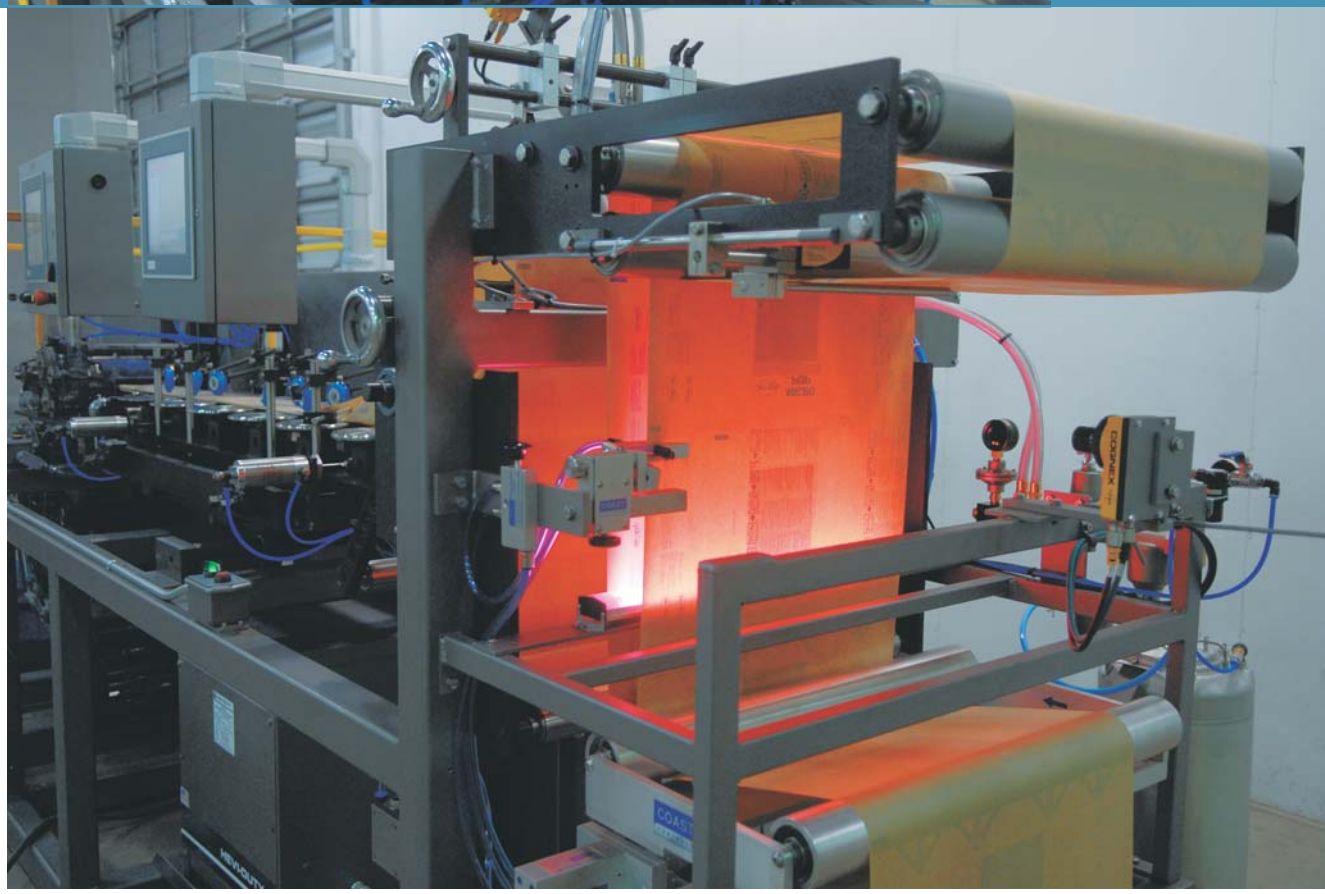
PC-based control system ensures flawless popcorn packaging

Optimized machine performance leads to increased profit

As a snack with its own button on most microwaves, popcorn is about as iconic as you can get in American comfort foods. Despite its all-too simplistic convenience, a great deal of technology goes into those microwave popcorn bags before they puff kernels into steaming bowlfuls of that essential movie night treat. Talon Manufacturing of Spring Park, Minnesota, equipped its latest microwave popcorn packaging systems with a PC-based control platform from Beckhoff in order to offer its customers even better performance, more cost-effectively.

Dennis Hohn, President, Talon Manufacturing

Talon Manufacturing is a leading supplier of packaging systems for microwave popcorn and exports its machines worldwide. The company was established in 1994 and relies on technical innovations and resulting cost savings in order to expand its market position further.



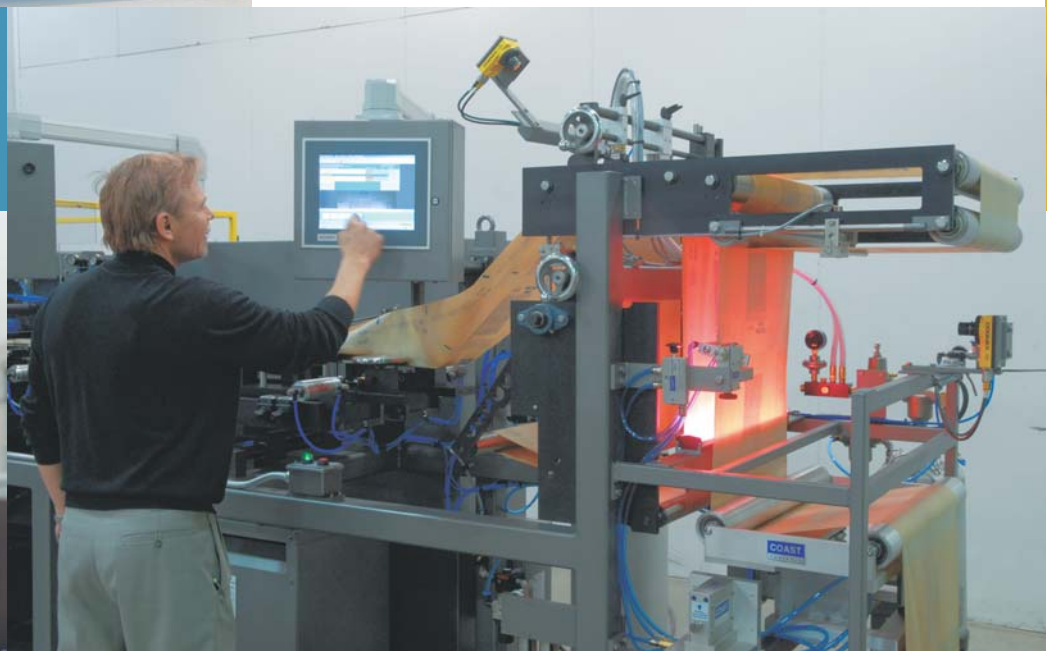
Special paper with aluminum/polyester heating element film being fed into Talon machine for folding and cutting into microwave popcorn bags

High-performance popcorn machines

After deciding he reached the limits of traditional PLCs, Dennis Hohn, managing director of Talon Manufacturing sought a high-performance automation platform the company could use as its standard for years to come. In the main architecture of the previous system, Talon relied on multiple suppliers – the PLC, operator interface and servo system were all supplied by different vendors. "We sought to streamline these elements and purchase them all from a single supplier if possible. The controls had to be more cohesive, with more features and better performance, while passing on cost savings to our customers at the same time," Hohn said.

"As panel space is obviously very important, the new supplier would have to provide more control in a smaller device format. With the more traditional PLC type approach, we found that we had to make our panels bigger and bigger as we added hardware to keep up with our machine control require-

The redesigned Talon popcorn bagging machines are controlled by a CX1020 Embedded PC with TwinCAT NC PTP.



Talon uses CP62xx Panel PCs for "all-in-one" control and display devices and CP69xx Control Panels for simple display and control functions.

ments," Hohn added. "Also, the complexity of wiring all these devices was compounded every time we tried to significantly increase performance – especially as we increased the number of motion axes."

PC-based control platform from one source

The redesigned Talon popcorn bagging machines now include the CX1020 Embedded PC with TwinCAT NC PTP software for automation and control functions, various standard I/Os, EtherCAT and TwinSAFE terminals, and AX2000 Servo Drives paired with AM3000 servomotors. In addition, Talon uses two types of Beckhoff 12" display panels – CP62xx Panel PCs for "all-in-one" control and display functions and CP69xx Control Panels for operation and monitoring.

"The CX1020 Embedded PC was selected largely due to its small housing format. Its design as a high-end Industrial PC that fits on DIN rail became a major space-saver for us when compared with the old PLCs," Hohn said. "Also, the Embedded PC's direct connection to Beckhoff I/O terminals made its selection that much easier. Windows XP is used as the operating system, which provides numerous helpful tools from the office world for use on our machines."

Talon selected the TwinCAT NC PTP software package, which includes axis positioning functionality (set value generation, position control), an integrated software PLC with NC interface, an operating program for commissioning and I/O communication to motion axes. TwinCAT NC PTP replaces conventional positioning modules and NC controllers. The TwinCAT Modbus RTU library offers quick and convenient interfacing with all Modbus devices.

Simplified cabling improves competitiveness

Using EtherCAT as the system fieldbus brought ultra high-speed, deterministic control into the equation for Talon. "Even though it provides extremely high performance, EtherCAT I/O is actually less expensive than most traditional I/O systems through the use of standard Ethernet-based components and cabling," Hohn said. "Avoiding expensive fieldbus cards and even more expensive fieldbus cabling is critical to protecting our machines' cost competitiveness."

The PC-based control system offers maximum precision: The popcorn bags now have more precise cuts and a more consistent length.

Also, Beckhoff Bus Terminal I/O – connected to EtherCAT via BK1120 Bus Coupler – replaced many of the simple terminal blocks used in Talon's previous system design. "This eliminated numerous connections that had to be wired back to the PLC. The fewer number of contacts, the better for overall system reliability," Hohn added. TwinSAFE terminals are used on the Talon machines to flexibly integrate safety functions with the existing Bus Terminal system. TwinSAFE does not require a special safety network and can be installed alongside "non-safe" Bus Terminal I/O without restriction. "TwinSAFE is a highly streamlined way to implement safety tasks so this also helped us reduce the space used in our cabinets that much more," Hohn added.

According to Hohn, a further advantage of the PC-based control platform is the programming time savings: "Previously, we had to spend considerable amounts of programming time with each new PLC or drive that we added," Hohn said. "With TwinCAT and Beckhoff hardware, it's now easier to program one central controller and conduct slight modifications as we modify our machine and add functionality."

Optimizations right down the line

Within a three month time window, Talon went from a new automation and motion control platform specification to full controls design, received UL approval and completed all programming. "Equipping our machines with Beckhoff controls really became a win-win for Talon and our customers," Hohn said.

"With the PC-based controls, we're also seeing a higher degree of accuracy in our machines' finished product," Hohn said. "The popcorn bags they produce now have more precise cuts and have a more consistent length. We experienced this improved performance at a reduced cost: Talon's controls cost today is about 30 percent less per machine than the previous PLC system. We were also able to increase our free panel space by over 50 percent," Hohn stated. "By doing more control and communication with less hardware, Talon was able to make some significant strides in cabling reduction. We now wire directly into the I/O terminals without wiring first through terminal blocks."

Prepared for the Future

The newly equipped machines will help Talon feed the demand for microwave popcorn machines, which account for about 80 percent of their business. After focusing almost exclusively on popcorn applications for nearly five years, Talon has recently re-entered the bagged snacks market in a big way with revitalized stand-up pouch packaging machines. "Talon plans on implementing Beckhoff as the complete control system for these machines too so we can expect more significant savings utilizing PC-based controls in the future. We've also actively begun retrofitting existing packaging machines with Beckhoff technology," Hohn said.

→ Talon Manufacturing **www.talonmfg.com**

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