Drive & Control **profile**

More speed, continuous motion fits stretch sleeve machine

For the SL-5400, SleeveCo envisioned a continuous flow machine with throughput rates targeted at 90 containers per minute—up to 150 containers per minute with a dual applicator head configuration.

A sophisticated array of advanced Rexroth pneumatics, controls and linear components helps new vertical sleeve labeler boost throughput and deliver non-stop production

Stretch sleeve labels have become a major labeling choice in many packaging categories—and the new SL-5400, from SleeveCo (www.sleeveco.com) of Dawsonville, GA is designed to do one thing and do it fast: Grip and pull sleeves over one-gallon jugs to the tune of 90 jugs per minute. That's one jug every 0.67 seconds!

SleeveCo is the industry's premier single-focus printer and converter of shrink and stretch sleeve labels. The company also designs and builds a full line of

Challenge:

Develop a new automatic vertical sleeve applicator, with higher speeds and continuous motion

Bosch Rexroth Solution:

- IndraMotion MLD compact drive-based motion and logic solution
- IndraDrive digital intelligent drives
- IndraControl VEP Windows-embedded HMI
- IndraDyn S MSK synchronous servo motors
- MSC-guided pneumatic actuators
- MLR high-speed belt-driven linear modules
- Non-Contact Transfer (NCT) pneumatic units

Results:

- Vertical sleeve applicator with higher speed, continuous motion
- Throughput rates targeted at 90 containers per minute—up to 150 with a dual applicator head
- Elimination of one axis of motion
- Cycle time of 0.67 seconds
- Extremely precise acceleration and deceleration variations

application equipment—the only label producer that also builds label machines.

To develop a new automatic vertical sleeve applicator, with higher speeds and continuous motion, they turned to expert distributor partner Livingston and Haven (www.lhtech.com) and the drive and control experts at Bosch Rexroth (www.boschrexroth-us.com) to equip the new machine with the right combination of drive, motion and control technologies to meet SleeveCo's demanding performance requirements.

Continuous sleeve labeling…faster.

SleeveCo's new machine, the SL-5400, is targeted at packagers that both fill and label blank containers of a standard size, up to one gallon. Three major examples are bleach suppliers, windshield wiper fluid companies, and bottlers of liquid milk. These businesses typically run the same size container for days on end, at fairly high rates of production.

"For this application, our biggest goal was a higher speed machine," said Gordon Rink, Vice President of Technical Services at SleeveCo. "Our earlier generation machines combined a horizontal motion—pulling the bottle from the conveyor—with a vertical motion—sleeving the label. The SL-5400 needed to be different."

For the SL-5400, SleeveCo envisioned a continuous flow machine with throughput rates

Rexroth IndraDrive systems and IndraMotion MLD were used to sync the up-down sleeve application motion with the conveyor's continuous movement.

targeted at 90 containers per minute—up to 150 containers per minute with a dual applicator head configuration. SleeveCo chose technology provider and distributor partner Livingston and Haven Technologies to provide engineering and machine design support for the SL-5400. To drive and power the machine, Livingston and Haven selected a complete, integrated platform of motion control technologies from Bosch Rexroth: pneumatics, linear motion and electric servo drives.

Synching applicator motion to conveyor speed

In the SL-5400, the empty bottles are fed non-stop by a conveyor into the sleeving zone. The labels are dispensed from a perforated roll that feeds into the machine over the top of the conveyor. As each bottle reaches the sleeving zone, two "fingers" open the label. Then, two actuators move up from beneath the conveyor, grasp the opened sleeve, and then pull it down onto the bottle.

According to Rich Arnold, Regional Sales Manager with Livingston and Haven, SleeveCo's design for a non-stop machine eliminated one axis of motion—pulling the bottle off and back on the conveyor. However, it also created a significant motion control challenge: synchronizing the up-down sleeve application motion with the conveyor's continuous movement.

"We faced some pretty challenging motion control issues with speed and inertia, to keep from knocking the bottle off the conveyor," said Arnold. "Trying to correct that issue, and keep it from happening at different conveyor speeds, up to 90 bottles per minute, was a challenge."

The solution: Rexroth IndraDrive systems and IndraMotion MLD. IndraDrive systems provide the intelligent drive-based multi-axis machine control that OEMs need to power today's state-of-the-art, modular machine platforms. The IndraMotion MLD is an extremely compact motion and logic solution housed inside the IndraDrive, designed to provide a decentralized control architecture that combines powerful motion and PLC functionality in a drive-based solution.

User-friendly, touchscreen operator control for the entire machine is provided through IndraControl VEP HMI, combining simplicity

and compact design with flexible, Windows-based high performance programming and control.

At 90 bottles per minute, the cycle time for sleeving the bottles is approximately 0.67 seconds—and the bottles never stop their forward motion on the conveyor. Using the IndraMotion MLD platform, the SleeveCo/Livingston & Haven engineering team refined motion control algorithms and established extremely precise acceleration and deceleration variations for the machine drives and the five Rexroth IndraDyn S MSK synchronous servo motors that power the SL-5400's motion components.

Faster Rexroth pneumatic actuators

Another crucial design problem was also speed-related: getting the clamps that grip the sleeve label to open and close fast enough to keep pace with the sleeving cycle.

Once again, Rexroth provided the solution with MSC guided pneumatic actuators.

The labeling head mounts two Rexroth MLR high-speed belt-driven linear modules, engineered for high-speed motion applications and rated to accelerate at up to 10 meters per second. The MLR linear modules move up and down, pulling the open sleeve label onto the bottle.

On each linear module there are fixtures with three MSC pneumatic actuators—and the speed and precision of the pneumatic actuators were crucial to the SL-5400's performance. MSC pneumatic actuators combine compact design and lightweight materials with extremely precise intelligent stroke setting and high drive forces—sophisticated actuation capabilities required for the sleeving cycle.

User-friendly, touchscreen operator control for the entire machine is provided through IndraControl VEP HMI, combining simplicity and compact design with flexible, Windows-based high performance programming and control.

"One of the turning points in the design, and getting the performance and speed that was required for the sleeving head, was choosing Rexroth's MSC guided actuators, which have better speed and stability," Arnold said.

Initially, round-bodied, unguided pneumatic actuators were used to drive the grippers. However, their performance was unsatisfactory. Livingston and Haven used a high-speed camera to isolate the problem.

"What we found was that the original cylinders didn't have the speed capability to perform the full motion in the required time," Arnold said. "When we added the Rexroth MSC guided actuators, they had twice the speed capability compared to standard cylinders—you could look at it on camera and see the difference." The MSC is a standard, off-the-shelf actuator from Rexroth.

IndraMotion MLD is the compact motion and logic solution based on the IndraDrive platform, designed to provide a decentralized control architecture that combines powerful motion and PLC functionality in a drive-based solution.

The NCT Non-Contact Transfer Unit stabilizes the bottles; the MSC slide units increase the speed of the process.

Rexroth's innovative pneumatics also play a crucial role keeping the empty bottles stable as the sleeve label is pulled onto the bottle. Two Rexroth Non-Contact Transfer (NCT) units are positioned in the sleeving zone beneath the bottles. NCT units utilize the Bernoulli principle to lift objects without touching them or requiring a vacuum seal.

In this application, the NCT units don't hold the bottles; they simply add a slight but highly useful element of stability for the half-second the sleeve label is pulled over the bottle, to keep labeling running smoothly and continuously.

Demonstrating the advantages of integration

Developing the SL-5400 gave Livingston and Haven an opportunity to work closely with SleeveCo, and to demonstrate the value of utilizing one supplier — Bosch Rexroth — for multiple machine technologies (pneumatics, linear motion and drive and controls).

"Many machine builders recognize the efficiency and design advantages inherent in leveraging the three technologies that we're using on the SL-5400 — the drives and controls, the linear components and the pneumatics," Arnold said. "This was just a perfect fit, letting us take advantage of the synergies of having all those technologies, and integrating them from one source — Rexroth"

Rink said that SleeveCo felt they were getting everything they needed to build a successful machine for the targeted application and market. "We felt Bosch Rexroth would give us the best product, and the support we needed, especially in areas such as engineering and programming, to get the job done," Rink said.

Ultimately, SleeveCo believes that the performance of the SL-5400 will help them boost the company's core business. "This is a big deal for us," Rink said. "We're giving the end customer packagers the speed they need. If we put more machines out there, we can sell more sleeve labels. We're confident this machine will help us reach that goal."

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