PLC-Based Robotic Controls Versus OEM Robotic Controls

What’s the Best Choice for Your Application?

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As more manufacturing facilities and distribution centers discover the benefits of robotic material handling solutions, the decision of how best to control the robot must be made. While robot original equipment manufacturers (OEM) all offer their own tightly integrated controller, recent developments have enabled control by a Programmable Logic Controller, or PLC. For facilities where PLC-based controls are already used in other machine control applications, the benefits of using one for the robot as well may be a wiser choice than the OEM controller. Below is a review of PLC-based robotic control to help you determine if it’s the best choice for your application.

Speaking Robot Just Got Easier, and Training Time Shorter

If you’re familiar with PLCs, as many engineers and technicians are, then you know how to read, understand and troubleshoot a PLC-based robot. What the robot should be doing and how are still required knowledge, but the hurdle of learning a proprietary OEM control language disappears, and with it much of the training time previously required. Moving to the PLC-based robotic controls world brings additional advantages including:

- Common programming controls (software, cables, etc.);
- Common software interfaces;
- Common program backup/restore methodology; and
- Common program documentation.

Interfacing with the Robot Controller is Greatly Simplified

Robotic material handling solutions are comprised of complex systems, including many different types of equipment in addition to the robot(s). These systems generally include components such as infeed conveyors, discharge conveyors, pallet dispensers, transfer cars and other additional equipment. System components are typically controlled via a PLC, therefore the robotic controllers must interface to the system controller, handshaking data and interlocks to achieve the desired functionality. Depending on the complexity of the application, this interface can be quite challenging.

“As we studied the packaging and palletizing markets, we recognized the need for a Unified Control strategy,” Steve Barhorst, president and chief operating officer, Yaskawa America, Inc., Motoman Robotics Division said. “These markets have engineers and technicians with extensive experience and expertise with PLC controls and programming. We view the development of the MLX100 Robot Gateway as an easy way for these users to adopt robotics into their packaging lines without the burden of having to learn a new robot...
programming language. Users now gain the flexibility that robots offer in a PLC-based platform they already understand. We still offer our standard robot controller, the DX100, for applications requiring process control, like welding, dispensing and painting."

When the PLC that controls the robot is the same PLC that controls the other system components, it eliminates this interface point and greatly reduces the overall complexity of the solution.

**Common Controls Architecture**

The controls hardware design for a PLC-based robotic controller can now utilize a common controls architecture with the system controls. "KUKA Robotics worked with Rockwell Automation to develop the capability to control select KUKA 4 axis robots to address demands from consumer packaged goods end customers who were looking for a single integrated control solution for their packaging machines and robotics," said James Cooper, vice president sales and marketing, KUKA Robotics Corporation. "Additionally they have requested a single point of operator interface for their automation solutions that involve traditional packaging machinery and robotics."

In addition to reducing overall footprint by being housed in the same control panel(s), the design of the robot controls use the same drawing nomenclature (wire number, drawing numbers, etc.) as all the other hardware in the panel reducing the overall complexity of the control system design. Benefits can include:

- Simplified troubleshooting and maintenance;
- Reduced panel footprint;
- Simplified training;
- Common spare parts;
- Common wire number/drawing numbering; and
- Common part numbering scheme.

**Input/Output and Communication Protocols as Flexible as Your Robotic Arm**

With PLC-based robotic controls, all hardware, input/output (I/O) and communications protocols available to the PLC are now also available for use with the robotic controls. This is particularly relevant when considering large portions of the proprietary OEM controllers’ I/O communications are primarily for interfacing the robotic controller with the PLC. With this additional communication no longer required, the only interfacing necessary is to the I/O on the robot, which is as simple as any other I/O that you have in your control system. PLC-based robotic controls support a much wider range of I/O hardware and communications protocols than the OEM controllers in order to cater to a wide variety of applications.
A Common Interface

No longer is the teach pendant the primary interface with the robot controller. With PLC-based robotic controls, the Human Machine Interface (HMI) is now the same throughout the rest of the system. The alarming system, fault recording, data monitoring and all the other functions that are available to HMI now directly interface with the robot controller. Unique faults and custom operations can be added and changed directly to the robot controller. An HMI interface allows for a much greater application-specific focus, as well as a considerably more agile structure.

Reduced Maintenance and Upgrade Costs Mean Reduced Total Cost of Ownership (TCO)

Manufacturing facilities typically integrate many types of equipment into their operations, such as fillers, packers, palletizers, wrappers and conveyors. There is a tendency in these facilities to favor PLC-based controls for all equipment. If each of the manufacturers is allowed to supply their own unique control scheme, the integrated system may be functional but a nightmare to maintain and upgrade. This is why there are detailed specifications in most manufacturing facility RFPs placing boundaries on the controllers and hardware OEMs use. Using a common control system makes the integrated system much easier and faster to maintain and upgrade, thereby reducing the total cost of ownership (TCO). By integrating the robot controller with the PLC-based controls system, the end user does not incur the additional costs associated with a unique control scheme.

More Robot Choices

Because the OEM controllers have their own unique language and training requirements, many companies that already have industrial robotic solutions tend to prefer the facility’s incumbent robot brand. This has often been an obstacle to selecting the right model of robot from any available robot manufacturer as companies are unwilling or unable to support multiple brands of robots because of the uniqueness of the different controllers. With the advent of PLC-based robotic controls, users are not “locked in” to the brand they chose for their first robot when making future purchases, as the controllers can be common across multiple brands.
Summing It Up

The potential of using PLC-based controls for robots introduces a new set of decisions for robotic integrators. In some cases, PLC controls may not be the best choice. The automotive and other robot-intensive industries, for example, are not likely to convert from OEM controllers due to a large install base and unique application requirements. Additionally, some robotic OEMs do not currently offer any way of provisioning a PLC-based controller.

In making your controller decision, considerations of availability, functionality and cost must be included in the process. However, in facilities where there is already a large, installed base of PLC machine control with which the robot will need to interface, the familiarity of technical staff with PLC controls over an unknown OEM controller can have significant impact on operational and support costs. A reputable robotic integrator will work to ensure that the final solution provides the optimal fit—whether it is PLC or OEM based.

Additional Resources

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- Picking the Best Robotic Tooling for Palletizing

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