

White Paper



Replacing Aging Process Automation Systems: Finding the best option

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Replacing Aging Process Automation Systems:

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1. Introduction

Today, for a variety of reasons, tremendous pressures are building that will require plant managers to update their aging automation systems during the next decade. Defining the need for and exploring alternative approaches to this modernization of manufacturing systems is the subject of this report.

2. The Need to Modernize

Managers in today's process manufacturing plants must react to factors ranging from massive customization and growing demand for change orders in the middle of production runs to management expectations mandating ever-faster execution of production orders.

Such constant pressures are driving many manufacturers to reevaluate the role of their automation strategies while improving the overall effectiveness of their enterprises. They're finding that automation is playing an increasingly important role in the effectiveness and profitability of their entire enterprise, impacting everything from cost of operations to customer satisfaction.

Fortunately, many are also discovering that they can make significant improvements throughout their value chain — without being forced to abandon their entire existing automation investment.

Bringing business and manufacturing together

For decades, strategic business decision makers at corporate headquarters focused on separate quarterly production targets and measures from each manufacturing entity in their organization. But along with excess manufacturing capacity and intensifying global competition, today's requirement for reliable, real-time enterprise excellence is making it increasingly difficult for businesses to keep manufacturing operations at arm's length.

The modern plant automation system must respond and inform immediately. And in the future, achieving operational excellence without tightly integrating every information and control system in your enterprise value chain may simply be impossible. This rarely occurs in plants today, mostly because of aging and inadequate control systems.

Improving plant performance

Over the years, considerable resources and money have been invested at the top levels of organizations to automate business processes through ERP, SCM, CRM, and related initiatives. Now we understand that to realize the maximum return from these investments requires real-time exchange of information with the plant floor.

However, when relying on today's aging plant floor systems, this is often not achievable. Only after system performance has sufficiently improved can your enterprise be enabled to reach a new, higher level of productivity. So you must first assess whether your existing control system can provide the realtime informational requirements of your modern business systems.

How old is old?

According to ARC Advisory Group, DCSs valued at \$65 billion on a global basis are nearing the end of their useful life. ARC defines "end of life" by two factors. First, the systems can no longer be maintained. Second, the systems cannot meet modern manufacturing requirements such as optimizing asset utilization or business system integration.

The following questions can help you determine whether your process control system has reached the end of its useful lifetime, or is ready for the next generation of enterprise productivity.

- Does your system enable you to adapt quickly and easily to a changing business condition?
- Can you implement advanced process control without extensive programming?
- Can you easily connect your system to local or wide area networks?
- Can you collect real-time production data from system sensors?
- Does your system support multiple fieldbus protocols?
- Can you still find a reasonable supply of replacement parts?
- Does the manufacturer still offer support for your system? If not, what impact will this have on your cost of ownership?

If you answer "no" to any of these questions, it may be time to consider upgrading your control systems. As you will see, this needn't be as much of an ordeal as you might imagine.

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3. Making the Correct Decision for your Plant

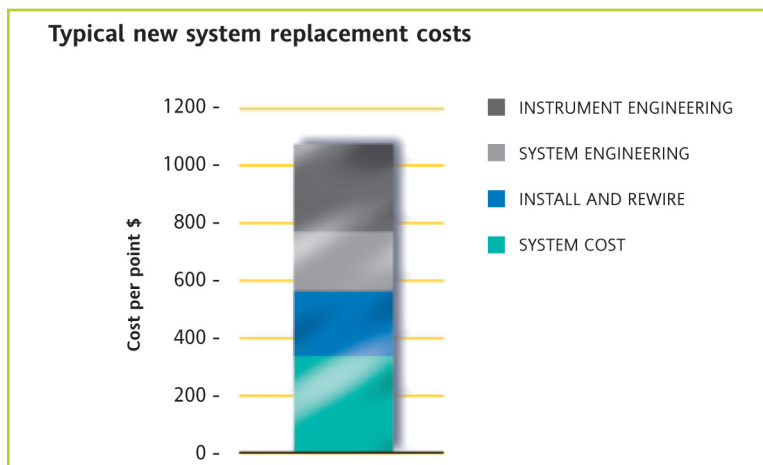
A classic DCS has three main elements: operator console (HMI), distributed controllers with integral input/output (I/O) modules, and a proprietary communications protocol. Typically, it also includes an engineering station and an application processor. Non-DCS functions such as batch management or supervisory control are often linked via a gateway or computer interface.

When you decide you're ready to upgrade, there are three fundamentally different approaches from which to choose. You can replace your existing system entirely. You can transition or upgrade elements of your existing technology. Or you can simply "plug in" a new system to obtain the advanced functionality that you require.

Total system replacement

The first approach, total system replacement, is conceptually straightforward. Once you find the system that meets your criteria, you purchase it, shut down for an extended period of time, tear out the old system, and wire in the new system.

Unfortunately, because of the risk, the high purchase price, the time required to wire and debug a totally new system, and the resulting lost production time, this approach nearly always represents the most expensive route. It's commonly referred to as a "bulldozer upgrade."



The migration upgrade

In our experience, however, you almost never need to bulldoze your entire legacy system. In many cases, for example, you can "save" parts of your current system such as racks and I/O wiring, since leaving these in place won't hinder the performance of a properly upgraded system.

For legacy systems in which the wiring is sound, basic control often can be migrated to new control system hardware. In these situations, replacing the whole system including the wiring is probably not necessary. Such migration is usually preferable to total replacement because it's much less expensive (up to 50% savings) and can save months of process downtime.

However, you must choose from several very different migration approaches. Each supplier employs a solution based on the inherent strengths or weaknesses of its newer technology. You can weed out most of these solutions on a cost basis simply by focusing on one key area — its approach to reducing cost, risk, and process downtime.

One of your best opportunities to reduce this cost, risk, and process downtime is the reuse of your existing field wiring. But because every vendor's new I/O equipment has a different signature size, shape, and I/O capacity, it usually can't plug into your existing termination assemblies without cutting and rewiring. If this is the case, be cautious — your risk of process downtime increases sharply.

You can soon find yourself in trouble due to excessive downtime and additional costs. At this point, in mid-stream, some vendors may recommend that you totally rip out the old I/O racks to install their cabinets, racks, and uniquely shaped I/O modules.

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Others recommend a cable solution in which a new set of cabinets, racks, and I/O equipment is installed next to your original equipment. Then cables are run between the two. And because the capacities of the old and new I/O modules typically won't match, wires need to be cut and moved to adjust the load.

In either situation, whenever wires must be cut and redistributed, you run the risk of additional costs for engineering, construction, and testing – plus significant downtime.

Migration via gateway

Another migration approach is to keep the old system and wiring intact while installing a new system in parallel, then integrating the two systems through a gateway. While this can be relatively low-cost and quick to implement, it's at best a Band-Aid solution. The underlying technology is still obsolete and will continue to age.

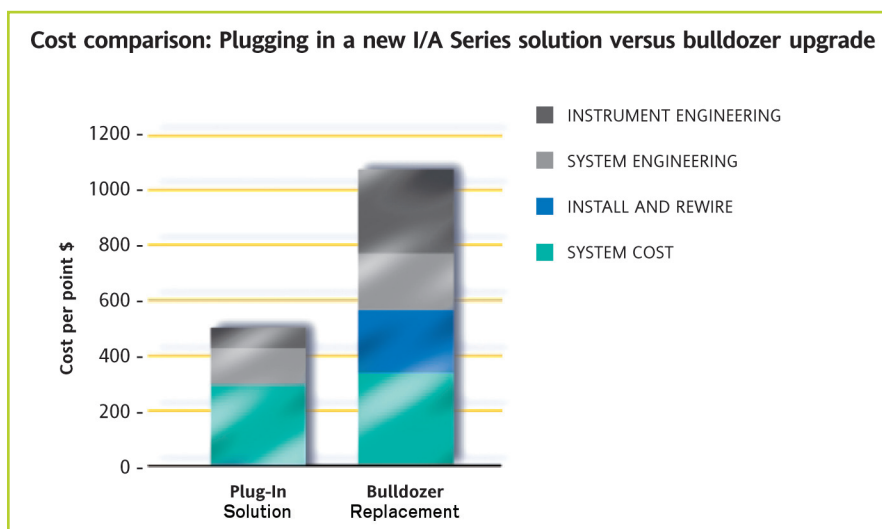
There are other significant drawbacks. As with the cable-connected approach, you need space for two systems. The old system also generates an additional layer in the communications system, which slows operation and creates another area vulnerable to problems. This would be especially undesirable in an upgrade in which the primary objective were to take advantage of advanced optimization applications, most of which require high-speed, highly reliable connections.

The "plug-in" upgrade

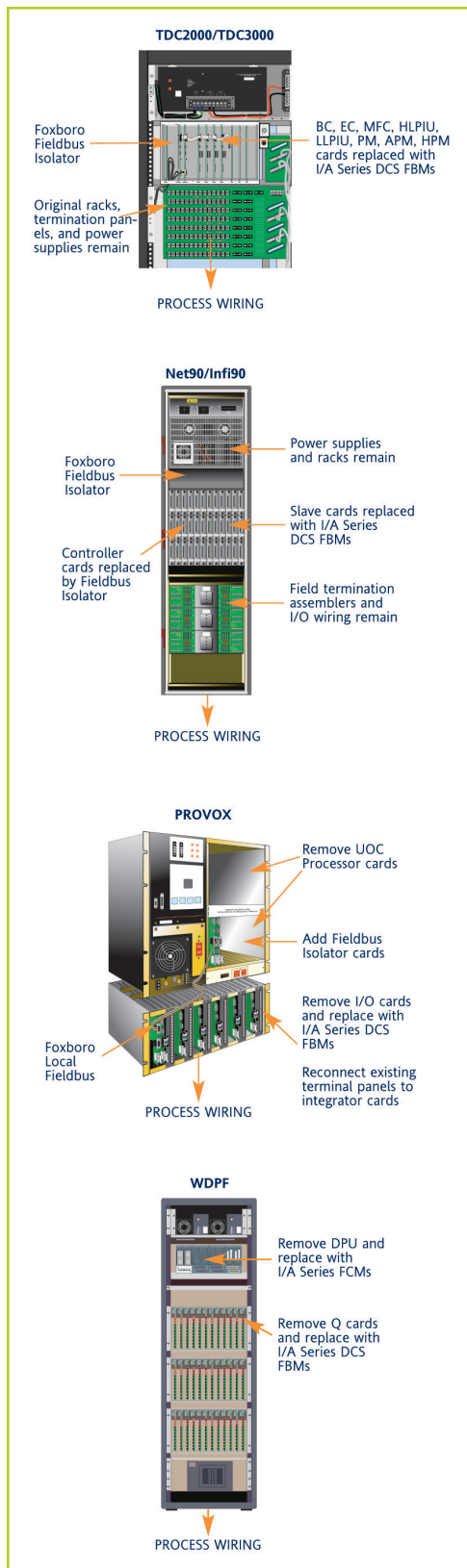
Fortunately, one supplier has developed a solution that eliminates the negatives associated with traditional migration approaches. By furnishing new I/O modules designed to mount right into an existing legacy chassis, Invensys Operations Management is able to provide users with a brand-new, modern control system.

You don't cut any wires. You don't add any racks or cables. You won't incur the risk of lengthy downtime — because this approach makes it possible to convert a rack back to the original system easily should an unexpected problem arise during installation.

Most important, because the new system is set up, staged, and fully tested offline, the time delay before you can resume production is shortened from weeks or months to hours.



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4. The Invensys Foxboro I/A Series System Solution

Invensys has long understood migration challenges, due to years of developing migration solutions for users of its 1970s-1980s-era SPECTRUM® system. Its migration program was introduced in 1997 to provide the same answer to users of other brands of DCSs. As with the SPECTRUM system, the company realized that replacement solutions would need to be cost-effective, low-risk, easy to install, and designed to minimize process downtime. Also, these solutions would have to eliminate the need for rewiring and retesting while the process is shut down.

The Invensys Foxboro® offering does so with a very simple concept. I/A Series® I/O modules (FBMs) are manufactured specifically to be form-fit replacements of the I/O modules in the original legacy system. This plug-in migration solution is currently offered for the following legacy systems:

- Honeywell® TDC 2000 & TDC 3000
- Emerson® (Fisher) PROVOX Series 10 and Series 20
- Westinghouse® WDPF
- Bailey® Net90 & Infi90
- Foxboro SPECTRUM & SPEC 200
- Moore® APACS
- Taylor MOD 300

Replacement I/O modules are standard I/A Series FBMs, manufactured to fit into your legacy system's form factor. They're made with the same components as traditional I/A Series system FBMs. No custom software is involved. Best of all, they line up exactly with your original I/O wiring terminations.

Add the new I/A Series controllers and workstations and you have a 100% new I/A Series System.

Installation procedures

To simplify and speed the process of replacing a legacy system involves extensive planning, testing, and preparation. The Invensys Center of Expertise is staffed with engineers who are expert at converting legacy system control and display databases to the I/A Series format. They use database conversion tools to recreate your plant control logic and strategy in your new system. They update graphics, stage the new I/A Series system, and test it offline ahead of time to ensure that all database conversions are done properly and to your satisfaction. While the plant remains operational, new I/A Series workstations and controllers are put in place alongside your legacy equipment and readied for hookup.

On the day of the planned switchover to the new system, the process is shut down, the legacy I/O modules are swapped out with the new I/A Series FBM modules, the network connector is put in place, loop checkout is performed — and the process is restarted.

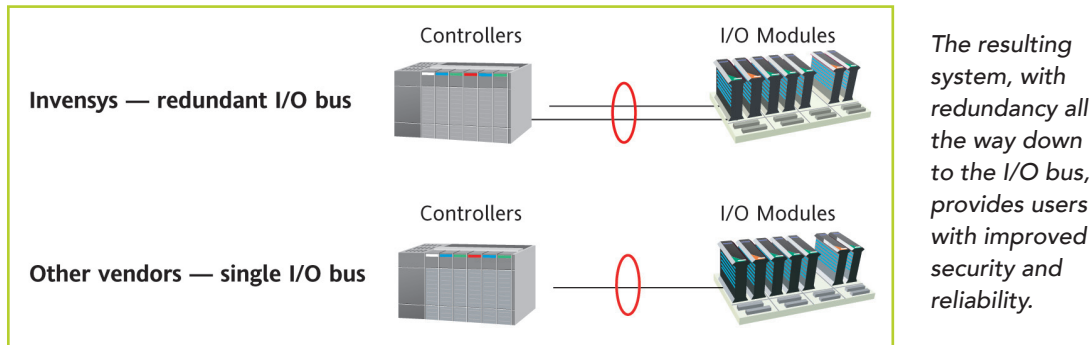
But now it's running on an all-new, modern I/A Series process control system, rather than an outdated legacy system. Once everyone is completely satisfied, the legacy controllers and workstations are permanently removed.

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Installation advantages

The Invensys solution is nondestructive: none of the field wiring or existing nests and termination assemblies is altered. Which means your original system can easily be put back in place should a problem arise. Invensys migration experts can take the problem and its resolution offline, without impacting your production schedule.



This Invensys migration offering from Invensys is a unique solution; no other controls supplier can plug your old system back in to keep your process operating. With other vendors, once they cut or move the wires of your legacy system, you're committed to their migration path regardless of how long it takes.

Invensys migration experience shows that with careful planning, the switchover can be done in hours, instead of days or weeks. The majority of installations have been done in less than a day. Some have even been completed while online, without shutting down the process!

Installation support

Invensys warrants the entire I/A Series system, including the remaining legacy equipment, as a new system installation. (Of course, the legacy racks and termination assemblies have no electronic components to break or wear out.) Replacement parts are inventoried in the event they are needed, and can be ordered directly from Invensys for all future system service and parts requirements.

Invensys has done it right for the customer, eliminating the excessive risk, cost, and process downtime typically associated with DCS migration.

At Invensys, we don't talk about "end of life" solutions. We support our customers for a lifetime. With Invensys migration expertise and the I/A Series plug-in solution, SPECTRUM installations that date back to the early 1970s are still being supported and modernized — at little more than half the cost of installing a completely new system.

5. The Continuously Current Enterprise

Easy, low-cost migration to modern control system hardware is just one element of an overall strategy to keep the enterprise continuously updated. In addition to removing hardware barriers that block control system upgrade, Invensys is also leading the way in enabling easy, cost-effective migration of software and knowledge.

Its ArchestrA® plant automation and information architecture, for example, provides a foundation that empowers decision-makers to achieve their business goals without abandoning prior investments in automation systems, production processes, or intellectual property. It offers a unified, robust architecture, plus an open development platform and tools that uniquely enable Invensys and third parties such as OEMs, machine builders, and system integrators to build domain knowledge and add significant value to the solutions they provide. End users and suppliers benefit from the instant integration of application information.

Result: The only comprehensive industrial automation and information architecture that orchestrates a new way to run or expand older plants more efficiently, and an optimal way to build new plants.

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6. Summary

The need for manufacturing managers to raise their aging automation systems to required plateaus of performance and functionality is obvious, and pressing. Various automation suppliers offer competing ways to do so. Total system replacement is effective but extremely expensive, risky, and time-consuming. Traditional migration via cabling schemes or gateways brings its own drawbacks of inefficiency, vulnerability, and risk.

The Invensys plug-in solution offers the most successful path to continuously current performance. It provides the functionality of a state-of-the-art control system without the trouble of replacing existing field wiring, at little more than half the cost of a total system replacement.