Control platforms

Maximizing productivity is a common goal for motion system engineers. In this report, *Motion System Design* editors tap industry experts for advice on how to maximize productivity associated with control platforms. Here are the responses we believe you'll find most helpful.

WHAT CONTROLLER ATTRIBUTES AFFECT PRODUCTIVITY THE MOST?

John • B&R: To optimize productivity, machine controllers must be extremely deterministic as well as fast. A deterministic control system helps with the repeatability of the machine's production quality.

Machine controllers must also provide meaningful diagnostics in the event of a failure to minimize machine downtime. Controllers that send error messages to pagers or cell phones save even more time, allowing in-house service technicians to come to the machine prepared.

Lucian • CMC: In motion-centric automation, productivity derives largely from the accuracy of the motion position block. The position block determines the controller's ability to minimize error, yet remain stable without breaking into oscillation. This allows for continuous feed, saving time that would otherwise be wasted settling into position.

Lee • Rockwell: Controllers that offer scalability, information enabling, and the ability to provide multi-disciplined control across many applications can increase productivity the most.

Joe • Bosch Rexroth: Reliability and easy troubleshooting are key factors in productivity. Machines that are easy to troubleshoot are usually easier to get running quickly. Ad-

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vanced control features also increase productivity, letting machines "fix themselves" by diagnosing malfunctions. A machine that can clear out a jam and return to a ready state on its own is likely to be very productive.

Lisa • Galil: Machine productivity is a function of controller processing time and ease-of-use. Fast command processing allows more complex tasks to be executed in a shorter time; it also allows for faster servo loop updates for higher bandwidth motors.

Controllers that are easy to program and install also increase productivity. Controllers with simple command languages and built-in software tools for set-up and tuning reduce the amount of engineering time required as well. Speed of installation is also improved with easier connectivity between components such as controllers, drives, and motors. Controllers that allow drives to attach directly minimize wiring and connectivity issues.

Corey • Beckhoff: Processing power and the ability to gather and share data with other devices greatly impact productivity. Engineers should use controls with Intel M

class processors because they provide high performance at low energy consumption levels, which in turn helps reduce the size requirements for power supplies. The higher processing power allows more work to be handled by one controller, thereby saving space, reducing cost, and requiring only one software package.

With a typical PLC system, designers often use a proprietary fieldbus network, which can increase front-end cost while adding complexity and reducing design flexibility. Controllers that allow many varieties of open networks provide more flexibility and reduce work-around.

Kevin • Yaskawa: Productivity is directly affected by throughput and, hence, update times. Every millisecond counts when producing dozens or hundreds of products per minute. The sooner the controller recognizes that action is required, the faster it can complete the process. Controller latency can limit overall throughput by a handful of milliseconds per product, which potentially results in a 5 to 10% decrease in the full potential of a machine.

Michael • GE Fanuc: What is important to the programmer usu-

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ally depends upon the application lifecycle phase being used. The application lifecycle phases can be divided into four steps: configuring, programming, commissioning, and maintaining.

The programming phase affects productivity the most because it usually is the largest in terms of time, effort, and complexity. When programming the controller, the engineer wants to maximize productivity in developing the logic for the control application.

Controller attributes that affect productivity the most include the ease in which applications can be developed and the engineer's ability to re-use proven application components from previous projects or applications. The ability to re-use application components, or to create (and re-use) application building blocks can save significant time.

WHAT CONTROLLER FEATURES INFLUENCE SETUP, INSTALLATION, AND COMMISSIONING THE MOST?

John • B&R: Many times a machine will have three main applications that must be written and maintained (HMI, PLC, and motion) and typically they will be written in three different development packages. Using a development environment that allows you to write and manage all three aspects of a machine in a single project simplifies this process. Having a single programming tool also makes the commissioning of the machine much easier because you can monitor any aspect of your machine from within one software tool.

Lee • Rockwell: Designers and programmers should demand a controller with multi-disciplined control, which provides the service needed for facilities with more than one function. Such controllers simplify development because they perform motion, safety, process, batch, discrete, and drive control in a single environment

Corey • Beckhoff: Users should demand greater openness, specifically IEC 1131 compliance. Among other advantages, IEC 1131-compliant devices provide common programming languages and structures for machines as well as controllers from different manufacturers. As a result, programmers spend much less time coding.

Software and hardware modularity is also important. The controller should allow various I/O modules and communication ports to be added as needed. This helps reduce problems during set-up, installation, and commissioning, because many short-cycle production processes demand changes on the floor.

Lucian • CMC: Insist on the ability to integrate logic functions and motion in one platform, eliminating the need for separate PLC and motion systems. This saves engineering, programming, and commissioning time; designers need only develop a single program and install

one platform. It also eliminates the need for wiring and configuring multiple pieces of hardware.

Joe • Bosch Rexroth: A single software package greatly reduces setup, installation, and commissioning time. Using an integrated package allows the entire project to be seen from one screen. Logic programming, motion programming, drive parameters, HMI screens, as well as pneumatics, hydraulics, and I/O are all right in front of the engineer, without having to load, run, and manage several software packages and associated licenses.

Field-upgradeable firmware is also important because requirements are not always known explicitly at the beginning of the project. Having the ability to quickly and easily upgrade operating firmware allows for greater flexibility when you need it most, as the machine is being commissioned.

Kevin • Yaskawa: The three major areas of concern are automatic configuration, centralized parameter management, and comprehensive data gathering tools to benchmark machine performance.

Automatic configuration saves a significant amount of time. Rather than configuring the software to match the physical layout, more time can be allocated to applying unique process expertise into the application program.

Centralized parameter management means simplification of the install and commissioning phase, and a trivial component replacement experience in the future. Systems can be quite complex, and the ability to store the image of all device parameters within the main controller is a significant benefit. Combine this with a method for transmitting setup parameters invoked from the application program, and the system can be configured in under a minute.

Thirdly, real time data storage is a great commissioning tool. The ability to monitor and store data at scan-by-scan intervals allows the designer to confirm and document the machine's capabilities. This is an invaluable method for tracking bugs during development and benchmarking the original machine performance at time of shipment.
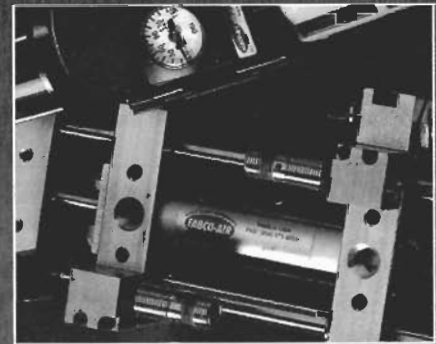
Michael • GE Fanuc: Software configuration of all controller and module parameters is one time saver, providing clear documentation and eliminating hardware jumpers and the like. Being able to make changes to the controller while it's running is another time saver. This makes it possible to tune the application for maximum efficiency while not requiring the shut down of the controller or process.

For more information on productivity and some bold predictions on the direction of control technology itself, visit motionsystemdesign.com's Knowledge FAQtory and look for the links that will c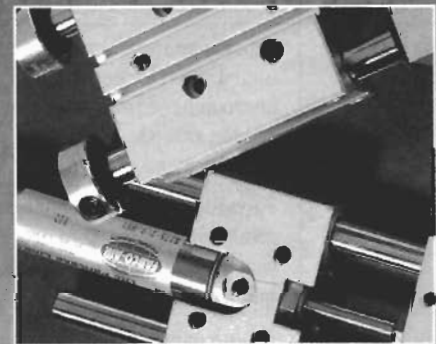onnect you to exclusive content related to this article.