

—
WHITE PAPER

Solve obsolescence problems and extend plant life with a control system retrofit



Solve obsolescence problems and extend plant life with a control system retrofit

The power generation fleet is aging

According to U.S. Energy Information Administration data from 2017, the capacity-weighted average age of operating hydropower plants was 64 years, while coal units were 39 years, nuclear plants were 36 years, and natural gas units were 22 years. Control technology has changed a lot since many of those units entered service. Most original control system components are very likely obsolete. Yet, many of these plants still plan to operate for 20 years or more. A control system retrofit offers the opportunity to address aging concerns while also improving plant performance.

Reasons to upgrade

There are typically two main reasons owners consider upgrading to new power plant control systems: equipment obsolescence issues in their current systems or because they want to extend the life of a plant well into the future and they believe a new control system will ultimately be needed. No matter the reason, there are a number of key items that must be assessed prior to selecting the best control system to install.

First, it's important to evaluate where available technology is in its own lifecycle trajectory. The last thing an owner wants is to install new equipment that will become obsolete before a power plant reaches the end of its useful life. According to Philip Trimble, retrofit engineering and sales manager for ABB Inc.'s Industrial Automation – Power Generation, Renewables & Water business, that's one area where the ABB Ability™ Symphony® Plus distributed control system (DCS) excels.

"Symphony Plus is in a sweet spot in its DCS platform lifecycle, in that, it is not new—not Serial #1—it was launched in 2011 and it is still undergoing new equipment releases, so you don't have the growing pains of a real-early-in-lifecycle system. But, it's ABB's flagship DCS for the power and water industry that's going to be around easily for the next 20 to 25 years," Trimble said.

ABB has an enviable history in automation control technology. Long-time power professionals are sure to remember Bailey Controls, an industry leader that achieved top market positions in various process control and instrumentation segments. The company was founded in 1916 by U.S. inventor Ervin G. Bailey. In 1989, Bailey Controls merged with Italy's Eltag Group to form Eltag Bailey Process Automation. Eltag Bailey merged with ABB in 1998. ABB's Symphony Plus platform evolved from legacy Bailey Controls systems, such as NETWORK 90, INFI 90, and Symphony Harmony.

Flexible configurations

Symphony Plus supports two form factors. One is called Harmony Rack, which has rack-mounted modules that slide in similar to previous generations. The other is Symphony DIN, a DIN-rail mounted system. Both fall under the Symphony Plus umbrella and use the same engineering tools, operator interface, and function code library. The benefits of this synergy cannot be overstated.

“We’ve actually done jobs where we took a Symphony Rack system that was installed in the early 1990s, and we replaced the hardware with Symphony DIN SD control and I/O. We took the same function blocks—the same control algorithms that had been running the plant for 25 years—and we recompiled it with the new external drawings, downloaded it, and started the plant. All the tuning was there,” Trimble said. “We like to say that the customer’s IP—their intellectual property—is how they configured and tuned their system as things have changed over the years. We protect that by using the same function block library.”

The majority of customers these days are selecting the DIN-rail mounted option when retrofitting units. In most installations, the modules connect in a horizontal configuration, and then a pre-fabricated cable is routed to the marshalling scheme, which connects the field devices to the process automation system. However, Symphony Plus also supports vertical mounting orientations. “We appreciate having that flexibility,” said Trimble.

As an example, Trimble referenced a retrofit ABB recently completed, replacing a competitor’s system. The field I/O was run to modules that were in a vertical column. Technicians were able to use Symphony DIN’s vertical configuration to easily convert the system. On another project, a rack-style system was replaced with a Symphony DIN rail-mounted system. “We made our marshalling terminal blocks mount one-for-one with the existing rack termination unit so that all the field wiring would land in the same place in the cabinet,” Trimble said.

Figure 1: Power plants are built to last for decades, but technology changes quickly these days. Obsolescence problems require action.



The flexibility can be vital to a project’s success. That’s because many facilities that perform upgrades are older units, which means the field cables have been in service for a long time. As such, it is best if the wires can be changed over with minimal disturbance. That’s why understanding the previous configuration and planning the job is so crucial.

“We need to see the condition of the cabinets. Are they top entry or bottom entry? Is there marshalling? Can the marshalling be reused? Are the devices marshalled by I/O card type or is marshalling done per device type?” asked Trimble. “First, you have to understand the physical arrangement of the I/O in the cabinets and from there you can develop a strategy to make the cutover as easy as possible.”

Two other important factors for end-users are cost and schedule. Occasionally, a plant won't have the money budgeted to totally upgrade its system or it doesn't have the time available to conduct a lengthy outage. In such cases, ABB's engineers can often find ways to interface with existing I/O cards through a gateway. Then, new Symphony Plus controllers and the top end, including the human-machine interface (HMI) and engineering tool, can be added. Trimble said a complete rip-and-replace is not always necessary.

"We've worked with a partner to develop a gateway that replaces certain competitors' controllers, so it can talk to the I/O and then communicate with the Symphony Plus controller," said Trimble. It can be a big cost and time savings when components from the previous system can be reused.

Figure 2: The ABB Ability™ Symphony® Plus distributed control system is very flexible, which can be vital to a successful retrofit.



Documentation and interfaces

Drawings are another important aspect of retrofit projects. Every plant is different. Some have excellent documentation while others are lacking many details. The key is understanding what is available and then deciding what can be maintained.

“A plant may have loop drawings that reference other drawings or reference terminal block locations,” Trimble explained. “One of the strategies that we try to implement is duplicating that terminal block naming or drawing naming so that we don’t have to update the plant’s other drawings to accommodate the change. That’s an advantage to the plant and reduces the cost.”

One advantage Symphony Plus has over much of the competition is that the first function code that takes in the I/O point includes a second drawing sheet that has the terminal information. In other words, all pertinent information is available on the external connection drawing. For engineers and technicians accustomed to other systems, which often identify wire locations by referencing a second drawing outside of the engineering tool, this is a vast improvement.

Designing adequate interfaces with third-party systems can be difficult, but ABB works closely with customers to ensure critical interfaces are configured properly. In some cases, the foreign device interface may not need to be routed to a controller. For example, if the interface is intended simply to get files into the plant historian or provide data to an HMI so operators can interact with devices, then it may be wholly appropriate to exclude a controller, which saves money. However, if the data is required for interlocks or if points need to be used for other logic, then it must interface with a controller.

Many power plants utilize third-party historian platforms, such as the OSIsoft® PI System™, to store and maintain plant operating records. Although Symphony Plus can interface with practically any of these systems, a nice feature of Symphony Plus S+ Operations is its embedded historian, which has all functions well-integrated with the platform. It provides a less-expensive, but still feature-rich and robust solution right in the DCS.

“The Symphony Plus S+ Operations historian has alarm management tools that help operators manage their alarm system,” Trimble explained. “We always try to improve operator awareness and improve alarm response as part of a controls retrofit, and there are tools built into the historian to assist in that.”

The scalability of the Symphony Plus system provides another big advantage to customers. Frequently, equipment skids are supplied with programmable logic controllers (PLCs), which could be sourced from a variety of vendors. Rather than creating a foreign device interface, which requires configuring a controller among other things, Symphony DIN control and I/O can be used to replace the PLC at a very competitive price point. That simplifies plant maintenance by reducing the amount of software that technicians must be familiar with, and it permits staff to focus on one common engineering tool. Furthermore, many PLCs and other DCS hardware are only designed for temperatures up to 55C (131F), but Symphony Plus has an environmental rating up to 70C (158F). The enhancement can be a gamechanger when installing I/O in power plants.

Communication is key

Projects can benefit greatly from clear communication, so ABB engages with customers to ensure all desired outcomes are fully understood. Recognizing what is working well and should be maintained from a plant's current control system, and identifying what can be improved upon in a new system, allows engineers to design and implement the best scheme.

"Can we simplify the operation? Can we improve the heat rate? Can we go to a high-performance HMI? Can we improve trending? Can we improve help screens and diagnostic screens? Can we provide operators with guidance concerning alarm responses? These are all questions we want to answer in collaboration with end-users, so we can develop the most comprehensive solution possible," said Trimble.

Of course, no control system retrofit is complete until cybersecurity is addressed. Plant owners and operators clearly understand the importance of securing information technology and operational technology (IT/OT) systems—they know they need protection and they know their current systems are probably inadequate—but they often don't have the knowledge base to spec systems appropriately. ABB comes to the table with vast experience and keen insight drawn from years of focus on the issue. The company can help customers get up-to-date on current requirements and look forward to where regulatory rules may be headed. This can put end-users in a position to maintain compliance throughout the life of their new equipment.

Figure 3: ABB engages with customers to gain a complete understanding of which systems are performing well and which could be improved.



—
abb.com/symphonyplus
abb.com/powergeneration
abb.com/water

—
Note:
We reserve the right to make technical changes to the products or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail. ABB does not assume any responsibility for any errors or incomplete information in this document.

We reserve all rights to this document and the items and images it contains. The reproduction, disclosure to third parties or the use of the content of this document – including parts thereof – are prohibited without ABB's prior written permission.

Copyright © 2019 ABB
All rights reserved

ABB Ability is a trademark of ABB.
Symphony and Symphony Plus are registered or pending trademarks of ABB. All rights to other trademarks reside with their respective owners.