Drive And Control System Leads To Smoother Machine

Highly efficient, ultra-sanitary HFFS machine uses Rexroth integrated motor and drive, pneumatics, machine control and linear motion system.

It was about 35 years ago when company executives at CP Packaging [1] began developing packaging machinery. Back then, it was only a concept to buy prepackaged meat and deli products. Now, in today's convenience oriented society, it's almost unusual for consumers not to buy pre-packaged meat items.

Seeing a need to serve this market, CP Packaging recently developed the VisionPak™, an efficient, easy-to-use and highly sanitary servo-driven horizontal form, fill and seal machine (HFFS).

Rexroth IndraDrive Mi integrated motor and drive units are located directly on the machine, saving on wiring and cabinet space and enhancing sanitation.

To meet its design goals for a precise, ultra-sanitary and easy-to-commission machine, CP worked with local automation distributor CMA/Flodyne/Hydradyne [2] and specified an integrated electric drive and control, pneumatics [3], and linear motion [4] platform from drive and control specialist Bosch Rexroth [4].

Top form with Rexroth drive and control

The VisionPak is a six-axis machine for packaging deli-style and other types of meat products. Pre-printed filmstock is unwound and fed into the machine where it goes through a heat-forming lift and die process to create the container shape. The formed film advances to the center of the machine where the meat product is added, and then it’s indexed to the end where another roll of film is used to finish the package with a heating, vacuum, sealing and trimming process. Other motion axes can be added for more functionality, such as hole-punching.

Seeking better control for the rollstock, forming and sealing process, CP incorporated a unique belt-driven motion and lift system synchronized by a half-dozen Rexroth IndraDrive Mi [5] integrated servo motor/drive units.

The washdown-rated IndraDrive Mi combines a traditional servo motor and drive into a compact, but highly functional drive unit. This unique design reduces the size volume by more than 50 percent compared to traditional servo drives using a separate motor and drive. With smaller integrated components, the size and expense of the control cabinet and the overall machine footprint are drastically reduced.

The VisionPak's motion and logic is controlled by a high-performance Rexroth SERCOS-based IndraMotion MLC controller which has built-in motion, logic, robotic and Flex Profile capabilities. With Flex Profile, cams can be multi-segmented and cycle times can be optimized for velocity, acceleration, position or time to avoid having to rebuild cams each time a parameter changes. A Rexroth VEP series Windows CE-based HMI provides the operator interface to round out the system.

The Rexroth HF03-LG modular valve manifold system provides high flow in a compact package, while the ED05 electro-pneumatic proportional valve replaces the mechanical dancer on the film rollers.

"On this type of machine the film is traditionally pulled through with a chain drive," explained Ray Buchko, Jr., CP Packaging vice president of operations. "However, the motion of our drive and lift system separates us from other manufacturers. We're using a servo belt drive which eliminates the potential for a dirty chain and more downtime," he said. "With Rexroth's IndraDrive Mi, we have complete control of our lift motion and drive. The independent motors are synchronized with a virtual master, which is a huge advantage because it helps avoid uneven wear," he said.

For the carriage lifts, Buchko added that Rexroth provided a TDC chromium-coated

linear Ball Rail® system instead of stainless steel for smoother motion, higher loads, and better washdown capability.

One feature that appealed to CP Packaging is the IndraDrive Mi's innovative "daisy chain" cabling design, which significantly reduces the amount of cable connections. Only a single cable containing both power and communication is needed, so the drives are easy to connect without a lot of wiring.

"With the IndraDrive Mi system, not only did we eliminate the need for a remote cabinet, we reduced the control panel space by 50 to 60 percent and realized a 30 percent cost savings overall," said Buchko. "By daisy-chaining the servos we reduced our cabling, which helped improve sanitation, cut the potential for downtime and lower our cabling costs. Now we can run our cables better to protect them from the washdown process, and by getting rid of the remote cabinet, a crew can install the machine in a matter of hours instead of days."

Motion and logic is controlled by a Rexroth SERCOS-based IndraMotion MLC controller with built-in motion, logic, robotic, and Flex Profile capabilities — located in the unique swing-out control cabinet.

Rexroth pneumatics eliminates mechanicals

Web feed systems on vacuumpack machinery require some type of film accumulation system, or mechanical "dancer," since film cannot be pulled directly off the roll straight into the machine. To address this issue, Rexroth provided ED05 electro-pneumatic proportional valves with high accuracy and dynamics to regulate the tension on the wind and unwind rollers and film sealing bar.

Buchko said using Rexroth pneumatics eliminated the need for a mechanical dancer, allowing the film to be pulled directly from the roll into the machine. "This is the first HFFS in the industry to do that," he said. "Not only does it eliminate mechanical components, which reduces costs and potential downtime, it improves sanitation by minimizing the ability for any surface debris to contact the film."

Rexroth also provided HF03-LG valve manifolds with Profibus interface to control

the air cylinders for the forming, sealing, evacuation and cutting. The HF03 valve series is a modular valve manifold system providing high flow in a compact package with low power consumption. The manifolds are field expandable in single station increments up to 16 stations, providing as many as 32 valve functions.

Partnership pays off

Buchko said the coordination between CP Packaging, Bosch Rexroth and CMA/Flodyne/Hydradyne was instrumental. Not only did CMA/Flodyne/Hydradyne provide guidance on selecting and sizing the Rexroth components, they handled the crucial machine programming as well, using Rexroth's IndraWorks uniform software suite. IndraWorks allows the motion, logic, visualization and HMI screens to be handled all in one package rather than toggling through multiple programs.

"The support from CMA/Flodyne/Hydradyne has been critical to our success," said Buchko. "And we have a long history using Rexroth. They're far ahead of their competition in bringing the various technologies to the market, and we only have to deal with one automation supplier," he added. "Those advantages sealed the deal."

More automation, cleaner operation

Philadelphia-based Dietz & Watson company [6] has been providing premium meat delicacies and artisan cheeses to grocers and consumers since 1939. The company recently became the first to install the VisionPak on a deli meat packaging line.

CP's unique synchronized belt-driven motion and lift system rides on Rexroth linear Ball Rails.

"We wanted the latest technology to increase our production," explained John Schoenfellinger, vice president of engineering. "The VisionPak uses an innovative motor and drive system to pull the film through the machine. They also moved the drive motors out of the washdown area and gave the control cabinet an innovative hinge design that swings out of the way for total access to the machine. Other washdown machines still have cabinets with limited accessibility," he said. "CP's design makes maintenance and repair very easy and it's no problem to clean up."

Schoenfellinger added that the VisionPak's design also makes it easier to install and

operate. “Other machines require a lot of rollers and tensioning dancer arms for the film,” he explained. “Ours uses pneumatics to replace the dancer, giving us faster changeovers and better control of the film during operation. We’re seeing at least a 10 percent improvement in changeover speed. Plus, we had it running within 24 hours of delivery,” he said. “CP has a group of knowledgeable people with a very strong engineering capability.”

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