Controllers are the big exception to this rule. To explain why they should be replaced infrequently, Ochsner compares control systems to the human body. In this analogy, the operator stations are the eyes of the system, and the controllers are the heart. “You put on new glasses to refresh your eyes quite often, but you don’t do a heart transplant unless you really have to,” she says.

For this reason, she recommends working with automation vendors that are dedicated to supporting their controllers for very long periods of time. When a vendor stops supporting its controllers, it puts the plants using them at risk. Because controllers are the hearts of automated systems, they can shut down a plant for a long time if no service is available when they fail. “If an obsolete part is critical enough to shut down your plant, then you’d better think about replacing it,” advises Ochsner.

USA Yeast, of Hattiesburg, Miss., took her advice to heart when it began to experience some growing pains. Its ProcessLogix controllers and I/O modules from Rockwell Automation were still in good shape, but the fieldbus interface module was having trouble communicating with some new Rosemont temperature transmitters. The module would not recognize the DDE files. “We needed a system that could grow with us and provide a clear migration path,” explains Stacey Miller, applications engineer at USA Yeast.

To develop one, the company turned to control-system experts at Honeywell. Because Rockwell continues to support parts of the system, Honeywell engineers were able to preserve the installed controllers and I/O modules. They upgraded the HMI and made a few other adjustments to bring the existing system up to date. For example, they moved the CL5555 processors and DeviceNet cards paired with a C200 processor into their
own racks, edited the exchange blocks and CL5555 processors to accommodate the new ASA path, and “flashed” all of the cards in the system with Honeywell’s firmware.

The frequency of such upgrades depends upon the application. “We have some customers that refresh every five or six years,” notes Ochsner. And some stagger the upgrades so they are not replacing all of them at one time. They find it both cheaper and less disruptive to do it incrementally than to rip everything out all at once.

To read the accompanying sidebar to this article, go to www.automationworld.com/feature-4348.