CONTROL

ESSENTIALS OF
THE MODERN DCS

About the *Control Essentials* Series

The mission of the Essentials series is to provide industrial automation professionals with an up-to-date, top-level understanding of a range of key automation topics. Our intent is to present essential engineering concepts in a practical, non-commercial fashion, together with a review of the latest technology and marketplace drivers—all in a form factor well suited for onscreen consumption. We hope you find this edition useful. Check in at ControlGlobal.com/Essentials for other installments in the series.
—*The Control Editorial Team*

Rockwell Automation

This Control Essentials guide made possible by Rockwell Automation.
See for more information on how the company's PlantPAx process automation system unifies production disciplines into a single integrated plant-wide architecture to address key market challenges.

WHAT MAKES
A DCS MODERN?

Process plants face increasingly stringent compliance requirements and regulations, even as they struggle to maintain profitability in an increasingly competitive global marketplace. Process control professionals constantly seek ways to improve productivity in order to meet these challenges, yet their efforts often are made more difficult by the use of distributed control system (DCS) technology that hasn't kept up with the times.

Traditional DCS platforms have long excelled at managing and coordinating the multiple controllers and instruments required for core process control tasks. But plant managers and personnel today seek an increasingly holistic, plant-wide view not only of process variables but of data and information embedded within complementary automation systems such as for power control and distribution, skidded equipment, drive systems, high-speed discrete control and safety. The integration of these disparate control platforms is time-consuming, expensive and difficult to justify using traditional architecture and tools. Meanwhile, maintaining multiple, disparate automation systems also places a strain on plant resources, flexibility and responsiveness.

New thinking by automation developers has led to a new process automation architecture that recognizes and addresses these longstanding challenges. Such a

system, which Rockwell Automation calls "the modern DCS," overcomes both the functional and economic shortcomings of traditional systems, making it much easier to create a plant-wide control system that also seamlessly integrates with a plant's information technology (IT) backbone. And, as technology evolves, the modern DCS continues to deliver core capabilities, such as timely and reliable handling of thousands of I/O and effective process control programming and configuration functions.

So what is it that makes a modern DCS modern? In addition to all the capabilities of a traditional DCS, the modern DCS readily accommodates plant-wide automation strategies; it provides plant-wide data visibility for greater optimization success; it facilitates system flexibility and scalability; and it opens the plant to the business/IT infrastructure. This functionality is accomplished through a common set of tools—from servers and workstations to controllers and network technologies—that allow automation systems throughout the plant to be integrated seamlessly and, in turn, increase plant performance and reduce total cost of ownership.

A RETURN ON PLANT-WIDE CONTROL

The seamless flow of information among a modern DCS and other plant automation systems pays off with new benefits and new opportunities for cost savings. When all systems use the same control architecture—in essence the same controllers, scaled and outfitted with the appropriate feature set—controllers can communicate with one another natively across system boundaries without the use of OPC bridges or other custom interfaces.

- **Greater productivity:** Plant-wide data access using a common set of tools enhances productivity and allows production intelligence to be used at all levels of the organization. For example, operations can more readily improve asset utilization and inventory velocity. Engineering can more easily maintain systems across the plant and across multiple sites. Improvements in cash flow and reduced time to market, in turn, feed top management's need for demonstrable improvement in financial terms.

- **Reduced energy consumption:** Energy is among a plant's highest and most variable expenses, and the ability to better understand its usage represents a major savings opportunity for the process industries. A modern DCS can, for instance, replace passive usage estimates with actual, real-time measurements. This native connectivity also can enhance plant availability by triggering manual or automatic intervention before an imminent fault results in unplanned downtime.

- **Reduced total cost of ownership:** A modern DCS with plant-wide control capabilities allows plants to better account for lifecycle costs associated with engineering, inventory, training, maintenance and future system expansions. The modern DCS eliminates the need for multiple vendors to provide support for multiple systems. Instead, it streamlines training, reduces spare parts inventories and integrates easily. Additionally, a single automation platform can reduce licensing fees related to future expansions, as well as provide incremental savings for projects aimed at optimization and productivity gains presently untapped.

MODULAR, FLEXIBLE, SCALABLE

Process subsystems—not just safety instrumented systems, pneumatics and other subsystems—are increasingly engineered, tested, debugged and deployed in modular, skid-based designs. Such modularity makes them easier to install, more flexible, simpler to operate and ideally suited to quick changeovers. The same principle should apply to the automation of such systems, but the cost to integrate such controls with a traditional DCS often amounts to 50-70% of the purchase price of the skid itself.

This happens because a traditional DCS architecture lacks the scalability to accommodate small or skid-mounted systems. As a result, integration likely involves custom data-mapping, duplicate HMI configurations and redundant vendor licensing fees that are—or should be—obsolete in the modern DCS era. Today, instead of an incompatible controller or one intended for a larger application, the end user or skid-builder can purchase a small, low-cost controller right-sized to the application that plugs directly into a modern DCS architecture.

The flexible, modular underpinnings of the modern DCS apply to small as well as large systems with high I/O counts. Standalone HMI displays, alarms, data collection and batch management requirements can be provided at a small scale without a supervisory workstation or server. These local systems, in turn, can become part of the plant-wide network, connecting with site-wide HMI, historian, and batch management servers as needed via the EtherNet/IP backbone of the modern DCS.

Of course, the EtherNet/IP used in the modern automation system architectures must fly industrial, not "business class." At the operations level, it must be optimized for safe, secure and robust applications such as process, safety, discrete, power and motion control. That said, compliance with IEEE 802.3 and TCP/UDP/IP standards and conventions allows the automation backbone to be easily integrated with business systems so that operations, engineering and IT departments can work together without compromise.

OPEN TO INNOVATION, SUPPORT OPTIONS

Common standards such as Ethernet pave the way for modern DCS applications such as mobile visualization, remote access, cloud storage and others enabled by technology borrowed from the IT world. By definition, a traditional DCS lags or is closed to such IT-world innovations. Additionally, the proprietary environment of the traditional DCS often limits users to a single choice in server, workstation, and network switch supplier. In contrast, a modern DCS is open to commercial, off-the-shelf servers, workstations and network hardware. Further, a modern DCS can better leverage state-of-the-art IT solutions in common arenas of concern such as virtualization and cybersecurity.

A modern DCS also frees users to choose from a variety of service providers. Traditionally, users were tied to a single vendor for service, which could be costly in time and/or money, especially in an emergency. In contrast, a modern DCS allows users to work with the automation vendor, call upon an alternate, qualified process system integrator, or tap the services of the process equipment manufacturer that may have needed expertise. These parties can also work in tandem more easily and with a greater probability of talking the same, standard "tech language."

The promise of a single platform with native, "out of the box" connectivity includes the transfer of real-time information across automation systems that may be disparate in function, but are no longer disparate in their technology platform. This transcends productivity and energy savings to affect potentially every system using the platform, and ultimately total cost of ownership. There are various competing implementations of the modern DCS. All, however, should enable plant-wide control and optimization; provide scalability and modularity for engineering flexibility and faster time to market; be open to new technologies that improve operation and enterprise integration; and offer a broad selection of component suppliers and sources of support.

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This *Control Essentials* guide was made possible by Rockwell Automation, whose thoroughly modern PlantPAx process automation system helps users to cultivate innovation with increased visibility and knowledge capture; support sustainability with extended product lifecycles, safer environments, and reduced energy usage; improve productivity with continuous improvements that provide better asset utilization and system performance; and facilitate globalization with worldwide support capabilities that meet local standards requirements.

Learn more about PlantPAx from Rockwell Automation.