Life Is On | Schneider Electric

Tackling safe automation integration

Jason Minto

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Schneider Electric has been improving industrial safety since the early 1970s. They were one of the first to provide safety offerings for eccentric hydraulic press applications, protecting press operators from serious accidents. Today, there is increasing demand to integrate safe automation in standard automation. Jason Minto, vice president of safety applications at Schneider Electric, discusses this progression, as well as the benefits and boundaries of safety technologies.

Q. Let's discuss the progressing integration of safe automation in standard automation.

A. I see strong markets for both stand-alone and embedded safety approaches. Some customers are looking for complete integration (combining safety and non-safety). They want shorter response times, simpler architecture, one system and software instead of two. On the other hand many customers prefer to keep a separation between the safety and non-safety automation due to aspects around maintenance capabilities and independence from the supplier for non-safety aspects.

With embedded safety offers, customers often heavily rely on one supplier and if problems occur, such as component delivery times or other issues, they have a harder time moving to an alternative solution.

Integration has its benefits: Faster safety response times, one environment for all diagnostic information, common interfaces between technologies and I/O with a mixture of embedded safety.

Either way there remains a need for safety modules in hardwired solutions; modular safety controllers — for simple to complex applications with speed monitoring; as well as embedded safety solutions with safety PLCs communicating with safe drives, safe I/Os with sensors, and actors over Ethernet-based architectures. For each type of offer our customers expect more functionality and availability, but control price. Customers want solutions to be reusable on other machine types so their maintenance team doesn't have to learn a new product every time they open the cabinet.

Q. Where are some of the boundaries of these technologies?

A. Machine setup and maintenance are challenges. If safety modules are hardwired, it becomes too complicated to have multiple safety modules (functions) interacting. Integration can be expensive. Also, companies want maintenance personnel to be able to quickly change out a product without learning new software.

A popular solution for many customers is the range between safety modules and embedded safety controllers. Instead of eight or nine relays in a typical cabinet, with our modular safety controller you can put a CPU with two I/O expansion modules. The system is able to manage multiple functions and speed monitoring is simple to setup and manage over the life cycle of the machine. For instance, if there is an issue with the main controller, you just replace the controller with a new one and, if the memory card option is used, the maintenance personnel only needs to remove the memory card from the existing controller, insert it into the new controller, and power on. No interaction with software is necessary and time of exchange can be within minutes.

Q. What are some of Schneider Electric's main offerings in this arena?

A. Our core value for our customers is that we are the provider of the complete safety chain and are able to provide the necessary support.

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One advantage is that we are able to supply our customers with the complete portfolio of devices to build their safety chain, such as sensor devices, pushbuttons (for emergency stop), HMI devices, contactors, drives, and safety processing devices (which consist of acquiring information devices, monitoring and processing devices, and stopping the machine devices).

The offer covers every type of machine function, emergency stop, speed monitoring, perimeter guarding, guard monitoring, and position monitoring. We cover all needed functionality for our targeted machinery applications: Hoisting, material handling, packaging, lift, material working (press machines, metal working, injection molding), and many machines outside of our targeted scope.

Our safety modules, controllers, and PLCs, for example, are used heavily in packaging machines. In some countries we have 30 to 25 percent of the market.

Q. What type of functions are available to customers interested in safety controllers and embedded safety.

A. This is relatively new technology in the world of safety. Ten years ago the philosophy was to stop the machine before doing anything with it. Now the goal is to slow it down to a safe speed or stop it momentarily and ramp up again as quickly as possible. Most of these functions can be monitored in two ways: Modular safety controllers or embedded safety PLC systems.

As outlined in the C-type standard IEC 61800-5-2, there are multiple functions defined for safe motion that are intended to be used to improve the machinery's usability and reduce machine downtime while supporting safe use of the machinery.

Safe Torque Off (STO) stop category 0 is typically used for the majority of machines' stop movement, which is a freewheeling stop. In motion-centric machines where freewheeling stop could end up with mechanical collision typically safe stop 1 or 2 is used as the deceleration ramp is monitored.

Safe Stop 1 (SS1) stop category 1 is a monitored stop within a minimum time and ensures safety by continuously monitoring the deceleration ramp on the drive/motor. At the end of the ramp, where an equivalent zero speed is reached, the function is switched to STO.

Safe Stop 2 (SS2) stop category 2 is a monitored stop within a minimum time and ensures safety by continuously monitoring the deceleration ramp on the drive/motor. At the end of the ramp, where an equivalent zero speed is reached, the function is switched to Safe Operating Stop (SOS), where continuous torque is applied to the motor and where movement is being monitored. If movement is detected, STO engaged.

Safe Limited Speed (SLS) monitoring is used to ensure the speed remains below a specific setting, very often used during maintenance operations.

Safe Direction Indication (SDI) monitoring is often used in conjunction with SLS monitoring. For instance, we use an enabling switch handheld device to move specific motors at limited speed and direction on the machine. This is often used when loading of materials into the machine or jogging the machine to a specific position.

Safe Maximum Speed (SMS) is used to limited the maximum speed of the machine. This function is often used to prevent an operator from changing the machine speed above the allowed maximum tolerable limits. There have been many cases where operators have entered an incorrect speed value within an HMI panel and the machine accelerated past its allowed limits and caused mechanical damages.

Overall, the boundaries of technology depend on the customer. Our solutions will continue to evolve toward a safer machine world.

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Jason Minto joined Schneider Electric, United Kingdom, in 2003. He has a Bachelor Engineering (BENG) and is a Functional Safety Certified Engineer Machinery (FSCEM). He was appointed Vice President Safety Applications at Schneider Electric in 2011. Minto defines and implements the overall global strategy for safety products and solutions within the Schneider Electric Machine Solutions Industry by evaluating worldwide product offers and market trends, as well as identifying key countries and markets in which to implement this strategy.

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