Process control: Managing the modernization process

By Jack Smith, Editor, AppliedAutomation

When process industries face control system modernization, they also face inevitable decision opportunities. Changes can range from simple component replacements to a full-blown overhaul.

Modernization has been called "migration," "evolution," "upgrade" and "rip-and-replace." "For example, one customer may call the project a 'migration' when they move from automation system A to C, while another customer may call that an 'upgrade' or a 'modernization,'" said Laurie Ben, director of modernization and migration, process systems and solutions at Emerson Process Management. "Another customer may say a 'migration' is within the current platform, i.e. System A to System A+, while that is considered an 'upgrade' at another customer site."

Migration, rip-and-replace pros and cons

Modernization comes in many flavors and depends on where plants are in their automation continuum. The bottom line: It comes down to time and money.

Changing out an entire control system requires a significant capital investment, which may be difficult to justify. The older the existing system, the easier it is to support ripping it out and replacing it. Even then, the decision comes down to cost-benefit ratio, return on investment, process disruption, company goals and tolerance to risk.

Ken Keiser, senior marketing specialist for process automation systems at Siemens Energy & Automation thinks the decision is more time-based. "If you want to do something fast, you would want to do rip-and-replace. You’re going to have a new system immediately," he said.

Keiser said rip-and-replace requires a lot of planning. "You’re looking at maybe six months to a year of planning, and then (maybe) a two-day cutover. Whereas – looking at the big picture – migration in a step-wise movement could take a decade. It depends on whether or not you have the money to do everything at once. If you don’t, you want to do it in a step-wise fashion," he said.

Mark Bitto prefers the term 'evolution.' "Unlike a greenfield installation where the user is beginning with a ‘blank sheet of paper,’ an existing system already has made investments in wiring, terminations and marshalling of field signals," said Bitto, global business development manager, control systems evolution at ABB Inc.

"Migration and rip-and-replace strategies represent a more radical step-change and provide the user with a ‘one time’ improvement opportunity," Bitto said. "These strategies require large capital budget investments and most likely will result in major disruption to production (long periods of start-up and commissioning) and risk to production by overhauling plant best practices (operations, engineering and maintenance). In the end, migration/rip-and-replace upgrade costs usually outweigh the associated benefits."

Bitto said migration and rip-and-replace strategies should be considered only when the installed system can no longer address – or provide a viable path to address – the user’s business needs. "Typically, users will try to avoid these drastic modernization techniques. Consider that an existing installation is fully operational (making product equals making money). Shutting down for extended periods to migrate or rip-and-replace means the site is not making product/money," he said.

There is no ‘typical’ migration scenario; they vary from plant to plant. The extent to which a plant should...
upgrade depends in many cases on the age of its existing automation systems. “Customers with automation systems that are older – 20 years plus, or panel-mount controls and pneumatics – have an opportunity to upgrade to new digital bus technology in field devices, along with the latest digital automation system that delivers improved process performance, reporting capability and alarm management,” said Ben. “They are looking at their entire automation network.”

Ben said if a plant is using an automation system with obsolete console electronics and/or software, an HMI upgrade is an attractive alternative and a worthwhile first phase migration project. “That allows them to move control hardware/software and I/O over in a flexible or phased approach, minimizing process upsets and downtime. The customer can then assess their process, units or system, and focus on implementing new technology in the area with the largest opportunity to support their business drivers,” she said.

Modernization methods

Migration usually involves a phased or stepped approach. “In a migration, HMIs are generally the first item to be upgraded,” said Bruce Jensen, manager of systems marketing and sales support at Yokogawa. “That is because HMIs are either based upon proprietary display hardware, or if they are now commercial off-the-shelf PCs or workstations that are running older operating systems.

“The second item is generally the I/O subsystems,” Jensen said. “The main concern there is the field wiring to the devices. The basic question is, ‘Can the I/O be saved, or more generally, can the field termination assemblies be saved?’ Sometimes with the I/O subsystems, field devices including traditional flow, temperature and pressure are replaced with smart...
“Typically, evolution improvement steps can be performed within annual maintenance budgets.”
— Mark Bitto, ABB Inc.

instruments, but now (with) MCCs or other devices with intelligent controllers and networks and the like.”

The controllers come next – often with the I/O – and interfaces to subsystems, systems and field networks. Interfaces to supervisory systems are last, according to Jensen. “These happen in stages; or in rip-and-replace, all in one project,” Jensen said. “Non-DCS includes SCADA and Safety Instrumented Systems – these have similar issues as DCSs.”

“Using the installed system as the foundation, evolution strategies deliver continuous improvements to automation system functions, allowing system owners to meet automation system business objectives in an incremental way, affording the lowest risk and greatest financial return,” Bitto said. “Typically, evolution improvement steps can be performed within annual maintenance budgets.

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