



US Chemical Automates Case Packing With Robotics

A robotic cell that packs chemical containers into cardboard cases is eliminating repetitive manual operations at plant in southern Wisconsin. The system, designed by Promatech, LLC, New Berlin, Wisconsin, was integrated into an existing filling, capping and conveyor system and incorporates a six-axis robot with a series of interchangeable grippers.

US Chemical, a JohnsonDiversey Company, is the largest supplier of privately branded specialty cleaning chemicals in the nation. The company's Watertown, Wisconsin, plant packages these cleaning products, including both liquid and solid formulas, in large plastic bottles ranging from spray bottles to quarts and gallon sizes. Typical products are used for washing, laundry, housekeeping and janitorial services in hospitals, hotels, universities and other institutions, commercial laundries, and the restaurant and food service industries.

Automating for Ergonomics

The newly automated packing line replaces a manual operation that was installed about eight years ago. Originally, workers manually packed four or six containers to a case. Operators lifted the containers from the conveyor and placed them in the case, closed and sealed it. As the volume and variety of products and containers increased, it became necessary to improve adaptability, stabilize operating speeds and eliminate the potential for repetitive motion injuries, the company installed a single-arm robotic cell.

Plant Lead Robert Dourlain says, "Increased speed wasn't really a factor, but with the operation automated, we avoided operator fatigue setting in." The changeover was made without laying off any employees, he notes. "We didn't need extra labor and weren't ready to automate."

Robotic Cell Brings Consistency

The robotic system, which was designed and developed by Promatech engineers, went into operation in February 2005. It uses a six-axis, articulated-arm robot. It uses several different end-of-arm grippers, designed by Promatech, to handle various container sizes.

In operation, filled containers and empty cartons approach the robotic cell on parallel conveyors. A diverter escapement directs them onto two adjacent tracks as they enter the cell. Sensors on each side are set to detect the correct number of containers needed to fill a case. When the sensors show that the correct number of containers needed to fill a case is in position, the robot picks them up. When the sensors then detect that no product is in position and allow the next batch to move ahead.

US Chemical sent a group of people to Promatech for training before the system was accepted. Dourlain says, "The exposure on how the machine operated. After it was in place, the operators had a good understanding of how to operate it."

The system was easy to learn, and the people who operate it had no prior experience with automated equipment. A person check the setup if they encounter any issues, but the operators continue to learn the skills needed to perform the job themselves. In addition, Promatech provides around-the-clock technical support when needed.

Operators use the FANUC iPendant to program the robot and make adjustments in its operation. The color, Intuitive

based and easy for the operators to use, Dourlain notes.

The line operates two shifts per day, five days a week. "In most cases," Dourlain says, "we try to run different for bottles with sprayers together to get a longer run time without changing the robot tooling." He says it takes about expects to cut that in half through some planned modifications to the attachments. Upstream from the robot, filler between runs as well. Run lengths vary but typically average one to two shifts per container, Dourlain reports.

Automation Engineer Corey Long, of Promatech, says, "US Chemical wanted to use a single robot to pack case multiples. We often provide tool changing, but a lot of their runs don't change often enough to justify that." Instead work holders that could be changed to accommodate the varying containers. "They aren't all uniform bottles," Long and there are balance issues as well. If you pick them up on center, they will tilt one way or the other, so we had

Another consideration was the behavior of the bottles themselves during handling. Long says, "Each program is that act on them when you move the robot at different speeds. You have to finesse the acceleration and deceleration and go as fast as you can, inertia and momentum will act on the bottle and its contents. This could cause them to tilt correctly."

Long says that the robotic cell was designed to fit into the line where the manual case packing had been done. "Before the capper before coming down the line into the cell," he explains. "The box line runs parallel to the filler line, so alongside the bottles. The robot reaches over the boxes to pick up the product, brings it back over the box and places

"At first," Long notes, "the box erector did not open the flaps fully, so US Chemical developed a box spreader to carton reaches the robot. The robot will go to the same point every time, but if it can't get the containers into the

Sensors Guide and Control

Several types of sensors are installed within the robotic cell to monitor and control the container placement, as well as prevent disruption to the operation. Promatech partners with SICK, Inc., a leading manufacturer of sensors and application, SICK WT4-2P330 proximity/diffuse sensors are used to signal when products and cartons are in place. They are protected by SICK E1000SK1 Safety Key devices. When an operator needs to enter the cage, she activates a safety key that pauses the robot at the next convenient point to allow her to use a special key to open the gate. The operator cannot start until it is re-inserted to ensure safety.