CONTROL ENGINEERING
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Choose the right control system

Choosing between a programmable logic controller (PLC) or a distributed control system (DCS) depends on the type of project and plant. Benefits of each differ, depending on the application.

A successful automation project requires automation and design engineers to evaluate application requirements and choose the most effective control system platform. These decisions will have a long-term impact on a facility's operational performance for 25 years or more years in some cases. Most control system decisions come down to choosing a programmable logic controller (PLC) or a distributed control system (DCS). In some cases, one option is clearly better for a plant while in others the option is not as easy. Many factors are involved in selecting the control system that will help achieve short- and long-term goals.

Control system platforms influence how the automation system will meet the needs for optimizing production, sustaining reliability, and obtaining data. A lack of foresight in choosing a control system also can hinder expansion, process optimization, user satisfaction, and a company's profits.

Apart from basic criteria—such as how to control the process—the design team must recognize considerations such as installation, expendability, maintenance, and upkeep, among others.

While PLCs might be cost-effective for the time being for a small facility, a DCS provides a more economical expansion with a potential return on the initial investment.

A PLC is an industrial computer that is built to control manufacturing processes such as robots, high-speed packaging, bottling, and motion control. In the last 20 years, PLCs have gained functionality and provided benefits to small plant applications and skid units. PLCs are generally self-contained islands of automation that can be integrated so they can communicate with one another. The engineering required for integration requires some degree of mapping between controllers because each PLC has its own database. This makes PLCs a good fit for small applications that are unlikely to be expanded.

A DCS distributes controllers throughout the automation system and offers a common interface, advanced control, a systemwide database, and information that can be shared easily. DCSs are traditionally used in process applications and larger plants and are easier to maintain for large system applications throughout the plant's lifecycle.

Application determines the platform

PLCs and DCSs generally are suited for discrete or process manufacturing. Discrete manufacturing facilities, which usually use PLCs, are composed of separate production units that generally assemble components, such as labeling or fill-and-finish applications. Process manufacturing facilities, which usually use DCSs, automate continuous

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KEY CONCEPTS

Programmable logic controllers (PLCs) are mainly designed for discrete industries, and distributed control systems (DCSs) are mainly designed for process industries.

PLCs are best used for short-term applications while DCSs are best in long-term applications.

Several methods can determine if a PLC or a DCS is best for an operation.

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How should you determine whether to use a DCS or PLC for an operation?

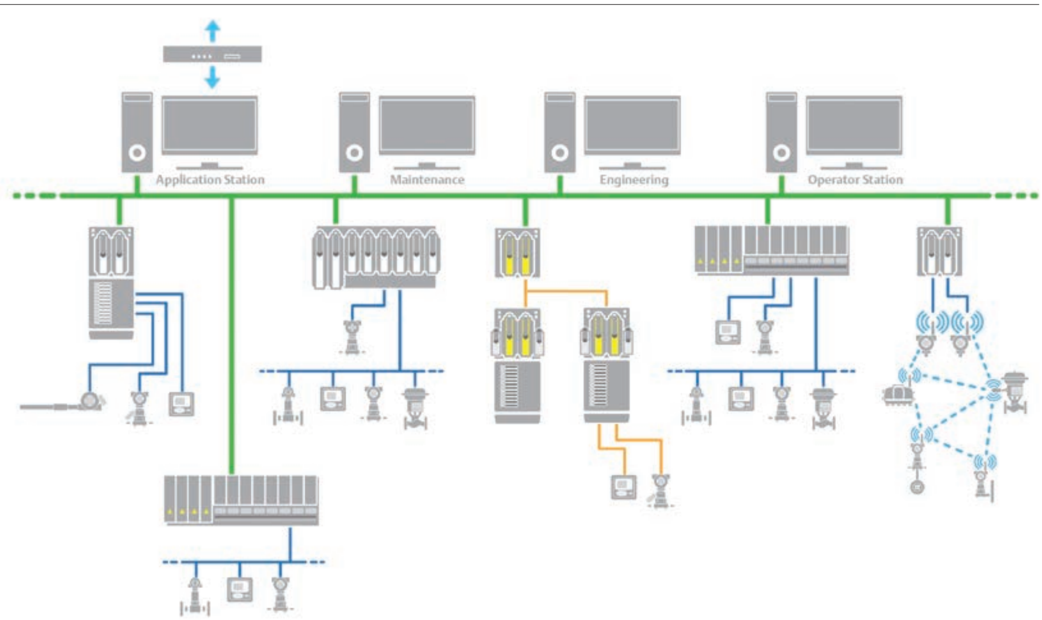

Figure 1: The DCS architecture with a single database approach allows users to easily maintain and operate the system from centralized workstations. All graphics courtesy: Emerson

and batch processes and implement formulas composed on ingredients rather than pieces, and their output is measured in bulk. Large continuous process facilities, such as refineries and chemical plants, use DCS automation. Hybrid applications generally use PLCs and DCSs. To choose a controller for an application consider process size, expansion or modification plans, integration needs, functionality, high availability, and return on investment (ROI) over the facility lifecycle.

Process size: How many input/output (I/O) points are needed? Smaller systems (<300 I/O points) might have smaller budgets, which makes PLCs a better fit. DCSs don't scale down as easily and function better in larger plants. DCSs are easier to manage and upgrade because they have one database; changes can be applied globally.

Modification plans: Small processes can use PLCs, but if that process is expanded or modified, more PLCs and databases need to be added and independently maintained. This is a time-consuming process that leads to errors. DCS upgrades are easier to perform, and aspects such as user credentials are managed from a central hub, which results in easier upkeep and maintenance (see Figure 1).

Integration needs: For a skid that stands alone, a PLC is ideal. When multiple PLCs are brought into a plant, interconnections are required. These can be difficult to create and often require data mapping through communications protocols. Integration can be achieved, but users might run into challenges when changes are made to a PLC that can result in two PLCs that no longer communicate as intended because the data maps have been impacted. Mapping is not required with a DCS, and configuration changes are a simple process; the controllers are native to the system.

Functionality: Some industries and facilities require historians, streamlined alarm management, and a central control room with common user interfaces. Some require manufacturing execution system (MES) integration, advanced control, and asset management. The DCS has these applications built in (see Figure 3), which makes it easy to add to an automation project without separate servers or added integration costs. This is more cost-effective, increases productivity, and lowers risk.

High availability: For high process availability a DCS provides redundancy options (see Figure 2).

Lifecycle ROI: Facility expectations vary across industries. PLCs provide excellent ROI for small and nonexpanding processes that don't require integration with other process areas. A DCS may have high installation costs, the full lifecycle costs and resulting increases in production and safety pay for themselves over the the system's lifetime.

Automation strategy

Balancing short-term needs with long-term vision is critical for operational certainty and improve plant operations and maintenance. **ce**

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Figure 2: For strong process availability, redundancy is important to long-term operation. Efficiency and ease of achieving redundancy are key to maintaining budgets.

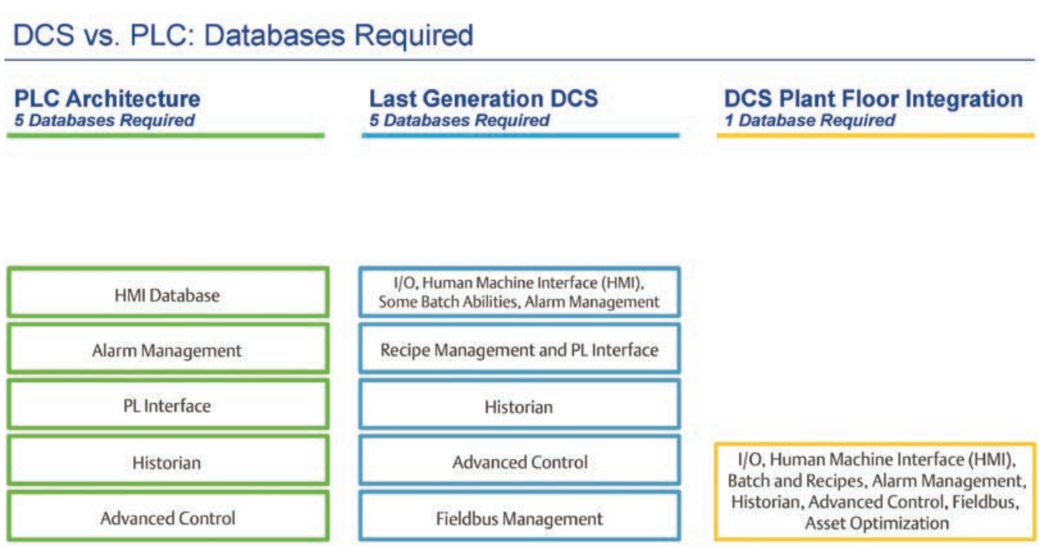

Figure 3: For functionality listed here, each platform presents unique database requirements.