

Do PLCs Eliminate Need for a DCS?

In the past it was fairly easy to determine whether a PLC or a DCS was right for an application but in recent years this has become more difficult. It is argued that more powerful PLC products coupled with new software tools provide an integrated process control system rivaling a distributed control system (DCS) for process control applications. The discussion of this topic has been through advertising, sales people, and a great deal of anecdotal information from a wide range of sources.

The architecture of a PLC and DCS system look strikingly similar on a system layout drawing with the same basic components: field devices, input/output modules, controllers, and human machine interface (HMI).

I have talked with a number of control engineers that are trying to sort out this issue to make decisions.

How does a control engineer decide what to use?

Automation.com decided to talk with the originators of the DCS to get their perspective on these issues.

I interviewed Jamie Bohan, Senior Segment Marketing Manager at Honeywell Process Solutions and a veteran of the industry.

Question: A PLC is viewed by many as a lower cost solution for process control, how do you view this?

Today with open technologies, DCS systems are competitively priced with PLCs. In fact, if you consider the cost of implementing the system and the cost of making changes to the system over time, in addition to the initial purchase price, the DCS can be much less expensive. The total project

costs include all the expenses required to build a working solution that accomplishes the long-term goal of effective process control. One must 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.

Honeywell TDC 2000

The Honeywell TDC 2000 was introduced to the North American market in 1975. The first system to use microprocessors to perform direct digital control of processes as an integrated part of the system. This distributed architecture was revolutionary in 1975 and became the new standard for process control. Digital communication between distributed controllers, workstations and other computing elements (peer to peer) was another major innovation and advantage of the DCS. Computer based process control systems before the TDC 2000 were mainly data collection and alarm systems with controlled pneumatic loop controllers and standalone electronic controllers.



Question: Is this only for large system?

DCS systems in the past had a high cost of entry so they were used for large applications. It is important to point out that today's DCS systems are modular and highly scalable so they can be purpose-fit to an application. The DCS adoption of open architecture standards has further improved the price modularity of these systems to make it easy to fit a DCS to meet small to large applications, while still retaining the benefits for the customer.

Question: Why do you think a DCS is more cost effective than a PLC in process applications?

Simply taking a PLC and adding an HMI and database on top of it requires a great deal more engineering to accomplish integrated control and information management than a DCS. If you do the programming and engineering required to create an integrated system, a large amount of unique programming and customization is required for the applications. This unique programming must be maintained for the life of the controls increasing cost and risk over the life of the control system.

In contrast, the DCS has all the system features built-in to handle process applications. For example, in Experion, once a point is built and loaded to the controller, a detail display for that point is automatically available to the operator. A DCS is an integrated system designed to create a control system tailored to the workflow of process control.

This integrated approach results in a system that provides efficient control and serves the needs of operators, process engineers, operations and management.

In the case of Honeywell, we have refined our DCS solution and made it easy to configure with templates, engineering tools, application libraries and scenarios for specific process control applications.

Question: Why is configuration better than programming?

Configuration means that the logic and control scenarios already exist in the system as functions that are applied to the application. These functions are proven, tested, and repeatable insuring high quality and low cost to maintain the system.

When configuring a tag, everything required is there to connect it to a field point and apply alarm logic, history, version control and other functions, saving time and improving quality. You don't have to build alarm logic, configure a separate historian and other functions.

Configuring field control is straight forward. For example, if you have a two input ,one output valve, there is a Function Block library so you don't have to create the logic from scratch. Again, customers use proven and repeatable logic that improves quality, reliability and speed.

The control logic and flow is clearly visible during run-time using the DCS approach in contrast to ladder logic where someone could have later added a rung or made a change in the logic that is not apparent. Because the logic

connections and flow are clearly visible in the DCS, making changes takes less time and there is significantly less risk of creating problems leading to higher process reliability.

Question: What are examples of the advantage provided by Honeywell's open architecture?

An open architecture provides the following advantages:

- Seamless platform provides the foundation for integrating all process control and safety systems—including non-Honeywell systems—and automation software under a single, unified architecture. This reduces engineering time, consolidates an operator's view and helps share data across multiple systems.
- Supports open tools and integrated software applications to capture and share process knowledge for better decision-making and improved business performance. Using open software, such as .html, also helps companies design ergonomic human interface displays to recommendations from the Abnormal Situation Management consortium. Engineering is made easier with an 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.

- This open architecture also makes it easier for end-users to migrate from older systems to Honeywell's system without replacing controllers, I/O or graphics.

Question: Integration with the enterprise is becoming very important and PLC advocates argue the enterprise interfaces are more open architecture than DCS systems, is this an accurate assessment?

DCS systems have tied into the enterprise for years. Honeywell moved to Microsoft technologies and was one of the first to adopt OPC technology in our servers, historian and in a number of applications. In addition, we support BizTalk and published XML interfaces. The interfaces are available for any enterprise system to communicate with the control system for information exchange including what to make, when to make, how much to make, real-time production statistics and real-time quality information.

Question: Another argument to standardize on PLCs for discrete and process control is that using a single control architecture reduces the complexity of managing operations. What are your thoughts?

The process and discrete domains are different and have different requirements. In addition, the roles, responsibilities and philosophies of those within the domains are different. Standardizing means that a sacrifice in terms of operational suitability must be made on one side or the other. Honeywell's core competency is process control. Our DCS is designed to optimize process control operations and efficiently meet operational objective of the users' business. The

majority of a PLC vendors' business is typically discrete control. Their employees are predominantly skilled in the application of PLCs to discrete control and their products are built for this purpose. I've talked to many customers about this concept and most feel that the improvements in business performance delivered by a DCS far outweigh having different control platforms to maintain.

Question: PLC proponents would indicate that the DCS is designed for the most complex process control applications and when applied to medium and small applications the DCS is more costly than PLC systems. Are the costs for large DCS carried into smaller applications?

DCS systems today can be scaled down to meet the needs of very small applications. There are many features and 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 needed for small sites can be peeled away to deliver a simple solution that can be expanded as needed in the future. The bonus today is that users get a system optimized around process control – at the right price point!

Question: PLCs are extremely good at controlling discrete devices such as motors and drives at high speeds so it would seem with requirements for faster plant operations that the PLC is a natural for process applications to integrate all control functions. Can a DCS meet these demanding requirements?

By faster plant operations, I believe you mean increasing throughput? In fact, increased throughput comes not from speeding up the controller processing speed (it is not the critical bottleneck), rather it comes from pushing more product through the processing equipment. This comes from improvements in reliability, equipment health monitoring, reducing communication times, etc. These are all areas where a DCS excels.

Honeywell is also pushing more functionality into the controller to improve performance and reliability.

A great example is putting the entire S88 batch control into the C300 controller so it runs in real-time. The system can execute a complete batch without the host server being involved. This alone can improve throughput one to two percent.

Question: Because PLCs are designed to be fully programmable devices it is easy to create customer applications for a plant. PLCs have powerful programming languages including ladder logic, function block, and features to facilitate the creation of custom code from scratch. How can these custom functions be done in a DCS?

The DCS also has powerful programming languages. Customers can build their own function blocks if they need to, and can include scripting using standard Visual Basic script. They can create custom sequences via drag and drop in an SFC structure. Customers can schedule when various elements in the controller are run and in what order.

Question: The general consensus is there are many systems integrators proficient at programming PLCs that customers can use for programming and maintenance of systems. Is this a serious consideration?

Our experience is that System Integrators are able to pick up the differences between PLC and DCS systems rather quickly and gain proficiency configuring and supporting DCS systems. They typically comment on the many built-in features of the DCS and are thrilled by the additional functionality in the controller and HMI.

Question: PLCs have interfaces for all the open architecture industrial networks including DeviceNet, Profibus, Ethernet/IP, Modbus TCP, HART, Foundation Fieldbus, and Profinet. Do you have these interfaces?

Yes, we do. In fact, in the DCS, data from field networks is integrated into the system and is made available for use by the HMI, historian, asset management applications, etc without additional interfaces or custom configuration.

Question: What dimensions should a customer use to compare a PLC and a DCS for batch systems?

I've implemented batch projects on both DCS and PLC platforms. My experience is that the DCS provides a much more robust and pre-built environment for sequential control (batch), this is especially evident at the Unit level and below. This difference contributes to faster and lower cost project implementation, better quality, easier maintenance and the ability for operators to troubleshoot the

sequences during run time. The key difference with Honeywell's Experion Process Knowledge System (PKS) is that we've moved the batch layer down into the controller. All of these advantages are delivered in standard product so customers don't have to implement this functionality for their project.

I recommend the following three considerations in a batch system comparison:

1. 60-70 percent of project effort is in implementation of the database, control modules and phases so this is a big area for customers to look for built-in capabilities to bring down project costs. These should be pre-built and tested as part of the standard product offering so customers can leverage these features across various product releases. Examples are mode tracking, arbitration of common devices and device logic.

2. Another key consideration is the ability to maintain and troubleshoot the batch implementation. This is a huge advantage in terms of throughput and burden on E&I-type folks to keep batches running. Ideally, operators should be able to troubleshoot running batches and see process conditions or control logic that's holding up the progress of a batch in real time from an operational graphic.

3. Finally, customers should look for systems that offer high availability. This should include batch automation in the controller with heart-beat failover of the redundant pair. Ideally, this will be a standard product, not a custom implementation so that customers can take advantage of new features as they come in future releases. In addition, systems should allow online changes so that production doesn't have to

stop to update or modify a non-related control strategy. These capabilities will help customers improve their agility and reliability so they can deliver quality products on time.

Question: What do you view as the best applications for PLCs in process plants, if any?

The most appropriate application for PLCs in process plants is on the packaging lines where high speed discrete control and synchronized motor drives are required. In addition to the points discussed earlier, the following can be used as a guideline for those who are considering PLCs on the process side:

- Future growth at the site – Will the site be growing in size or scope? If so, it is much easier to expand a DCS architecture than a PLC architecture while still keeping one integrated control system.
- Need to make changes frequently – Does the user need to modify control logic or graphics frequently? These tasks are easier to do with a DCS and can be done while the system is running so there's no need to stop the controller to add new logic.
- Integration requirements – What are the needs around workflow of operators and control engineers? Do they need access to history, alarms, live trends, live views of control strategies, system diagnostics, etc? These are all built in to the Experion PKS environment. Also, integration of other systems (PLC, SCADA, etc), devices, applications the enterprise? These can all be more tightly integrated with a DCS and with less engineering.

- Robustness – PLC controllers are very robust, the concern is at the HMI/application/engineering layer. What is the tolerance for loss of view, loss of data, downtime associated with servers/HMI/applications?
- Network – What are the networking skills of the plant folks? Setup and configuration of the network are designed into Experion PKS as part of a plant network environment. Compatibility of various components are tracked and tested, patches are tracked and tested, etc., making the network maintenance load much simpler than a PLC system.

safety, reliability and efficiency to our customers.

Our impression is that some PLC companies are creating a great deal of hype over PACs, but customers who are familiar with a DCS are already aware of the concept. Customers that are doing side-by-side evaluations with PLCs are choosing the DCS. The PLC vendors still seem to be struggling with trying to get all the parts and pieces to work together seamlessly. Again, I believe this goes back to core competency and the primary domain in which a system was designed to work from the ground up.

PAC Issues

Question: The promotion of Programmable Automation Controllers (PAC) is muddying the waters even more. One definition of a PAC is a multi-disciplined controller capable of providing real-time logic, motion, and process control, in addition to human-machine interface (HMI) and other functions, on a single platform. What are your thoughts?

Question: Is there anything you would like to add?

The DCS has come a long way from proprietary, large systems of the past to being scalable to meet a wide range of applications. Most customers that have in the past used PLCs are delighted when they see what's available to them today in current, state-of-the-art DCS solutions.

DCS systems have for many years provided multi-disciplined controllers for logic, sequential and process control, HMIs and applications on one platform. That's really the definition of a DCS - an integrated, distributed systems approach. It's more than just about the individual components being pulled together into one platform. It's about the way data flows through the system, the way that information is presented to an operator, the way that changes propagate through the database, control strategy, graphics, applications, etc and the robustness of the platform as a single entity. Our product strategy is to leverage this platform to deliver