

13 Suggestions for Control System Migrations

As anyone who has been involved in a control system migration will tell you, it's never an easy process. Whether it's an upgrade, expansion, stepwise migration or rip-and-replace, the bigger and more complex the project, the more fraught with tension and risk. To help you get through the project with your sanity intact, we share our recommendations and suggest pitfalls to avoid:

1. Determine strategy. Your migration strategy will depend on which type of automation you're dealing with: scripts, workflow tools, policy-based orchestration, configuration or control systems. The different activities that can be automated (provisioning, maintenance, proactive incident response, production execution, etc.) and the different degrees of automation (automating just a few actions, partial workflows or end-to-end) will determine your strategy in terms of resources, time scale, production stops, etc.

Migrating your control system at your own pace



2. Virtualize first. Automation upgrades or migrations need to be scheduled properly in terms of system commission date to extend the warranty or for a vendor's obsolete notice date. The best practice is to conduct a virtualization of the new automation system.

The future of automation will need virtualized infrastructure and platforms to deal with the IT spectrum, cyber security and better management capabilities. Virtualization has many benefits in terms of technology, investment, maintenance and lifecycle cost.

- 3. Take it one step at a time.** Avoid changing the entire system or manufacturer if you are upgrading. Upgrading to the newer modules or systems of the same vendor provides a bit more reliability, since the basic architecture remains the same.
- 4. Don't experiment.** While innovation is important, there is a counter-argument for doing what you know will work. If rip-and-replace is possible (and that means you have to stop the plant for several days, weeks, or months depending on the circumstances) and you know that it works, that is the best choice. But if you can't afford a shutdown, then go for a step-by-step migration. Make sure you work with an experienced vendor and proven technology.



5. Consider three critical migration issues.

When doing a migration there are three points to think about: how to update software and whether you have the right conversion tools; what you need to do to avoid system failure or risk for the migration step; what is the expected lifecycle of the new system.

- 6. Make no assumptions.** Try to foresee every small step in a migration implementation. Don't assume anything. Every implementation is done to achieve some objective of the operation. The needs could range from some reporting or alarm functions to an action initiated due to alarm. Always visit the site to understand the requirements and the nuances completely.
- 7. Changing suppliers adds some complexity.** The difficulty of a process migration usually increases when you change DCS suppliers, since different brands often don't have similar functions. Factor that into your timeline and risk assessment when weighing whether to switch vendors.
- 8. Start with data needs.** First you need to understand what data the user will require and how quickly the data is needed. That should be the starting point in developing your migration strategy. The second priority is to determine the impact on the safety and productivity of the plant.
- 9. Focus on controllers.** The best strategy is to first upgrade the controllers, then replace the I/O chassis piece-by-piece going forward. Some I/O changes could be driven by other projects, such as a motor control center(MCC) replacement.
- 10. Do your homework.** Do some up-front analysis to avoid creating problems for yourself by not choosing the right migration path. For example, migrating from one generation of processor to another one may not be a wise choice. Reviewing the instruction sets and information available about conversions and manufacturer recommendations will give you insight into the difficulty of the conversion. If you do your homework, you might choose a different processor to make the conversion easier.
- 11. Technology education.** It is important to educate everyone on the new technology. Remember, it is easy to use "old" thinking instead of changing practices to take advantage of the benefits of the new technology.
- 12. Decentralize.** The architecture has to be critically reviewed and transformed, keeping in view the improved performance of the local controllers. Your mantra should be to decentralize the controls as far as possible.



13. Aging equipment. Depending on the technology you have installed, when your equipment is more than 10 years old you will need to implement a rip-and-replace. If you are just making some modifications you can upgrade or make an expansion only. Most of the problems that arise during a migration are with the field equipment you have installed and control room facilities.

Migrations Are Emotional Events, So Work to Minimize the Pain

Even if the technology being used is important, the success of any control system migration will be mainly people-related. Plan for disruption and try to minimize that. Operators, technicians and everyone else directly touched by a migration will be upset. Regardless of the benefits, nobody is going to like it. Just accept this. When you are explaining the new equipment, do not exaggerate or misstate anything because everyone will only remember the thing you said it could do, but it turns out it can't.



It is mandatory to conduct an extensive upfront study to identify and clearly define the implementation strategy and the potential consequences to production. Involve operations, maintenance and management teams so that the suggested transition will be "blessed" by all.

Making the transition as smooth as possible will require the cooperation of all involved. Structure your team to include both seasoned personnel who are the old-system's experts (and know how it really works) and relatively new personnel who are competent enough to learn, but not already ingrained with the old system. The newer people will pick up the new system more easily, while the more-experienced people will be able to stop you from doing something stupid.

Four Considerations for Upgrades and Migrations

Regardless of whether you want to increase productivity or shorten time-to-market, attaining success in these areas depends on the application of suitable automation technologies in a continuous process operation. Following are the principal steps involved in assessing your plant's technology to gauge whether a technology upgrade or migration is in order:

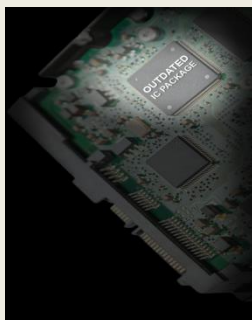
1. Consider the full range of aspects that relate to your existing systems, such as:



- Risk of unplanned plant downtime and production stoppages;
- Ability to expand production or introduce new products;
- Ability to integrate with enterprise-level business software and at what cost;
- Ongoing maintenance costs;
- Need for continuing support of the legacy system; and
- Effect on the efficiency and productivity of plant personnel.

2. **In each case of upgrade or migration, return on investment plays a crucial role.** A huge investment in hardware and application software is associated with the installed process control system, as well as the accumulated know-how of the operating, engineering, and maintenance personnel. For this reason, the prime objective of any migration strategy should be to modernize the installed base gradually without any system discontinuity and, if possible, without any plant downtimes or loss of production that would negatively affect the investment return.

3. **Assess the long-term security of existing investments.** This assessment is important in order to maximize the return on assets (ROA). For this reason, every migration should include a robust lifecycle support strategy for the new system that considers not only the availability of the components, but also product warranties, on-site service, and ongoing technical support.



4. **Obsolescence.** When deciding whether to upgrade or migrate to a new system, there are two aspects of obsolescence to assess. In a migration, it's important to understand the history of the technologies supported by the company behind the product under consideration. Does this company actively support the long-term lifecycles of products as they are typically employed in a process operation? Do upgrades have significant backwards compatibility? How often are upgrades typically released for this system and what is required for installation?



For upgrades, it's important to understand what the future outlook is for the system under consideration.

With the significant maintenance and security issues tied to process control systems, you should always consider your risk of system obsolescence and the associated costs incurred with such a scenario versus the costs of moving to a better-supported system. The good news is that, in the process industries, most vendors are very aware of the long-term use of their systems by end users and thus tend to support their systems for multiple decades rather than a single decade, as is more common with office IT systems. As newer automation technologies become core components of process control systems, be sure to talk with your supplier about their support plan for those newer technologies.

Finally:

Update policy. Digital upgrades can become obsolete much faster than previous analog devices. Make sure you have put in place a sound software/hardware update policy with your vendor of choice. Don't become complacent about upgrades.

Get to complete. The hardest thing to do is to get to "complete." You'll find that as the system matures and users gain more experience, they want more features. If you never freeze scope, you never get complete. If you never get complete, even if you add all the features requested, then the project will fail.

Document it. Always finish as-built project documentation. Have funds earmarked and dedicated exclusively to this effort. Keep a continuous record of updates and releases, so that there are no undocumented updates or fixes. Make sure you capture the lessons learned along the way during any automation project and document them in your system.