Optimizing Machines Using Programmable Drives

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Programmable drives are becoming more sophisticated and capable, enabling controls engineers to drastically reduce project costs.

On a new design, some integrators and OEMs reach for an elaborate multi-axis PLC system to solve a relatively simple application. This happens as designers work under compressed schedules, and choosing a familiar solution seems like the right thing to do.

By leveraging intelligence in a servo drive, automation designers are able to downsize or eliminate PLCs in many applications. Architected correctly, machines that utilize these smarter drives deliver higher throughput are more cost effective and are simpler to troubleshoot.

Common machine applications for programmable drives

Many applications only require high-performance on a single axis and the remaining axes are driven by hydraulics, pneumatics, or an open-loop technology such as stepper. This is illustrated by the traversing winder machine pictured in Figure 1, below. The traversing axis requires the positioning resolution of servo control; however, the feed and process axes are coordinated by other motion technologies and controlled via the PLC capability within the programmable drive.

A second example is a PI control application. The thermoforming machine uses a hydraulic pressure-to-heat exchanger. Historically driven by an AC induction motor,

the system was large and inefficient. Using a programmable servo drive with a compact, permanent magnet, synchronous motor, the closed loop thermal system was implemented in application code to accurately control the heating set-point by maintaining pump pressure. Constant heat was maintained while the pump only replenished the losses in the hydraulic circuit – yielding a significant efficiency gain.

One final example of this concept is a nip-roll cut-to-length machine. Registration is brought into high-speed inputs at the programmable drive that commutates the cut axis. This same drive also makes decisions based on inputs from quality control sensors to redirect gates and perform other less time-critical functions. The system is further enhanced by an HMI panel to offer configurability with recipes, trending of key metrics and alarm notifications.

Each of these actual application examples are utilizing the power of smarter drive technology in place of dedicated PLCs to build differentiated and price-competitive machines.

Machine architecture tips

Centralized versus Decentralized processing is a discussion without resolution. From telnet client terminals to personal computers to internet and cloud-based architectures, the general computing world is ever oscillating through the spectrum with each camp having its own merits. The growing capability of programmable drives enables further creativity and the development of differentiated solutions. Following are some tips for best utilizing the capabilities of an intelligent drive:

1. Handle time-critical functions within the motion axis. Utilizing high-speed inputs, system responsiveness far exceeding fieldbus update rates (up to

4,000 percent) can be achieved resulting in significantly greater throughput.
2. Downsize or eliminate the automation controller. By distributing high-rate polling one reduces the demand of the centralized machine controller.
3. Create islands of automation within the machine to reduce troubleshooting complexity. Classically, this is the concept of dividing and conquering. The machine should be conceptually divided into modules that are easily validated and, once complete, the subsystems are blended together. The result is a more robust and thoroughly validated machine.
4. Utilize programmable drives for retrofit and capability add-on projects at end-users. Practical and cost effective solutions can be created without fully integrating the drives onto the existing machine fieldbus. For example, a printing facility with diversity in equipment can utilize programmable drives to create an independent module on the post process such as a take-up module with dancer. This solution provides cross-vendor functionality without the added expense of recurring software licensing.

Selection Guide: Product features to look for

Not all programmable drive products are created equal. It can be difficult to navigate the maze of specifications to select a product that maximizes sustainability and flexibility after the design phase.

Following are some primary issues to consider when selecting a programmable drive:

- Serviceability and program retention (SD cards): A 3rd shift technician may not have the application software to commission a replacement drive. Some programmable drives offer an SD card option to serve as a backup to retain key information to recover from a failure without a PC.
- Breadth of power offering (limited ampere range): Especially for single-axis programmable drives, it is important that a sufficient power range is available to ensure machine scalability.
- Scalability potential: If the application has potential to require multi-axis coordinated motion, some programmable drives serve as a master to multiple servo slaves over a fieldbus such as EtherCAT. This foreseeable need should be considered up front to ensure the right controller product is selected. Programmable drives are available today that make the process of scaling a machine design seamless.

The automation market is ever changing. Innovative solutions such as smarter programmable drives are delivering new capabilities that, with thoughtful planning and creative thinking, are enabling machine designers to build differentiated machines, faster.

To learn more about programmable drive technology, visit Kollmorgen at http://www.kollmorgen.com/en-us/products/drives/servo/servo-drives *[1].*

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