Honeywell | Connected Enterprise

DISTRIBUTED CONTROL SYSTEMS: ADAPTING TO THE REALITIES OF TODAY'S MANUFACTURING

How DCS Technology Evolved Into a Scalable Automation Solution

White Paper

Abstract / Introduction

For industrial organizations, the rewards from investing in automation can be substantial, such as increases in productivity and improved safety, with reduced costs. There are common industry-wide issues associated with implementing new technology, which can have varying impacts on the success of industrial operations.

The evolution and commoditization of Distributed Control System (DCS) technology has produced a modern, graphical, highly interactive integration platform, which provides process control functionality as well as real-time data connectivity between the plant floor and the enterprise. Development has also led from a proprietary, system-centric architecture to one that is more focused on supporting collaborative business processes.

Today, a new breed of scalable and flexible control system is designed to provide end users in mining, pharmaceuticals, biotech and similar process industries with an automation solution that can fit their applications better than Programmable Logic Controllers (PLCs) and costs less than a traditional DCS.

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Changing Industry Requirements

Driven by technological evolution in recent years, manufacturers of process automation systems now offer DCS solutions with greater scalability as an alternative to PLCs in some industrial plant applications.

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Around the world, industrial firms are faced with an increasingly competitive business environment. Manufacturers must find ways to produce quality products quickly, efficiently and cost-effectively.

To cope with increasingly volatile markets and shareholder expectations for continually improved financial performance, manufacturing companies are moving to Make-to-Demand (MTD) production. strategies while

Process industry professionals face difficult and evolving challenges. How can they adhere to tightening compliance requirements while competing for market share in a globalized economy? How can they meet the demand for new sources of productivity while ensuring the safety of people, assets and the environment?

Technology advancement is driving new innovations and industrial organizations need to stay in step to remain competitive. This includes effective solutions for automating a wide range of plant processes and delivering the information needed to make effective operational and business decisions. Process control applications come in many different sizes and levels of complexity, and it's critical to have an architecture built to support this required scalability, or you end up with multiple, isolated, difficult-to-integrate solutions.

Historically, plant automation has relied on a mixture of diverse systems and tools expressly developed for the tasks they control. Manufacturing uses one system for process control, another for discrete control, and yet another for power control. Specific functions with high-speed, discrete logic might be controlled using dedicated Programmable Logic Controllers (PLCs), while the main process area in a facility is automated using a dedicated Distributed Control System (DCS). Integration of the DCS with automation systems used in the balance of plant is often costly and engineering intensive. Maintaining multiple disparate automation systems strains operations and support resources, restricting flexibility and responsiveness.

Reasons for Choosing a DCS

Traditional DCS systems in the past had a high cost of entry, limiting their use to large facilities and applications. Experience has shown they can be time-consuming to install, migrate and support for smaller operations. These issues are only compounded by difficulties in finding qualified support resources and spare parts.

Driven by technological evolution in recent years, manufacturers of process automation systems now offer DCS solutions with greater scalability as an alternative to PLCs in some plant applications. The new systems are modular and highly flexible so they can be purpose-fit to an application. They make it easy to deploy a DCS to meet the needs of control applications of all sizes while still retaining the benefits for the end user.

The modern generation of control solutions provides:

- All the core capabilities expected of a DCS, while enabling plant-wide control and optimization
- Scalability and modular architectures to match exact requirements
- Open, information-enabled, and secure architectures
- Flexibility in the delivery and support for the system

The current breed of integrated DCS is designed to create a control solution tailored to the workflow of process control. This integrated approach results in a system that provides efficient control and serves the needs of plant operators, process engineers, and management. The latest technology also makes it easy to configure with templates, engineering tools, application libraries, and scenarios for specific control applications.

Cost is a key consideration for any end user contemplating the choice of a DCS versus a PLC--based solution. Considering the effort of implementing the system and the cost of making changes over time, in addition to the initial purchase price, the DCS can be much less expensive than other approaches. Total project costs include all the expenses involved in building a working solution that accomplishes the long-term goal of effective process control. End users must also consider maintenance and changes to accommodate growth over time. These total costs are lower than applying PLCs because the built-in functions and inherent integration available in a DCS enable implementation and maintenance of a more effective system with less labor.

In addition, the new generation of DCS enables industrial firms to respond swiftly to constantly changing market requirements. Integrated safety concepts ensure continuous operation of systems and protect personnel, machines and the environment. They offer high system availability, investment security, and future-safe technology, together with a reduced total cost of ownership.

A new breed of DCS is designed to meet the needs of control applications of all sizes.

Flexible Automation Strategy

The merits of a scalable DCS are obvious: efficient engineering, easy operating and maintaining as well as increased productivity. Utilizing a modern, flexible control platform is strategic to improving productivity. With it, end users receive information that is rich in production intelligence right to the business system, providing the visibility needed to drive efficiency and productivity across all layers of the organization in real-time.

DCS systems today can be scaled down to meet the needs of very small applications. There are numerous capabilities created for complex applications that can be removed or hidden to simplify the system and reduce the purchase cost and implementation. This means that many features not required for small

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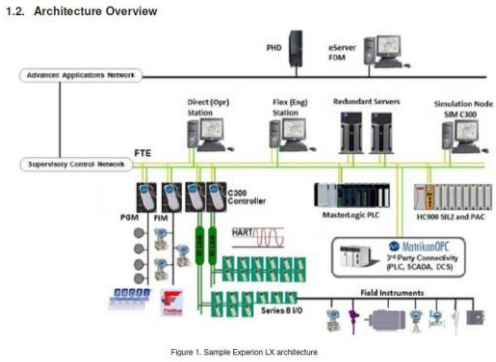
sites can be peeled away to deliver a streamlined solution that can be expanded as needed in the future. The bonus is that end users get a system optimized around process control – at the right price point.

As demonstrated at diverse process industry sites, implementation of scalable and open control architecture provides a number of key advantages:

- Seamless platform for integrating all process control and safety systems, as well as automation software, under a single, unified architecture, reduces engineering time, consolidates an operator's view and helps share data across multiple systems.
- Open tools and integrated software applications enable plant personnel to capture and share process knowledge for better decision-making and improved business performance. Using open software also helps companies design ergonomic human interface displays to recommendations from the Abnormal Situation Management (ASM®) Consortium. Engineering is made easier with integrated database and drag-and-drop features for configuring function blocks.
- Open interfaces into the business network support collaborative decision-support to help effectively manage the enterprise supply chain – essentially linking raw material variability to demand variability.
- On-process migration solutions allow end users to upgrade from older systems to the latest automation technology without replacing controllers, I/O or graphics.

Scalable Control Solution

Thanks to ongoing advancements in process control technology, a growing number of industrial organizations can realize the performance advantages of a true distributed control at a reduced cost. Major automation suppliers like Honeywell provide purpose-built DCS solutions, which can be tailored to fit specific control applications — regardless of their scope — and extended at any time to include personnel and assets, and even to integrate entire business operations.



Honeywell's scalable and flexible control system architecture.

Honeywell offers the Experion® LX DCSs for differently sized facilities throughout the process industries. With these scalable control systems, various functions and applications aimed at optimizing performance are inherently available in the context of specific industry operations. Data are also presented in an integrated operating environment.

Honeywell's innovative technologies are intended to achieve improved plant performance and better business results, and can be implemented in a way that suits an individual site.

- Tightly integrated DCS and Supervisory Control and Data Acquisition (SCADA)
- Robust process controller to execute control strategies on a constant and predictable schedule

- High-fidelity simulation for training operators and engineers, and proving-out control strategies
- Patented, high-performance Fault Tolerant Ethernet (FTE) control network
- Optional redundancy at all levels: server, network, controller and I/O modules
- Patented algorithm for predictive control
- Universal I/O module design for compact footprint, and efficient installation and maintenance
- Enhanced control builder application and Human-Machine Interface (HMI)
- IEC 61850 interface enabling integration with the electrical system in a single control/SCADA platform
- IEEE 1588 Precision Time Protocol (PTP) support for system-wide SOE
- Powerful reporting tool for debugging and system maintenance
- Smart device integration through industry-standard protocols such as HART®, FOUNDATION™ fieldbus, PROFIBUS and Modbus®
- Centralized asset management system for remote configuration and maintenance of smart field devices
- Integration of PLCs, DCSs, Remote Terminal Units (RTUs), drives, safety systems and weigh scales through SCADA capabilities and OPC servers
- Flexible Distributed Server Architecture (DSA) for integration of processes across multiple units, control rooms, or geographically separated locations for optimum flexibility and system maintenance
- Virtualization solutions intended to improve performance and reliability in the industrial automation domain

With Honeywell's approach, industrial firms benefit from significantly enhanced batch capabilities. Users can run an S88-compliant batch system entirely in the controller, providing faster and more reliable batch operations compared to a conventional server-based system. Class-based recipes enable reuse of recipes and help reduce the cost of recipe engineering, maintenance, and testing.

Process plants implementing Honeywell's patented, model-based control algorithm with the DCS can achieve optimal control by using a model of the process dynamics to predict effects of control moves on the controlled variable. By anticipating future changes, this control solution knows exactly how much to move the process to meet desired control objectives. The DCS also supports custom algorithm blocks for building user-defined algorithms and data structures for batch applications.

Honeywell's solution delivers automated procedures and operations for all steps of production, helps capture the knowledge of expert operators, and enables consistent and optimized procedures. It also increases operating flexibility to allow faster response to business opportunities while reducing the costs of incorrect execution of procedures.

In addition, Honeywell's DCS provides a comprehensive set of SCADA capabilities, including equipment-based configuration to dramatically reduce engineering effort. End users can employ a library of standardized objects to build ASM-compliant displays, enabling quick project implementation and effective plant operation. With the system's tightly integrated architecture, they only need one server or a pair of servers for both DCS and SCADA systems. No additional hardware costs are necessary for integrating SCADA functions or third-party systems.

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Today's scalable and flexible DCS solutions enable process end users to extend their scope at any time to realize the benefits of robust and secure distributed control.

The Honeywell solution allows industrial operations to implement centralized or remote control of geographically separated segments of production through its DSA. No additional hardware and networks are required to connect multiple control systems; users can leverage integrated engineering configuration, as well as greater flexibility to implement control where they want it.

Integrating the DCS with smart field instruments enables process plants to get more from their intelligent devices. This strategy supports efficient maintenance with instrument messaging for quick identification of devices and required work. Plus, it improves operational safety with effective maintenance mode indicators and tamper reporting.

Plant operators are able to communicate with larger numbers of smart field devices through industry-standard protocols like Profibus DP and FOUNDATION Fieldbus. Moreover, they can take advantage of reliable, flexible and low-cost integration of third-party data through a Peer Control Data Interface (PCDI), rather than serial interface modules.

Lastly, native CDA integration with Honeywell's industrial wireless system results in lower total cost of ownership; reduced engineering effort to design, commission and maintain an ISA 100.11a system; and efficient monitoring of remote assets.

Benefits to End Users

Today's scalable and flexible DCS solutions enable process end users to extend their scope at any time from process control and management to include personnel and assets, and to even integrate the resources of their entire business operation. They allow facilities of all sizes to realize the benefits of distributed control:

- Expedite commissioning and start-up
- Increase production capacity
- Improve reproducibility of processes
- Decrease process and quality variability
- Improve long-term stability and consistency
- Optimize paperless operation
- Simplify configuration of continuous and batch control
- Streamline application development and verification
- Minimize downtime
- Lower maintenance costs
- Reduce lifecycle costs
- Expedite payback on investments

Conclusion

The Distributed Control System has come a long way from proprietary, large systems of the past to being scalable to meet a wide range of applications. Many industrial operations that typically use PLCs should consider what's available to them in current, state-of-the-art DCS solutions.

For More Information

Learn more about how Honeywell's DCS solutions can improve your performance, visit honeywellprocess.com or contact your Honeywell Account Manager, Distributor or System Integrator.

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