



# Welcome to the Machine

Are you ready to accept automation and robotics in your facility? • By Ken Mark

**R**obots will be coming soon to a hog slaughterhouse near you. And that represents a big change from their traditional role playing second banana doing post-production, picking and packing in food-processing facilities.

Behind this move are several recent major technological breakthroughs and the constantly improving value proposition of such systems. Enhanced capabilities, including laser vision and simpler programming, enable robots to deliver greater efficiency, flexibility and optimization at more affordable prices. As a result, robots are enabling food processors to control production costs more tightly and meet new regulatory demands more easily, while maintaining profit margins to stay competitive. In automotive assembly and parts production sectors, as well as in the electronics industry, robots have already proven their worth. Now it's show time for food processors.

Until now, the industry has lagged in the area of automation and robotics. According to estimates from Bob Hirschinger, Business Development manager for Kinetix Integrated Motion, a division of Rockwell Automation Inc., there are about 3,000 robots in food processing in North America (no official Canadian robot population statistics exist). That's compared to 50,000 in automotive assembly and parts production, and 25,000 in electronics production.

However, analysts believe that in the future, robots

can help the food industry meet pressing business needs. "Meat packing profit margins are shrinking and under constant pressure from rising labour and insurance costs," says Bill Willard, Atlanta, Ga.-based national accounts manager of Food and Beverage for KUKA Robotics Corp. "In addition, there are increasing safety and other requirements from regulators and government departments. For example, OSHA (the U.S. Occupational Safety and Health Administration) is expected to lower the maximum weight that employees will be allowed to lift on the shop floor." Willard also notes that robots occupy a smaller footprint on the hog-processing floor than other conventional automated methods, and can be retrofitted to existing systems. In addition, since robots offer a wider range of motion flexibility and fewer moving parts, they help reduce maintenance cost as compared with other automated equipment.

"A robot's mechanical unit and controller are very durable and reliable," notes Steve Stegora, Mississauga, Ont.-based vice-president of Sales for Langen Packaging Inc. "There is an average of 78,000 hours between breakdowns," he says, but adds that, "As a total system, however, other problems such as consumables and damage to an electric eye by workers can occur more frequently."

Most recently, kinematics has simplified the programming of robots so as to make them more easily integrated into the processing system. The kinematics algorithm is the basis for

a robot's co-ordinate system and is executed by the motion controller. Rockwell Automation has been a pioneer in addressing the industry's need for a common hardware and software architecture that has led to the creation of all-purpose controllers. As a result, robots can improve throughput by 25 to 30 per cent.

Such standardization is also facilitating the integration of robots into other production line components, something that's helped stabilize robot costs. "Even though functionality continues to increase," says Harminder Singh, Business Development manager for Global OEM packaging segment at Rockwell Automation Inc., "robot prices are close to what they were in the late 1990s."

Regardless, American packers are currently looking closer at introducing robots to boost production yield by eliminating worker inefficiencies and errors. According to Willard, employee efficiency fluctuates through the shift depending on distractions and the redundancy of routines. At the beginning of the shift, employee efficiency may be 100 per cent based on their capacity, but can fluctuate throughout the shift and drop by as much as 50 per cent by the end of the shift. In contrast, when properly programmed with the correct information, robots operate at 100 per cent efficiency 100 per cent of the time. This sort of accuracy and precision are crucial in meatpacking. For example, the initial, belly-to-breast cut opens up the carcass hanging from a hook causing the internal organs to drop out into containers below. If that cut is off-centre, it affects the quality of meat by damaging the entrails and other parts, which in turn reduces carcass yield. So while robots may not necessarily significantly reduce labour cost initially, they will increase the yield to packers by increasing revenue from higher-quality meat.

European meat processing facilities have already established a track record in using robots. "In North America," says Willard, "we are targeting plants with volumes anywhere from 200 hogs per hour to 1,300 hogs per hour. Our system can handle up to 650 hogs per hour. There should be beta-test sites up and running by the end of 2007."

As this new generation of robots becomes more intelligent they will deliver greater value. For example, when armed with laser vision, robots can scan a carcass and adapt its functions to differences in size, the hanging angle and gender. A 3D laser scans for the process floor and 2D lasers scan for those sections with prime cuts. In addition, newer vision systems are now more powerful – even detecting external abscesses and ascertaining gender.

Next-generation robots are also capable of a light touch. "In the past, robots were used to replace humans because they could do the job faster, with greater consistency and precision," says Scott Scriven, Kansas City, Mo.-based



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president and CEO of Weber Inc. "That's about to change with the launch of our new system that can do things that human beings cannot." The firm's new Weber Food Robotics division has launched an innovative, as-yet unnamed production line picking and packing system that slides a "shingle" of meat – several slices of luncheon meat fanned out like a deck of cards – from a conveyor and places it in a clear plastic tray, then overlays another shingle on the first one. The overlap between the two shingles can range from 100 per cent (stacked directly on top of the first shingle) or zero (beside it or any position in between). The result is a more effective product presentation to consumers.

"It's the precise overlapping of the two shingles that humans can't do," says Scriven. And, he adds, "The robot only occupies a small shop-floor footprint compared to machines 15-ft to 18-ft long currently performing similar functions."

Scriven also anticipates other creative applications such as automating sandwich assembly, whereby the robot places in quick succession a slice of meat, a slice of cheese, condiments and finally the top slice of bread on a bottom slice of bread set in a tray. Projected volumes for the system are 16 "indexes" or packaging cycles per minute. The system is up and working at a plant in Spain and was introduced at the recent IFFA trade show in Frankfurt, Germany. It will be formally launched in North America at Chicago's Worldwide Food Expo in October.

Despite the glitter of such groundbreaking technology, existing robot capabilities continue to contribute in terms of productivity and flexibility. Today's robots are no longer simply one-trick ponies. "Our LRC-700 robot offers unique multi-task capabilities," says Stegora, "including case packing – loading products into cardboard boxes and palletizing them – and organizing those boxes into skids. The robot's utility is maximized because it occupies less floor space." In addition, capabilities such as this can help food processors who have introduced a central palletizing system which moves goods along conveyors to a specific area where robots armed with bar code scanners, and eventually RFID tag readers, can pick boxes to build skids for delivery.

But the future promise of robots is even greater. Industry observers can hardly wait for Swiss-developed Delta robots – which resemble upside down, three-legged spiders and which are prized for the agility, speed and elegance at which they work – to come off patent in the U.S. at the end of this year, something that happened last year in Europe. Consequently, the cost of these top-of-the-line robots is expected to drop considerably. Watch for the debut of these robots – they will be the stars of 2008. FC