Drive & Control
profile

Robotics makes the right move for Medifast

Medifast worked with KHS Bartelt Packaging Group to install a three-axis delta picker with Rexroth electric drives and controls for better product transfer between its pouching and cartoning equipment.

Delta robot adds flexible automation, improves transfer between poucher and cartoner

In automated packaging operations, transferring products from one machine to another can often bottleneck the entire line. Jams can occur, products may need to be manually inspected, and overall efficiency may be less than optimal as machine operators spend time addressing problems.

Medifast, Inc. (www.medifastnow.com Owings Mills, MD), provider of popular clinically proven weight-loss and healthy living products and programs, recently sought to improve the transfer system between its pouching and cartoning machines. They chose to work with the KHS USA, Inc. Bartelt Packaging Group (www.khs.com Sarasota, FL), a leading manufacturer of filling and packaging equipment for the beverage, food and non-food industries, to implement a flexible automation solution: a new delta

Challenge:

Improve product transfer between Medifast's pouching and cartoning machine

KHS Bartelt and Rexroth Solution:

- Three-axis delta picker robot controlled by Rexroth's IndraMotion MLC motion logic control platform
- IndraControl L65 controller with Sercos ring
- IndraDrive Mi cabinet-free integrated servo motor/drives
- IndraDrive M digital intelligent servo drives
- IndraDyn MSK servo motors
- IndraWorks programming package

Results:

- Better integration for pouching/cartoning
- Stable, uniform pouch stacks for improved cartoning
- Easy robot positioning, changeover
- Reduced cabling, smaller machine footprint, higher ROI on floor space
- Measurable improvements in throughput, OEE

robot picking system controlled by an advanced servo platform from Bosch Rexroth Corporation (www.boschrexroth-us.com Charlotte, NC).

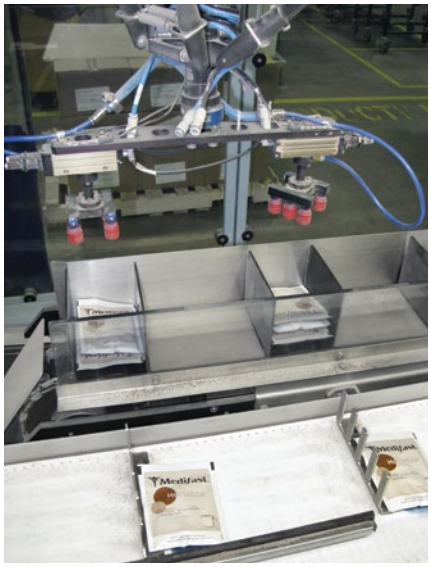
Pouching, checkweighing and cartoning

Medifast supplies powdered, portion-controlled meal replacement products—soups, shakes, soft bakes, pancakes and so forth—for weight loss and weight management purposes. Each product carton contains seven pouches to match up with certain meals for the days of the week.

The powdered mixes are filled into standard 5-inch and 5.5-inch tall pouches by an existing KHS Bartelt pouching machine. Once filled, the pouches are sent by pairs through a high-speed checkweighing system and then transferred to the infeed of the cartoning machine. Seven pouches are stacked lying flat in a bucket conveyor on the cartoner, then automatically inserted into the cartons.

According to Medifast Engineering Manager, Ron Marburger, these three key steps—checkweighing, transferring from the poucher to the cartoner, and stacking the formation for the cartoner—caused intermittent disruptions and inefficiencies that became a persistent issue.

"Using the previous mechanical transfer system, we didn't always get reliable uniform stacks in the bucket conveyor, which caused jams on the cartoner," he said. "And with the previous checkweigh process, if one of the paired pouches was outside of specification, both pouches were rejected and had to be inspected manually. We wanted a flexible solution that was better at



Taking input from the checkweighers, the robot picks up the good pouches and alternates the orientation, turning every other one to provide uniform, stable pouch stacks for better cartoning and fewer jams.

transferring product from the poucher to the cartoner."

Delta robot delivers flexible automation

After investigating several options, Medifast and KHS Bartelt determined that a three-axis delta picker robot would supply the speed, flexibility and improved placement Medifast sought for transferring product coming off the poucher. KHS Bartelt provided an infeed system with third-party robotic hardware from Codian (www.codian-robotics.com Jackson, MI), controlled by the five-axis cartoner using Bosch Rexroth's IndraMotion MLC motion logic control platform—similar to the controller already in place on the upstream eight-axis poucher.

For the delta robot, the IndraMotion MLC platform delivers all the motion and robot control capabilities needed for multi-axis path interpolation in space. It features a full software library of ready-to-use kinematics for robotics applications, and supports fast set up configuration using onscreen dialog boxes. In addition, machine builders and end users have the option to use Rexroth's Open Core Interface software to author robotics sequences in high-level languages such as C++ if they prefer.

The controller hardware is the Rexroth IndraControl L65, a powerful, scalable unit featuring an ultra-compact design and integrated standard interfaces, including Ethernet TCP/IP and Sercos®.

"Bosch Rexroth's controller provides all the functionality and processing power that was required for both the delta robot and the cartoning machine," said Tom Tomac, KHS Bartelt electrical engineering manager. The IndraMotion MLC controllers for the poucher and cartoner are networked together using an external controller-to-controller Sercos interface, which fully integrates control of the packaging process from pouching through cartoning.

"The external Sercos ring lets us share positioning between the two controllers," Tomac said. "With the logic of the controller, the delta robot can track each pouch's position deterministically in real time coming off the poucher and checkweigher without using a vision system. The pouching throughput speed can change and the robot will respond to the change without interruption."

Networking both controllers and having the robot and the cartoner share one control platform also made it relatively simple and more cost-effective to integrate the robot into Medifast's existing systems. Rexroth's user-friendly IndraWorks programming

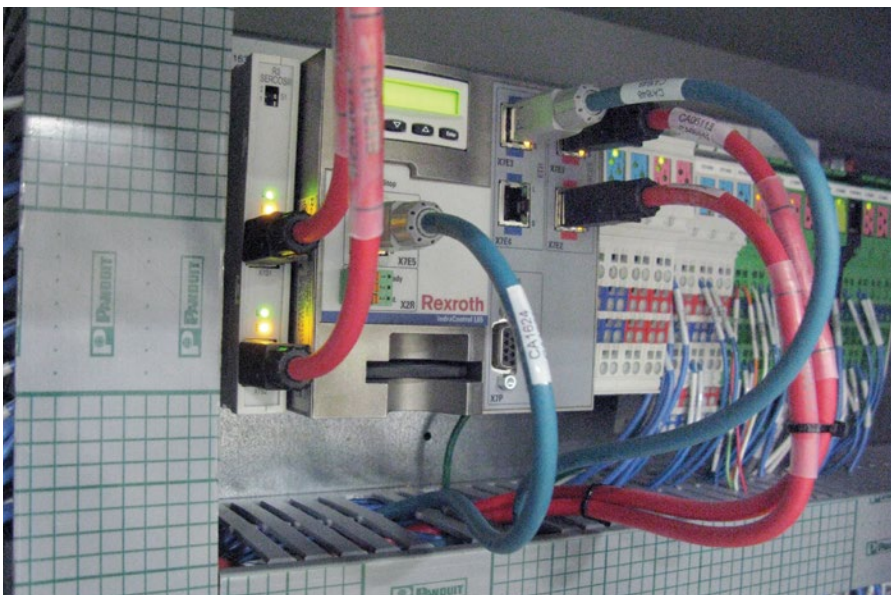
package was used to program the IndraMotion MLC platforms with a single uniform programming environment for logic, motion and kinematics.

The robot is powered by Rexroth IndraDyn MSK motors coupled with intelligent IndraDrive M servo drives. Both pouching and cartoning machines use Rexroth's IndraDrive Mi cabinet-free integrated servo drive-motor solution, which merges the drive electronics and servo motors into single units that help reduce cabling requirements and the size of the control cabinet as well as the overall machine footprint. Using the IndraDrive Mi allowed KHS to eliminate a freestanding drive and control cabinet and use a smaller, machine-mounted cabinet. Removing the cabinet and adding a delta robot led them to configure the poucher and cartoner inline. "This helped streamline the physical footprint of both lines, eliminating offsets between machines and allowing both systems to be installed in a straight line, saving valuable floor space," added Marburger. The result is a higher ROI per square foot of floor space.

Checkweighing, teardrop pouches and square stacks

The robot has helped improve multiple areas on the pouching and cartoning line. For efficiency, the KHS Bartelt poucher completes two pouches simultaneously; they are then discharged, separated and sent through two high-speed checkweighers before going into a single line.

The robot takes inputs from the checkweighers and only picks up and stacks the good pouches, while any rejects are diverted—significantly improving throughput. "This reduces the time operators have to spend dealing with false rejects and has noticeably improved their efficiency, especially when clearing out any remaining product during lot changeovers," Marburger said.



The Rexroth IndraMotion MLC platform delivers all the motion and robot control capabilities needed for multi-axis path interpolation in space and features a full software library of ready-to-use kinematics for robotics applications.

The Rexroth drive and control platform provides all the functionality and processing power for both the robot and the cartoning machine, while using an external Sercos ring to integrate with Rexroth's upstream controller on the poucher.

Creating stable pouch stacks in the bucket conveyor has also been significantly improved. As is typical with powder products, the Medifast ingredients settle into a "teardrop" shape in the pouch—wider at the bottom than the top. In the past, the pouch stacks might not be even and stable, because the mechanical system stacked all seven pouches in the same orientation, with the wider teardrop shape all on one side.

"With the delta robot, it picks up and alternates the orientation of the pouches, turning every other pouch 180 degrees," Marburger said. "We get much more uniform, stable stacks for insertion into the cartons, and much fewer jams."

He added that alternating the product orientation has enabled Medifast to evaluate different options for reducing carton sizes. This could

Mounted directly on the machine, Rexroth's IndraDrive Mi cabinet-free integrated servo motor/drive units reduce cabling requirements and help minimize the size of the control cabinet and the overall machine footprint for better ROI on floor space.

decrease container costs and allow more product density in the pallet, in the truck and in warehouses—with potential savings throughout their supply chain.

Simplified product changeovers

A human-machine interface ties in with the Rexroth IndraMotion MLC platform to control changeovers when different products are processed; depending on the product, the pouch "teardrop" can be thinner or thicker, which changes how the robot stacks the pouches.

According to Marburger, the Rexroth controller makes adjusting the robot arm's positioning a snap. "It shows all the coordinates for the robot, and it makes it very easy to change them when you need to," he said. "That feature is very helpful, and we can easily train our operators to do it."

Measurable improvements in OEE

Medifast uses overall equipment effectiveness (OEE) to track the performance of its manufacturing systems. Under the previous pouching-cartoning configuration the maximum OEE they were able to achieve for a single shift was 83 percent. "Most recently, the delta robot has helped us reach almost 97 percent OEE for a single shift, which absolutely crushed our previous record," Marburger said.

Although this was the first time Medifast installed delta robot technology in their plant, the past experience working with KHS Bartelt gave them confidence that the move to robotic transfer would be a success. "We trusted KHS and it was very easy working with them," Marburger said. "Plus, we're engineers, so we were excited about bringing a robot into the plant."

"At KHS, we know that one size doesn't fit all," said Marty Bechtel, KHS Bartelt Packaging Group's sales director. "We knew that Medifast had the environment that would make the best use of this particular solution, and we knew the Rexroth controls and drives would make it easy to integrate it into their operations. It was the right move for them."

Do you have an application worthy of a case study?
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