
Upgrading Your DCS: Why You May Need to Do It Sooner Than You Think

White Paper
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Introduction

Process plant operators looking at their existing automation systems are facing pressures from two directions. First, the distributed control system (DCS) platforms controlling those units are getting older and exhibiting age-related problems and failures. Second, newer technologies are capable of extending what those older systems can do. For both these reasons, many plant operators should be making plans for major upgrades or even migration to a completely new system, but large numbers of facilities are trying to push out the inevitable change by scavenging spare parts. Unfortunately, many of the OEMs ceased supporting legacy platforms long ago and may have even gone out of business, so the ability to keep these old systems running is quickly eroding. A serious failure can cause a plant to grind to a halt with no simple means to fix the problem.

The big question for most is how long they can continue before a catastrophic failure. While waiting until the last possible moment may seem like the sound financial approach, it is very risky. It is better to launch an upgrade program long before production hangs in the balance.

The decision to upgrade a DCS is like the decision to upgrade your laptop or PC without pausing your work, but on an enormous scale. Transferring files and programs while learning new PC software is never easy, but using an outdated computer is even more of a chore and it locks you into obsolete technologies. Support becomes harder to find, new programs cannot be used with old operating systems, and speed and storage become major problems. Efficiency suffers as a result.

Of course, migrating to a completely new DCS requires far more extensive planning than upgrading a PC. Fortunately, there are many ways to make it easier to justify and accomplish.

Don't Wait Until It's Too Late

Your control system is supposed to support your manufacturing. When keeping it going demands too many resources, it ceases to be a benefit. It's important to understand the risks of waiting to upgrade so you can decide when the time is right for your business. Here are five reasons why you may want to upgrade sooner than later:

Signs That Your DCS Needs Upgrading

- People who support the existing DCS are close to retirement.
- The vendor has ended support for the product.
- Outages and downtime caused by control problems are increasing.
- Current technologies are not compatible with your DCS.
- Spare parts and technical support are becoming hard to find.

1. The number of operators and engineers who understand your existing DCS is shrinking.

Retirements and promotions have reduced the number of engineers with expertise in most legacy DCS platforms, including yours. Younger engineers, the kind you're trying to recruit, will be reluctant to join a company where their first years on the job will involve nursing an old control system built on equipment headed for the scrap heap. Where young engineers have a choice, they will go where they can work using new technologies and build job skills with a future. On the other hand, an upgrade strategy provides a means to collect the knowledge of your retiring workers and build it into the new system. Younger engineers can participate in this change-over and be part of designing what the plant will look like for years to come.

2. Since product support ended long ago, upgrades are more challenging. Moving past the end-of-support deadline impacts all the users of the platform everywhere, and your facility may be one of many scrambling to find a new solution. As the number of skilled technicians dwindles and the supply of replacement parts dries up, all the plants running that system face the same problem. You will have to compete with them to find quality resources — human and hardware — for the transition. Plus, the external deadline reduces your flexibility to adjust to unforeseen problems. Planning and executing a DCS upgrade or full migration project can take years, so by starting early you can complete the migration before support is completely gone. The absolute worst time to upgrade your DCS is under a time crunch when production is seriously threatened. When your vendor says it will cease support, take it seriously, especially if the company's focus shifted long ago to a new product line.

3. Old systems cannot use many new technologies. An outdated DCS using older networking protocols cannot communicate effectively with most third-party systems, eliminating remote access capabilities. Even something as simple as adding wireless field devices becomes problematic. Workarounds exist but can be expensive because they often require complicated, custom hardware and code writing. Upgrading to Ethernet-based networks and an OPC-compliant DCS opens the door to a wealth of productivity tools and advanced control applications able to deliver more return on your DCS. The ability to communicate with third-party systems such as SAP, ERP and MES using open, standardized communication approaches will deliver benefits across your enterprise.

4. Old systems only allow for configuration of certain types of controls. Old DCS platforms were designed to handle control strategies designed 30 or 40 years ago, which were adequate for plants of the era. Today's DCS products do not suffer from fundamental control problems such as those related to initialization, windup protection, override selection and discontinuous control. New systems can also directly incorporate advanced regulatory techniques, such as small-scale multivariable and model predictive control,

eliminating the need for expensive MVC software and license agreements. Other characteristics of the latest generation of DCS products include:

- Simplified procedures for bulk-building and editing of I/O points.
- Microsoft® Excel or XML formats that allow users to build the control database more easily than with cumbersome text dumps.
- Graphical function block configuration, which makes configuration easier than text-based forms and allows for easier control application maintenance and self-documentation.

5. The cost of staying with an old system eventually exceeds the cost of an upgrade or full migration. Maintenance of older systems becomes more expensive as support dwindles and spare parts become harder to find. If your maintenance team is spending more time repairing system components rather than improving your process, it is time to upgrade. As reliability begins to decline, unplanned shutdowns and the resulting production losses increase your costs.

Approaching a DCS Upgrade

Once your business decides it's time for a new DCS, you must decide how you will approach the transition. Upgrades are complex and expensive tasks, so depending on the size of your system, it may make sense to do it all at once while others may take a phased approach.

New Unit, New DCS — If a plant expansion is in your future, one of the best ways to introduce a new DCS into your plant is to specify it as part of a new process unit installation. Operators and engineers can be trained on the new technology, which will make future upgrades of your existing facility easier. One of the worst things you can do is to try and save money by installing an older DCS on your new unit. It is likely you will never see a return on such an investment, since these projects are invariably more complex than they sound, and an upgrade will have to be done sooner than normal.

Phased Upgrade — Most of today's DCS platforms support some kind of phased or stepped approach to their deployment. Taking this path may actually cost more in the long run than an all-at-once project, but the costs can be spread out over a longer period of time. These approaches are also inherently less risky and allow for less downtime than replacing the entire DCS as a single turn-key project. Two common ways to perform a phased upgrade include:

- Update the HMIs first. The HMI packages for most newer DCS platforms can be configured on top of legacy control systems. (Some combinations of old and new platforms work better than others, so research this approach carefully and thoroughly if you are considering using it.) This upgrade can be done on a running plant with little impact to production during the conversion. By upgrading the HMI first and involving your operators in the process, you ensure their engagement before the complete system is installed. Changes in presentation and interaction with the new control system are some of the biggest hurdles operators face, so it may be a good strategy to execute this portion first. It is also the perfect time to replace your old graphics by developing a high-performance HMI (HP HMI) strategy and graphics. Operator effectiveness, safety and efficiency can be improved greatly by analyzing how your operators actually do their jobs and incorporating this into your strategy and screen graphics. Many new HMI packages also support extra connectivity, such as OPC. The HMI software can serve as an interface that allows for the development of MES and ERP projects without the need for a full DCS revamp.

- Replace the controllers and HMIs, but leave the existing I/O modules. Most current platforms have the ability to connect to I/O devices at the backplane of the old DCS controllers, allowing the I/O and field wiring to be left in place and upgraded as needed in the future. This approach is particularly well suited to hot cutovers, leaving reconfiguration of the I/O to be done as shutdown schedules permit. It also reduces the labor costs for electrical and wiring work and the associated documentation updates, such as wiring diagrams.

Finding the Right Partner and the Right Solution

Once you know how you'd like to approach your migration, you must make two decisions of equal importance:

- Who will serve as your partner during the transition?
- Which DCS platform should you install?

Of course, if you choose to have a DCS vendor assist with the migration, then it does both. Ultimately, your three basic options are:

- Stay with the same vendor. Some DCS platforms are still supported by the original developer. Others changed hands when the original company was purchased or went out of business. Most DCS vendors have paths in place to help you plan and execute the migration, even if it is a legacy brand. But keep in mind the ultimate goal of the vendor is to sell you new products, and it may want to move you from the legacy system to its current products. So if you are using a phased approach, take care to migrate only what you need at the time. Staying with the same vendor should also simplify the migration of the control strategy. Even though the DCS is a new product, there will most likely be some holdover from the legacy DCS able to make the transition of applications easier.
- Switch vendors. A comparison of current platforms from different vendors will show how some are similar in concept and practice, while others are drastically different. Similar platforms make for relatively easy migrations, while others are far more challenging. Sorting through these compatibility comparisons can help narrow down your range of choices. As you consider various offerings, make sure to evaluate the long-term outlook for the company while considering the technology and features. Many of the platforms still running now were developed by companies that no longer exist or have been acquired by larger companies. As those companies became obsolete, so did their DCS products. Also consider how often your prospective vendor rolls out new packages, because once the vendor has a new DCS to sell, support for older systems may diminish, forcing you to undergo another upgrade.
- Consult an independent system integrator. An experienced system integrator can help you make an unbiased, informed decision on which DCS to choose. This type of partner will have practical experience working with a range of products on the market in applications like yours. This experience is especially beneficial if your plant uses a mix of different technologies. A specific vendor has expertise in its own products, but an independent partner knows them all. The system integrator will also lead you through the planning and implementation, and will be supportive of phased approaches without pressuring you to buy more products along the way.

The Importance of Planning

When considering a project, remember: DCS upgrades and migrations take time, so plan accordingly. Plants with older systems often lack good documentation on system configuration and control strategies, requiring everything to be reverse-engineered. Application code and control strategies rarely port over directly. Many vendors claim to have automated tools for conversion, but their effectiveness varies according to which systems are involved. Make sure you allow enough time to adequately convert the system because these conversions invariably require some manual fixes. Also allow room in your budget for inevitable problems. Assembling a strong team of engineers, operators, IT personnel and maintenance technicians will help throughout the process.

On the bright side, upgrading your DCS is one of the rare opportunities to clean up your system, allowing you to remove all the dormant files, abandoned control strategies and obsolete data points. You should strongly consider taking this opportunity to leverage the latest technologies and standards to innovate and improve your process, delivering true ROI. Some ways you can accomplish this is to implement high performance HMI strategies and graphics, perform alarm rationalization, and ensure your company is protected from internal and external cyber threats. There are many gains to be made in adopting these newer approaches:

- By improving your operator interface and experience, you can put safety first.
- By implementing alarm management as part of the migration, you create improved operator awareness and response to abnormal situations.
- By assessing cyber security risk as part of the migration, you can identify vulnerabilities, implement good process, and deploy technology to protect assets and operations.

In the end you will have a robust control system that will improve the overall productivity for your operation.

Upgrading or migrating your DCS might seem like an impossible task, but it's really no different than any of the other major projects that occur within your plant at any given time. As with any project, the main key to success is the quality of the team you assemble. Once your DCS upgrade or migration is successfully completed, you can begin to reap the rewards that a new DCS is sure to provide.