White Paper

Honeywell

Honeywell Process Solutions

Control System Migration:
Protecting Investments, Lowering Risks

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Today's competitive environment demands automation solutions that increase plant efficiency and profitability. Control system performance can significantly impact a plant's bottom line. Leveraging automation capabilities through simplified, cost-effective migration to new technology while optimizing current investments is key to success.

In some cases, legacy control systems can no longer meet corporate objectives that include enterprise-wide sharing of business information. Nor can they enlist advanced control capabilities that enable increased throughput, lower costs and improved regulatory compliance while responding to customer demands for better product quality and faster delivery.

This paper analyzes the requirements for safe and manageable control system migration, providing guidance for users who recognize the need to upgrade to the latest process automation technology while making the most of existing plant assets and intellectual property.

Background

For industrial companies, improving the performance and business results of Brownfield plants through control system migration has become an important strategic initiative. The typical drivers for migration projects include the impact of downtime of existing control platforms, the cost of maintaining obsolete equipment, and the need to acquire or supervise global business data.

The need to upgrade to newer automation capabilities means that industrial operations must select the best migration strategy and technology solutions based on various critical factors, including control reliability, data configurability, network architecture support, plant standardization and safety-instrumented systems (SIS) integration.

In recent years, consolidation of automation industry vendors has created some confusion for customers, especially when it came time to upgrade their process control systems. Some legacy systems were neglected or outright abandoned by their new vendor-owners. For process plants, the critical issue in control system migration is deciding when to jettison the old in favor of the new. However, obsolescence does not happen on a specific date, but rather is a gradual process that starts when a vendor discontinues support. Spare parts become more difficult to procure and more expensive. At some point, as spares become too expensive or too hard to find, obsolescence is inevitable and migration must occur.

Project Challenges

In most companies, there are many projects vying for the same capital dollars. When migration projects do get funding approval it is imperative that they are executed successfully to gain justification for other automation projects.

For industrial plants, migration challenges include:

Selecting the right technology

The first task in any migration project is determining the process for selecting the future control system. The process used for this selection often determines customer satisfaction with the new automation solution. Faced with increasing performance demands, industrial facilities need a seamless platform that provides the foundation for integrating process control and safety systems, along with automation software, under a single, unified architecture. They also require software applications that enable the capture and sharing of process knowledge for better decision-making. Additionally, plants seek collaborative decision-support tools that help minimize disruptions and overcome abnormal situations.

With an open, tightly integrated automation solution, end-users can unify plant safety and control, providing increased safety, security and system dependability. They also gain a single facility-wide view of operations, plus the interfaces with industry-standard digital network protocols to optimize existing assets.

Many end-users are ready to provide mobile computing capabilities through the adoption of wireless solutions that extend the reach of automation. New wireless field data collection systems enhance asset management by integrating field data with data from other sources, including production, process control and work management systems.

Ensuring operator acceptance

Operator acceptance is a key intangible that can determine migration project success. Because the control system is a direct operator interaction device, even if the new technology outperforms the legacy system, a lack of consideration for operator needs can lead to failure.

Replacing HMIs

The Human Machine Interface (HMI) included in Distributed Control Systems (DCS) is most vulnerable to support issues. At many plants, multiple types of HMIs are installed. At some point, the HMI hardware will exceed its life expectancy or the cost of finding replacement parts will become prohibitive.

Figure 1. HMI migration is one of the most important aspects of control system modernization.

End-users need a solution that allows the new HMI to communicate with existing controllers on a continuous basis. Ideally, the new HMI would run in parallel with the current one for some period, giving operators a feeling of continuity during the transition.

Creating third-party interfaces

Communication and interfaces with third-party devices can be a major stumbling block to automation system upgrades. Control systems frequently communicate with legacy systems, such as Programmable Logic Controllers (PLCs), safety systems and advanced applications. Identifying these systems and determining a detailed interface plan is essential for an effective migration.

Scheduling migration work

When it comes to a control system migration plan, best practices can reduce or eliminate risks. First and foremost, give thoughtful consideration to the scheduling of any migration. Long-term planning for multiple migration stages will help to ensure maximum ROI and minimal disruption.

Preparing for system cutover

System cutover requires careful planning to minimize risk. A comprehensive cutover plan is a critical requirement for seamless transition to a new control platform. Without proper preparation, migration projects can be affected by cutover delays and other unexpected issues that may cause downtime.

Technology Solution

Now, more than ever, industrial operations need an easy, low-risk transition path to a modern control system architecture. With an effective migration solution, companies can take advantage of existing automation investments while building a base for the latest digital technologies.

Unified architecture

Unifying people with process variables, business requirements and asset management allows automation end-users to transform process control beyond traditional DCS functionality. Competitive demands call for an automation system that focuses on plant personnel and makes the most of their knowledge.

By upgrading to a “process knowledge system,” end-users can achieve improved operations, increased incident avoidance, better decision-making and enhanced workflows. Automation systems employing best-in-class technology, built on a secure DCS architecture, integrate the entire scope of production—equally addressing the needs of operations, maintenance, engineering and business. In addition, these systems provide integrated physical security, emergency shutdown and fail-safe controls.

Seamless integration

With integration of new and legacy systems, controller data has the same look and feel—regardless of where the data originates. Operator effectiveness is improved by merging multiple platforms. Plant personnel have seamless access to points, alarms, operator messages and history between servers. Moreover, they can access a single virtual database without duplicate configuration.

Thanks to an integrated control infrastructure, alarms and events are detected automatically and operators have system-wide acknowledgement. Secure control access can be achieved using OLE for Process Control (OPC) with vendor-specific extensions. A truly unified system solution allows peer-to-peer communication between legacy systems and the application control environment. It also provides a common security model, as well as fault tolerant communications with full redundancy.

Continuous evolution

Effective control system migration does not end with a single modernization project. Industrial plants need a cost-effective approach for maintaining up-to-date process automation functionality and minimizing risks associated with system upgrades.

Continuous control technology evolution is the goal of lifecycle management — accomplished by establishing a committed automation roadmap that leads to either electronic refresh or complete migration. Lifecycle support allows plants to start down the path to modernization today, and progress incrementally as needs and schedules dictate.

A lifecycle management solution should offer flexibility in how companies manage their plant assets and predictability in how their choices are financed, including the freedom to choose when to modernize, how to fund the transition and how long to maintain current capabilities. In this way, companies can effectively extend equipment life while providing a secure path forward to the latest advanced control technology and functionality.

End-users should partner with an automation vendor offering multiyear support agreements that guarantee parts availability and support until a modernization occurs according to site operating plans. Such agreements result in predictability by providing:

- Locked-in pricing on spare parts, support contracts and migration/upgrade kits
- Reduced risk and increased reliability via guaranteed maintenance
- Long-term protection from equipment obsolescence

Case History: Dupont Chemical

On August 29, 2005, Hurricane Katrina ravaged the U.S. Gulf Coast. DuPont's DeLisle Titanium Dioxide (TiO2) plant sustained heavy damage due to wind and water. The facility had a comprehensive hurricane preparedness plan. Nevertheless, a large share of its process automation and control room equipment was destroyed in the storm.

Figure 2. DuPont's DeLisle TiO2 plant

Prior to the hurricane, DuPont had implemented a comprehensive lifecycle management strategy for the plant's process control and safety systems. A detailed analysis of the plant's existing system was performed and a multiyear plan was put in place. This system encompassed approximately 20,000 I/O points.

After Katrina, DuPont teamed with Honeywell on an ambitious rebuild of DeLisle's entire process control system. Plant management viewed the DCS recovery as an opportunity to replace outdated equipment. Due to migration planning completed prior to the hurricane, DuPont was able to identify the path forward quickly and in the most efficient manner. For example, the project accelerated migration from Honeywell PLC 620s with Logic Managers to contemporary C200 controllers. UPS, grounding and power distribution systems were updated in certain areas due to obsolescence. Most panel-mounted instruments also received a technology refresh.

As a result of the DCS recovery effort, DuPont was able to restore the DeLisle operation to commercial production ahead of schedule. This project demonstrated the critical nature of an emergency preparedness and recovery plan, and proved the value of technology migration backed by solid vendor alliances.

Migration Strategy

Properly planned and implemented, control system migrations enable end-users to migrate legacy control platforms at their own pace, allowing new controllers to be added at any time and integrated with existing controllers. It also permits migration of subsystems and function blocks to new controllers whenever the user decides.

When a migration project is identified, several critical areas commonly define whether or not the work is successfully completed relative to scope, schedule and budget. First, end-users must take control of their existing system and clearly define upgrade goals and objectives. Then they must determine the optimal migration strategy. A structured, organized approach to system migration enhances the benefits of technology upgrades and preserves the rich intellectual property contained in legacy systems. Regardless of vendor support, end-users should play an integral part in the migration effort, reviewing its progress every step of the way.

Do your homework

As part of good engineering and project management practices, plants should take the following steps during migration planning:

1. Determine the best time to migrate
2. Determine the best migration path
3. Define the project through front-end engineering
4. Use a proven approach with comprehensive checklists
5. Develop detailed cutover plans
6. Define intermediate operability and training plans

As with any large, complex project, planning for control system migration is the key to success. The most important parts of a migration plan are the process definition and functional specification documents, defined at the start of the work. When detailed planning is not completed prior to beginning the project, everything takes longer than expected.

To ensure a successful technology migration, end-users should plan for the change, identify a critical timeline, conduct regular (perhaps daily) meetings, engage those who will be affected by the change, identify all available resources and plan for contingency resources or vendor staff, if needed.

A formal migration plan identifies migration and support strategies for existing control system nodes, such as controllers, HMIs, supervisory computing nodes, etc. It also includes proposals for consolidating existing control systems in order to reduce costs and enhance safety. Additionally, the plan provides recommendations for ensuring the reliability, robustness, security, expandability and ease of diagnosis of process control networks.

Major control system suppliers employ knowledgeable migration experts who can optimize the number of steps required to execute a long-term automation migration plan. These migration specialists help leverage investments in critical legacy components and maximize the retention of intellectual property.

Assess your current system

A system assessment is essential for determining currently installed assets, as well as identifying current maintenance costs. The assessment outlines areas for improvement, the anticipated value of those activities and specifies actions that will achieve improvements.

The system assessment typically includes:

- Audit of the current system and process
- Recommendations for HMI migration and effective operator displays
- Recommendations for base regulatory and advanced control improvements
- Strategies for migrating hardware and software, and protecting current installation investments
- Plans for personnel training and implementation
- Recommendations for optimization and integration

Perform front-end engineering

Migration projects can be more complex than they appear at first glance. Such issues as space allocation, HVAC and power considerations can have significant impact when not identified early in the project. Upfront engineering defines the detailed migration work scope and estimates the overall cost of upgrades. Front End Loading (FEL) can identify potential difficulties with a migration project and provide plans to mitigate risks. An FEL study analyzes all aspects of the project, including mechanical, civil/structural, instrument, electrical and controls. The result of FEL is an overall design specification, outlining the strategy and schedule for migration activities.

Optional Methodologies

Industrial facilities should take care to choose the migration methodology best suited to their specific needs. No single approach is appropriate for all operations. Typical migration options include:

- Phased migration – Allows system modernization in gradual steps, replacing the HMI or a particular unit first. Once this is completed, the end-user can take advantage of solutions improving operations and safety. The rest of the system can be replaced over several years.
- Complete replacement – Allows the entire system to be replaced all at once during a planned outage. In some cases, hot cutover can be used to minimize system downtime and ensure seamless integration of current control assets.
- System upgrade – Allows an upgrade of critical system components at the end-user's own pace. The main automation contractor must be committed to retaining the value of existing systems and continuing to offer parts and support for the legacy platform.

HMI migration is key

HMI migration is one of the most important aspects of control system modernization. Upgrading legacy DCS operator stations to the latest HMI technology allows plants to provide a common user interface to the integrated control architecture, reducing training and maintenance requirements by keeping existing graphics, networks, controllers and I/O in place. It also provides direct access to the control network with read/write data access and integrated alarms and events.

Frequently, when a control system requires change, replacing existing controllers also makes economic sense. For migration, two key functions are required — the existing field signals must be easily and quickly moved to the new control system and the existing control schemes must be migrated (and preferably improved).

Automation suppliers offer hardware assemblies and project services that enable the simple and easy transfer of existing DCS I/O connections so end-users can take advantage of the full performance benefits of a new automation platform.

Phased migration

For a large-scale retrofit, it is often best to use a phased approach. Phased migration eliminates risk by incrementally narrowing the focus, while providing a fallback position to the old system. This approach requires communication with the existing system for interim phase-in, physical coexistence with the old equipment to enable a hot cutover and the ability to switch quickly and easily between old and new signals for testing/tuning purposes.

Phased migration does have its drawbacks in terms of cost and time, but it is a lower risk approach with less downtime. Further risk and downtime reduction can be achieved by simulating the new system prior to installation.

End-User Benefits

A well-executed migration plan provides significant operational and business benefits through seamless integration of new and existing automation systems. By incorporating existing data, events and operator messages into the control architecture, and providing a common operator interface, the legacy system appears as an extension of the new system.

From managing existing parts or infrastructure to upgrading hardware and software, an effective migration solution can maximize the end-user's ROI while helping them maintain predictable year-over-year expenditures.

The specific benefits of control system migration include:

- Increased protection of asset investments
- Reduced modernization risk
- Increased plant reliability
- Improved process performance
- Improved operator effectiveness
- Fewer unscheduled shutdowns
- Greater productivity through a faster network
- Enhanced platform for advanced applications
- Improved human interface functionality
- Reduced engineering time
- Improved ease of communication with third-party systems, devices and software
- Increased wiring and I/O savings
- Reduced service and implementation costs
- Lower component costs as compared to legacy systems

Conclusion

Control system migration projects, although challenging, have the potential to deliver great value to industrial plants. The process used to arrive at migration timing and scope has considerable influence on whether that value is actually achieved. The most critical consideration is planning. The more upfront detailed planning performed, the lower the risks in the execution phase of a project.

A well-planned and executed automation migration ensures seamless integration of new technology and continuous lifecycle support for legacy systems. It puts the end-user in control of the plant modernization strategy, allowing them to determine component investments and how much longer to maintain current capabilities.

For More Information

To learn more about how Honeywell's migration solutions, visit www.honeywell.com/ps or contact your Honeywell account manager.

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