Transform your plant into a highly efficient and productive information system with Siemens SIMATIC WinCC V7.2 SCADA software.

See page 31 for details.
Robotic innovations, safety

U.S. robotic safety regulations are changing to accommodate global rules allowing collaborative human-robots operation without enclosures. Simpler programming methods and designs improve industrial robot usability, flexibility, and effectiveness, as examples show. At www.controleng.com/archive see more of each article.

New robotic safety regulations are pending

Robotics, subject to many safety regulations, are getting more, addressing some technological advances for robots, including operating without enclosures.

Mark T. Hoske

Standards, including safety standards for robotics, level the playing field in the marketplace when all players meet them. Safety standards lower risk to life and limb, limit liability, help meet market demands, and lower costs by unifying designs and manufacturing. And globally harmonized standards lower costs for machine builders and end users, according to Roberta Nelson Shea, director, Safety & Compliance, C&S Wholesale Grocers, and director, safety and compliance, Symbotic LLC. She presented at the 2013 Robotics Industry Forum in February, organized by the Robotic Industries Association (RIA).

Nelson Shea, chair of the RIA Robot Safety Standard Committee, said the committee recently sent ANSI an update to ANSI-RIA Robot Safety Standard (R15.06-2012). It is a direct adoption of ISO 10218-1 Robots and part-2 Integration, with an R15.06 introduction and bibliography. It helps robot manufacturers, other machine builders, system integrators, and end users, she said, as it brings the world closer to global harmonization of robot safety standards, which should drive down costs. It also improves options for safety capabilities embedded in robots not accessible by humans during operations and for “collaborative” robots, those intended to operate in the same area as humans. Part 1 relates to robots only, not end effectors. When the standard talks about operators, it means all personnel, not just robot operators. The R15.06-1999 standard can be used until the end of 2014.

Other ISO robot safety standards activity includes Technical Specification (TS) 15066 in process, about collaborative robots, including force and power limiting provisions. Rethink Robotics and Universal Robots have robots with sensors that halt motion when an obstruction is met, lowering risk to humans when working in the same area. ABB and Kuka are developing such capabilities, she said.

- Mark T. Hoske, content manager, CFE Media, mhoske@cfemedia.com.
Optimizing analysis of sugar beets at Nordic Sugar

Nordic Sugar worked with a distributor to install user friendly, reliable robots without enclosures or robotic experts.

Kristian Hulgard

When Nordic Sugar was researching a new generation of robots to automate the analysis of raw material samples, the most important criteria were flexibility, user-friendliness, and a reasonable price tag. With three robots as “colleagues,” the employees can easily adjust analysis without consulting robot experts. Nordic Sugar AB factory in Ortofta in Sweden is among the largest European sugar factories. It operates 24/7 mid-September until mid-January, receiving 600 daily deliveries of sugar beets from about 2,000 Swedish beet growers.

“To ensure that each grower receives the correct payment for their raw materials, we inspect the sugar content and concentration in the beets,” said Bo Bergdahl, production and analysis manager with Nordic Sugar AB’s testing department. During the four-month season, 45,000 samples are inspected, and the department performs 35,000 analysis samples for partners.

Bergdahl introduced robots for monotonous tasks in 1993 and adapted a robot designed for spray booth painting, which necessitated consultant services even for minor adjustments in the software. Plexiglass covers and light beams were needed as safety guarding, and the cost of exchanging spare parts in the robots were high.

After testing a new robot for sugar analysis, Nordic Sugar now has three such robots operating, and another three are expected to be integrated within the next two years to replace the earlier generation of robots. Robots scan barcodes and pick up containers with sugar for analysis from scales to filters and back. The process is performed by the pneumatic gripper and a barcode scanner, integrated end-of-arm tooling. These robots automate at low cost, said Peter Johansson of AH Automation, the distributor who installed Nordic Sugar’s latest robots.

“Today, if we need to reposition the robot or change its speed, we can do it by ourselves,” said Bergdahl. The new robot replaced “another robot, but if I had to use manual labor, the robot would have paid for itself in four months. Now we can invest in new robots instead of buying spare parts,” Bergdahl said. In a collision, the robot delivers less force than the 150 Newton (33.72 lb) regulatory limit [EN ISO 13850]. End-effectors and other environmental conditions could create hazards; and a risk assessment should done. (In 1,600 applications, 80% of Universal Robots did not require an enclosure.)

- Kristian Hulgard is area sales manager at Universal Robots.

6 tips for collaborative robots

Rodney Brooks, chairman and CTO, Rethink Robotics, explained that robots don’t need smarter users; they need to have user interfaces that match users’ capabilities. By redesigning one interface to be more like a game controller and less like the brain of an MIT engineer, users were able to use 85% of one robot’s capabilities within five minutes. Brooks said a collaborative robot should:

1) require no integration; a complete system should work out of the box; 2) need no programming or training; it should be usable in minutes; 3) be very capable; 4) work intelligently, with knowledge about its environment, including automatic error recovery; 5) be safe to operate, even if the operator gets hit at full velocity; and 6) have an extensible platform. Brooks spoke at the Robotics Industry Forum in February, by the Robotic Industries Association (RIA).

Go Online: At www.robotics.org.

Rethink Robotics offers Baxter, an easy to program and use collaborative robot that can work safely in the same area with humans. Courtesy: CFE Media video

Now Nordic Sugar employees can program the robots using the UR robots’ intuitive user interface, rather than call experts. Here, without safety guarding, the employee monitors the robot in production, testing can contents and how contents pour into filters. Courtesy: Universal Robots

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Open-source robotic software advances

ROS-Industrial Consortium (RIC) held a kickoff meeting on March 6 and 7 at Southwest Research Institute (SwRI) in San Antonio, Texas, with 25 people from 14 organizations. RIC is an international network of automation R&D organizations to foster advanced manufacturing technologies enabled by ROS-Industrial open-source software.

The meeting introduced SwRI, ROS, MoveIt!, ROS-Industrial, and the consortium. Participants, mostly from industry, expressed enthusiasm about the potential for ROS-I and for an upcoming ROS motion planning application called MoveIt!, explained by Dr. Sachin Chitta from Willow Garage. The MoveIt! software framework for motion planning in ROS (a core part of the ROS platform).

Via his VGo telepresence robot, Erik Nieves, technology director for Motoman Robotics America (part of Yaskawa), discussed the value of ROS-Industrial to robot original equipment manufacturers. “ROS-Industrial is an important work. It is true: we do need to have a hard and stable version of ROS from which we can proceed. So Yaskawa has thrown our hat in with the ROS-Industrial Consortium, and we’re glad that you have too!” said Nieves.

A tour of SwRI included five ROS-I-enabled robot demonstrations at SwRI’s Manufacturing Systems facility. HDT Robotics showed its teleoperated portable robotic arm.

At the members’ meeting, attendees shared experiences using ROS/ROS-I for industrial robotics R&D. Shaun Edwards, founder of ROS-Industrial, proposed a roadmap for ROS-Industrial development. Attendees divided into work groups to give feedback on plans of ROS-Industrial.

Ulrich Rieser, group manager, software engineering and system integration, Robot and Assistive Systems Department at Fraunhofer IPA, gave the keynote presentation, “ROS-I European Perspective,” which outlined a roadmap for ROS-I adoption in Europe.

5 possible projects

Paul Hvass, the consortium program manager, explained how consortium Focused Technical Projects (FTPs) work, and how they enable members to share the cost of developing specific new ROS-Industrial capabilities. Consortium members presented five proposed FTP topics: 1) A graphical programming user interface for ROS; 2) A MoveIt!-based mobile manipulation demonstrator; 3) A MoveIt!-based deburring demonstrator; 4) A force-controlled teleoperated system for deburring/grinding; and 5) Improvements to a human tracker system for forklift/AGV safety. An FTP starts when a critical mass of members agrees to fund the topic.

A ROS-Industrial training class is planned at SwRI, June 4-6. There is a cost for nonmembers. The next member meeting is in September.

- Information from ROS-Industrial Consortium.

ROS-I Founder Shaun Edwards demonstrates pick-and-place robotic functions with ROS-I open-source programming. Courtesy: ROS-Industrial Consortium
To meet the imperatives of global manufacturing agility, one of the world’s largest automakers recently tapped Moore Controls, Dexter, Mich., to provide a new material handling system to serve automated transmission manufacturing, to transport workpieces through various manufacturing cells, starting with turning steel blanks into finished gears for further assembly.

“Traditional gear-handling systems focused on long runs of a single part,” said Steve Moore, president of Moore Controls. “Changeover was time consuming, labor intensive, and impacted overall throughput. The demands of today’s global marketplace require the automaker to seek a system with the flexibility to handle a greater number of parts, but without the extra tooling and changeover time.”

Moore selected parallel, two-fingered grippers that use a 24 V dc motor with an encoder designed for electrical controls. The grippers are variously mounted on gantries, robots, and modular frames that can be adapted for each manufacturing cell. A minimum of two gripper assemblies is used for each modular cell, and some units have up to five grippers; a full material handling line of integrated, automated stations uses hundreds of grippers.

In the most common application involving these stations, “flexible automation cells,” the grippers are mounted to standard pneumatic components: ISO cylinders for horizontal and vertical part rotation; valve terminals; and air-preparation components. Two sets of grippers are mounted on the pneumatic cylinders. They are oriented 90 degrees from one another so that as one gripper clamps down on a gear’s outside diameter (O.D.), the other swivels into place, ready to pick the next gear for more constant, productive operation. As the grippers clamp onto the O.D. of each gear, they precisely measure the diameter of the gear, and reject any that are the wrong size and may have been introduced during loading by manual operators.

To measure and identify each gear based on encoder feedback, the grippers use electric controls with servomotors and ball screws managed by programmable logic controllers (PLCs). At each cell a motor controller communicates to a PLC via Profinet network using the Profinet International (PROFINET) protocol. The PLC calculates the absolute position of the gripper fingers and sends direct commands to grip and measure each part.

The PLC calculates the absolute position of the gripper fingers and sends direct commands to grip and measure each part.

“- Bryan Morehouse is automotive industry project engineer, Festo.

Automation gantry has two Festo servo grippers and V-shaped gripper fingers mounted to a Festo pneumatic cylinder to allow finished part pickup with one gripper and raw part placement with the second gripper. Rear view of servo grippers on automation gantry shows power and communication cables to the grippers. Courtesy: Festo

At www.controleng.com, for more application and product details, search for Automaker changes gears without changing grippers.
www.moorecontrols.net
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Consider this...
What new robotic technologies can be applied in your automation application to simplify programming or improve quality?