

# Drive & Control profile

## Evergreen Gable Top Packaging Machine Excels with Servo Speed



The Bosch Rexroth PPC controller and modular servo drive system provides the tight synchronization and production performance the Q-16 needs for shorter cycle dwells and higher speed timing.

As juice, dairy and other liquid food production practices adapt to meet consumer demands for freshness and convenience, packaging equipment, specifically form/fill/seal (f/f/s) machines, are called upon to provide greater capacity and a wider range of

carton sizes. This growing demand for volume and versatility is what prompted Evergreen Packaging Equipment of Cedar Rapids, IA, to develop its latest f/f/s machine using DIAX04 synchronous AC servomotors and drives and a PPC motion controller from

### Challenge

Faster carton filling  
and easier changeover

### Bosch Rexroth Solution

- DIAX04 synchronous AC servomotors and drives
- SERCOS
- VisualMotion software
- PPC motion controller

### Benefits

- Machine speed up to 18,000 cartons per hour
- Servo system provides accurate positioning, speed and acceleration
- Tight synchronization for shorter cycle dwells and higher speed timing
- On-the-fly adjustments for different product types and carton sizes
- Faster feed rates
- Greater uptime
- Quicker changeovers
- Less maintenance
- More reliability and repeatability
- Lower cost of ownership

the Electric Drives and Controls group at Bosch Rexroth.

Called the Delta Q-16, this modular, servo-driven gable top packaging machine runs at speeds up to 9,000 cartons per hour on the single-line base module and up to 18,000 cartons per hour on the double-line expansion module. The integrated servo motion control system also allows Evergreen to offer its customers automated, infinitely adjustable fill volume control, standard carton sizes from six ounces to 38 ounces and small cross-section carton sizes from six to 16 ounces—effectively meeting customer demand for both production speed and product versatility.

### **Servos from the Start**

Purchased in 1991 to become part of International Paper's Beverage Packaging Business, Evergreen Packaging Equipment was originally founded in 1880 as the J.G. Cherry Company, which later became Cherry-Burrell Corporation. Early innovations included a patented line of "jacketed cream cans" made of wood with tin linings. The cans contained unique float devices to keep the cream from churning itself into butter on the way to the market. Later, in the 1960s, the company acquired the rights to manufacture and sell a line of gable top carton fillers, and over the years, these machines laid the groundwork for what is now international acceptance of the gable top concept for refrigerated milk, juice and other liquid food products.

Today, still on the cutting edge, Evergreen continues to greet new packaging opportunities. The company is now advancing from traditional mechanical packaging systems to the greater possibilities provided by servomotors and drives.

"After evaluating the features we wanted to include in the Delta Q-16—specifically faster carton filling and easier changeover—we immediately realized the limitations of relying strictly on mechanical components. Right from the start, we made the decision to design the Q-16 to include servo motion control," recalls John Petesich, Evergreen senior project engineer.

On the new Q-16, carton blanks are manually loaded and each carton is simultaneously picked and opened. The carton travels through the bottom forming section of the machine, where it is heated, folded and cooled to form a leak-proof seal. The carton then moves onto a conveyor, where the top is pre-broken along shorelines and a screw-off cap is applied. Next, the inside of the carton is sterilized and a two-stage, servo-driven, bottom-up fill system provides accurate filling at high production speeds. Finally, the top of the carton is heated, squeezed closed and cooled to form a leak-proof top.

Petesich notes that Evergreen specifically selected the Rexroth PPC controller and modular servo drive system because of the tight synchronization and production performance the Q-16 needed for shorter cycle dwells and higher

speed timing. Each of the machine's independent servomotors is controlled by a servo drive, while the master PPC motion controller synchronizes all operations, from the main drive to the carton conveyor, fill metering bowl and carton lift. The servo system provides accurate positioning, speed and acceleration on the fill and lift systems.

According to Dan Throne, Food and Packaging Industry business manager for Bosch Rexroth's Electric Drives and Controls division, the Q-16 design also leverages the capabilities of SERCOS via the system's DIAX04 intelligent digital drives.

"The drive stores many of the computing tasks itself, rather than in a central control, yielding a more scalable, cost-effective and higher performing system than those that rely upon central motion control," explains Throne.

Likewise, each drive's SERCOS interface offers extensive diagnostics and enables operators to input parameters via PC, reducing downtime and considerably shortening commissioning time. SERCOS is the only open standard that exists for coordinating and synchronizing digital-based motion controls, functioning as the digital interface between the motion control system and its drives. In addition to transmitting standard position, velocity and torque commands, SERCOS manages the communication of errors, drive and motor statuses and diagnostic information to

the PPC motion controller, where corrective action can then be communicated back to the drive.

The modular control and open architecture of the Rexroth servomotors and drives are supported by Rexroth's Windows®-based VisualMotion software. VisualMotion controls the servo system by replacing mechanical line shafts and timing, indexing and start-stop mechanisms. The programmable motion allows no-tool product changeovers in minutes instead of hours. When a product size or specification changes, the operator simply sets up the machine by selecting a new profile at the control panel, so that electronic gearing ratios, camming set points and motion profiles change instantly with the push of a button. A large library of profiles further complements this level of control and is an efficient alternative to mechanical cams.

Once a profile is stored in the drive, the operator simply recalls the profile, including temperature, dwell time, acceleration/deceleration, etc., whereas older machines required operators to slow down or even stop production to make adjustments. The servo system gives operators real-time control, allowing them to change profiles and make on-the-fly adjustments

for different product types and carton sizes, according to the process demands.

“The servo motion control system is a key factor in providing consistent, high-quality forming and sealing, while minimizing carton damage and scrap with efficient horizontal in-feed,” says Petesich.

Labor savings are realized with the use of the high-capacity in-feeds and touch-screen control of machine functions. Fast product and package size changeover and simple cleaning through automation and easy access mean less routine maintenance using servo motion controls, lowering the cost of ownership. Lower electrical and air consumption and a reduced bottom heat requirement are also the result of the greater operating efficiency provided by servos.

#### **Live Long and Prosper**

Measuring 33 feet wide by 7.5 feet long, the Delta Q-16 also features ESL® (Extended Shelf Life) and ELL® (Extended Long Life) options, which help processors reduce returns and enlarge distribution areas by extending the commercial life of products packaged.

Consumers enjoy the benefits of these longer-lasting products as well. ESL and ELL options combine Evergreen fillers with patented

barrier board technologies to extend refrigerated shelf life up to 90 days for dairy products and beyond 100 days for juice products. The machine is available with a re-sealable SPOUT-PAK™ option.

According to Petesich, the Q-16 allows customers to select the carton sanitation and treatment levels that work best for their products and facilities. Product integrity is maintained by sterilizing the fill system and product tank at 250 degrees Fahrenheit using a hermetically sealed, double-diaphragm metering bowl, automatic fill nozzle purging and recovery system, double HEPA environment and a side-sloped table top. The carton treatment sanitation level enhances product life. Level one includes HEPA and auto sanitizing, while level four includes HEPA, auto sanitizing and 35 percent hydrogen peroxide with heat.

Summarizes Petesich: “The servo technology in the Q-16 provides faster feed rates, greater uptime, quicker changeovers and overall less maintenance over the life of the machine, providing the level of reliability and repeatability that our customers want.”

**Rexroth**  
Bosch Group