ASCO Power Technologies™

Modernizing Existing Paralleling Switchgear Systems

Four Ways to Upgrade without Breaking the Bank

Revision 1

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Four Ways to Upgrade without Breaking the Bank

ASCO Power Technologies has designed, manufactured, installed, and serviced Generator Paralleling Systems for more than 50 years. In our experience, their effective service life can often be maximized or extended by completing key modifications. This document describes four common upgrade strategies.

The most common Power Control System (PCS) modifications include (1) direct component replacement, (2) door-and-panel replacement of control and communication equipment, (3) control segregation, and (4) programming upgrades. By employing any of these approaches, a facility can benefit from the latest emergency power control features at a fraction of the disruption and cost associated with complete system replacement.

DIRECT COMPONENT REPLACEMENT

Direct component replacement is the simplest type of PCS modification. Direct replacement can be required to correct a malfunctioning device. Likewise, obsolete components can warrant replacement when parts, service, and/or technical support are no longer available. For instance, older ASCO switchgear may control generators using ASCO Generator Sensing Panels, ASCO Generator Control Panels, or outdated Woodward controllers, devices that are either obsolete or no longer available or supported.

Although the aforementioned components routinely provide reliable service, they may require replacement as they reach the end of their service life. As a result, replacing any of these units with a Woodward DSLC2 controller is a common upgrade. In doing so, facilities benefit from receiving the same level of technical support offered for a switchgear manufacturer's current products. In addition, DSLC2 controllers utilize the Windows operating system, which allows technicians to easily configure set points without having to use an older-style wired handheld controller.

Scope of Work

Component replacement occurs on a "one-for-one" basis, where the legacy components are replaced directly with new units. These modifications do not increase PCS functionality, even when the new unit offers more capabilities. System functionality and the sequence of operation remain the same. Examples of direct component replacements include these Programmable Logical Controllers (PLCs):

- ASCO Generator Sensing Panel to DSLC2
- ASCO Generator Control Panel to DSLC2
- Older Woodward controller to DSLC2
- Generator 90-30 PLC to Versamax
- Master 90-30 to Rx3i
- Master 90-70 to Rx3i
- Genius I/O to Versamax

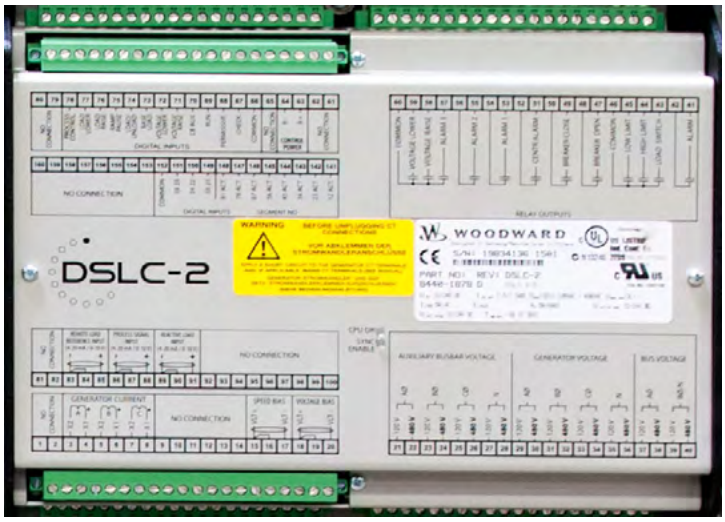

Figure 1: Upgrading an old PLC to a DSLC2 controller can assure continued technical support.

Benefits and Considerations

Replacing components directly offers fast and reliable repair and/or service restoration for one or more failing components. It also enables facilities to receive continued technical support for older PCS equipment, and can be completed quickly without the lead times required to engineer and manufacture new equipment. For these reasons, direct component replacements can be completed at a relatively low cost.

When considering component replacement projects, it is important to evaluate whether an alternative strategy might offer a better solution. The following circumstances could indicate that an alternative approach should be considered:

- Sequence of operation changes
- Adding closed transition or utility paralleling capabilities
- Adding Supervisory Control and Data Acquisition (SCADA) functions
- Adding redundant input/output
- Adding generation capacity
- Enlarging a distribution system
- Replacing 50% or more of the components in a PCS section

DOOR-AND-PANEL REPLACEMENT

"Door-and-panel" projects typically replace all monitoring and control components that are mounted on doors and interior panels within one or more PCS sections. Because all of the required components and hardware are pre-installed and pre-wired on new doors and panels in the factory, technicians need only remove old panels and/or doors, equipment, install the replacements, connect the associated wiring, and complete associated testing. This approach facilitates direct replacement or upgrade of entire component sets, minimizes installation time, and limits operational disruptions.

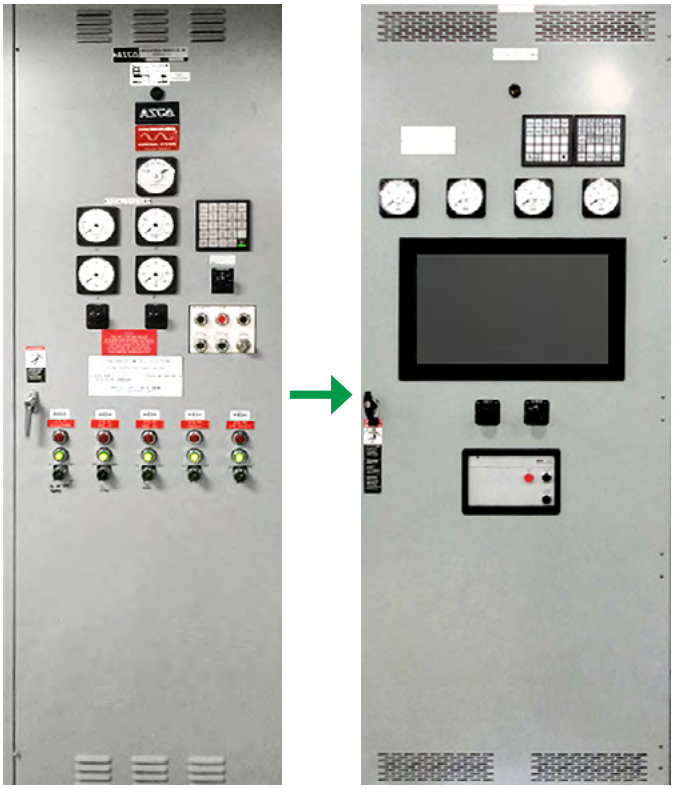

Figure 2: The legacy Master Control Section at left was upgraded as shown at right. The upgrades included added annunciation, a large-screen Human-Machine Interface, and replacement of the legacy Master GE 90-30 PLC controller with a new Modicon M580 controller.

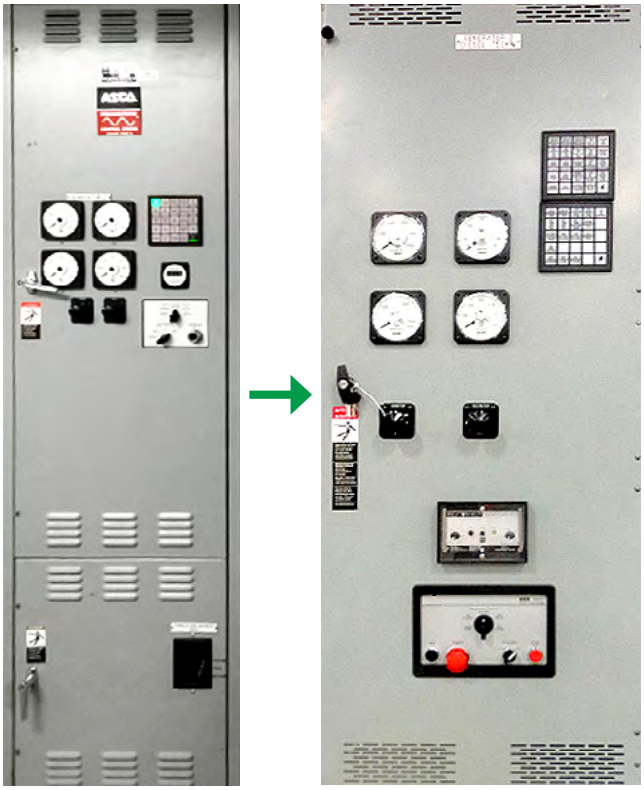

Figure 3: At the same site, the legacy ASCO Generator Control Section at left was upgraded with added annunciation and its Generator GE 90-30 PLC was replaced with a Modicon M340 PLC unit shown at right.

Scope of Work

The door-and-panel approach replaces doors and internally mounted panels with units pre-populated with new components. It also reuses existing structures, circuit breakers, bus work, current transformers, and other mechanical equipment already contained in the existing switchgear lineup. This approach relies on completing as much work as possible at a factory before equipment is delivered to a site. It also requires development and fabrication of a site-specific solution for refitting the equipment quickly.

After the doors and panels have been constructed, pre-wired, and factory-tested, they are shipped for modular on-site installation. Because most of the labor has already been completed at a factory under controlled conditions, a technician at the site can remove old equipment and install new doors and panels quickly. When compared to component-by-component replacement, the door-and-panel approach significantly reduces the time and disruption associated with some other types of equipment upgrade.

In door-and-panel projects, all PCS controls are upgraded to the most recent design specifications. This provides updated functions and enables customers to receive the same level of technical support afforded to new ASCO equipment. In addition, existing PCS can be upgraded with features such as bus optimization to manage loads, hardwired backup components, large touchscreens with the latest monitoring and control software, and redundant master programmable logic controllers. Door-and-panel projects can also be combined with changes to sequences of operation and/or capacity expansions by adding generator or distribution sections to a switchgear lineup. Connectivity to a Building Management System or an Emergency Power Management System can be provided with Modbus or BACnet communications, or an ASCO PowerQuest® system can be provided for enhanced control, reliability, and efficiency. An ASCO Simulator and remote ASCO PowerQuest displays or other displays can also be furnished.

Benefits and Considerations

A door-and-panel approach makes sense when obsolescence and/or a need to update features require replacing most or all of a system's monitoring, control, and communication componentry. Full door and panel assemblies facilitate quick site work and fast project completion. Because it preserves existing switchgear structures, door-and-panel replacement typically offers a strategy for acquiring modern capabilities without requiring additional floor area or architectural modifications. These projects are usually completed at a fraction of cost of replacing an entire paralleling switchgear system.

Door-and-panel replacements can be applied to specific sections or to entire switchgear lineups, and require minimal downtime. However, when compared to direct component replacement, these projects require a longer lead time to accurately assess, design, manufacture, and test the equipment so that it can be installed without problems. Although the replacement hardware will be thoroughly tested before it is shipped to a worksite, a higher level of intersystem testing could be required to commission the new equipment and assess the proper function of new features.

CONTROL SEGREGATION

Another strategy for replacing obsolete or dysfunctional switchgear control and monitoring equipment is to furnish a new lineup of segregated controls. This can be accomplished by bypassing the entire set of legacy monitoring, control, and communication components and installing upgraded control equipment in new sections. This arrangement segregates the controls to a new remote location, and can incorporate changes to sequences of operation.

Scope of Work

In order to segregate switchgear controls, new sections containing updated equipment are designed, manufactured, tested at the factory, and then installed at the facility. Custom interconnect panels are also installed in the legacy equipment, which are then connected to the new remote sections via interconnect wiring. The existing switchgear structures, circuit breakers, current transformers, bus work, and other equipment are reused. The following features and capabilities can be provided:

- Emergency Standby Operation
- Parallel with Utility Operation
- Load Demand capabilities that ensure that only the generators needed to carry real-time load are kept online
- Load Control/Bus Optimization
- Human-machine interface touchscreens equipped with the latest software
- BMS/EPMS connectivity using Modbus or BACnet protocols
- Remote Human-Machine Interface or ASCO PowerQuest System
- ASCO Power Control System Simulator

Benefits and Considerations

Segregating PCS controls into dedicated sections enables operation from a convenient remote location. This can also reduce safety hazards by removing the controls from sections that contain energized bus. In addition, system-level replacements provide a single unified solution with comprehensive feature upgrades. As with the other modification strategies, the upgrades can be completed for a fraction of the cost of replacing an entire switchgear system.

Control segregation requires additional floor space for newly installed equipment. It also requires that an electrician install control wiring between the legacy switchgear sections and the new segregated control sections. In some facilities, this work could require management of architectural issues, such as the availability of floor space in a suitable location, the availability of a suitable pathway for running wiring and conduit, and management of any asbestos-containing building materials in the project area.

SOFTWARE PROGRAMMING UPGRADES

For some applications, changing switchgear controls may require adjusting the existing sequence of power operations or adding new sequences to provide additional capabilities. In other instances, facility operators have recognized opportunities to improve event sequences and desire their incorporation into an improved control scheme.

Scope of Work

In order to revise event sequences, the facility requirements and existing sequences must first be clearly understood. Thereafter, as-built drawings identifying the equipment and the most recent versions of all associated software must be obtained and reviewed. The equipment manufacturer must also develop and test new code for the desired sequences. At ASCO, new code for complex systems is tested on an ASCO PCS Simulator provisioned with one-line diagrams of a facility's emergency power system. Thereafter, a technician installs the new code in the PLC at the site, and then tests the system for proper function.

Benefits and Considerations

When sequence changes are required, they can usually be completed without changing control system hardware. Depending on the scope and complexity of the software changes, recommissioning of the paralleling switchgear and backup power systems may become necessary.

SUMMARY

Although power control system components routinely provide reliable service, they may require replacement as they reach the end of their service life. Common approaches to replacing and upgrading PCS equipment include direct component replacement, door-and-panel level replacement of control and communication equipment, control segregation, and programming upgrades. Each of these strategies can be accomplished at a cost well below the expense of total switchgear replacement. Nevertheless, each approach requires careful consideration of the advantages and disadvantages, a full understanding of facility requirements, and accurate up-to-date information about the configuration of existing systems. For support in evaluating paralleling switchgear upgrade options, contact an ASCO representative or the associated switchgear manufacturer.

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