

The ServoFlex™ lines had a complete mechanical and electrical redesign and now perform better and are more flexible to program.



→ Shrink wrap machine manufacturer, Conflex, maximizes machine design flexibility with centralized PC-based controls and EtherCAT.

Lean, high-performance control system with CX1020 and EtherCAT I/Os

A shrink wrapper's renaissance

Located in Germantown, Wisconsin, shrink wrapping machine builder, Conflex Inc., has been undergoing what Joe Morrissey, Product Manager at the company, refers to as a renaissance. In 2005 Conflex began the "rebirth" by substantially redesigning each machine in the product line and will continue redesigning machines until the end of 2007. The company's Modular CW and ServoFlex™ lines have had a complete mechanical and electrical redesign.

Conflex wrapping machines are tailored to the food, consumer goods, electronic media and printing industries, among others. Typical applications for the company's machines include wrapping for frozen foods, CD and DVD packaging and the packaging of household products and toys. With the Conflex motto in mind – "Flexible People Make Flexible Systems" – Conflex sought a controls system that could fully deliver true application flexibility to customers in these diverse industries. All of Conflex's customers demand user-friendly machines with intuitive interfaces.

New technology implemented in practice

In particular, the ServoFlex film seal wrapper saw dramatic changes from its previous incarnation. The old ServoFlex design utilized numerous intelligent drives that handled the automation and motion control aspects of the machine. The

required programming time for multiple drive controllers irritated Conflex.

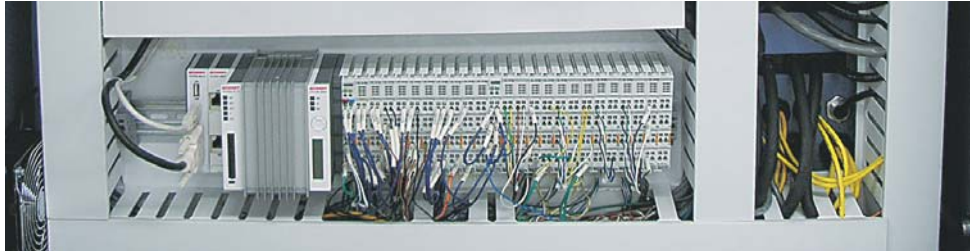
"This was a three servo system – each axis had its own controller that had to be individually programmed," said Mark Lorenz, Conflex Electrical Applications Engineer.

For restructuring the machines, Conflex decided to use the CX1020 Embedded PCs with TwinCAT as control platform. From January 2006 onward, Conflex began the design and construction of the revamped ServoFlex machines. "Using the CX1020 with TwinCAT, we handle all PLC functions and motion control on a single device," Larry Koenigs, Electrical Engineer at Conflex, said. The new ServoFlex machine is a four axis system – one master axis with three slave axes. This horizontal form, fill and seal wrapper delivers continuous motion at up to 100 ft of film per minute with an advanced reciprocating hot knife seal system. ServoFlex machines feature cradle-style powered film feed, which is easy to load and allows for fast change-overs.

Software libraries save engineering costs

Conflex found that several of the programming libraries in TwinCAT were particularly helpful. "The Flying Saw code library saved us time and effort by providing pre-written software functions to achieve a great deal of our motion program-

Conflex uses Beckhoff CX1020 Embedded PCs with TwinCAT, handling all PLC functions and Motion Control on a single device. The CX1020 devices are directly connected to EtherCAT I/O.



ming," Lorenz said. On the ServoFlex, a vacuum conveyor holds the wrapper film and leads it to the sealing area that features reciprocating motion. "We have to hit a very specific mark on the film, so the Flying Saw program handles the sealing motion of the knife moving back and forth on the machine," Lorenz said. "Also, built-in libraries for PID temperature control for the machine's film heaters and superimposed move for print registration are huge time savers in our area of packaging."

EtherCAT boosts control speed

Any controller Conflex uses must provide very fast control of the film cutting knife to exactly match the speed of the incoming wrapper film. "The Industrial Ethernet fieldbus, EtherCAT helped immensely in terms of ramping up our control speed on the ServoFlex machines," Morrissey said. "Beyond top performance, Conflex had to choose a fieldbus that will be supported well into the future (like EtherCAT) and won't go obsolete in a few years." Conflex customers also enjoy remote diagnostic capabilities for troubleshooting via standard Ethernet connectivity with the EtherCAT-equipped machines.

Some EtherCAT I/O terminals are used on the ServoFlex to develop built-in special latching functions for hardware interrupt. The significance of the latch input is to allow the machine cutting and sealing operations to be synchronized to the printed film. This allows for a very professional looking finished product for the machine's end user. The EL5101 EtherCAT Terminal is an interface for the direct connection of incremental encoders with differential inputs (RS485). A 16 bit counter with a quadrature decoder and a 16 bit latch for the zero pulse can be read, set or enabled. Incremental encoders with alarm outputs can be connected at the interface's status input. Interval measurement is possible.

"With the low-cost Beckhoff EtherCAT I/O system, we have the best solution available for our previous I/O board challenge," Koenigs said. "The simple, direct I/O connection to the CX1020 made this decision that much easier."

User-friendly machines

The main objectives of the Conflex machinery renaissance were to not only make the machines perform better, but also to make them more flexible and even easier for end users to operate. "ServoFlex machines feature pre-loaded training videos that can literally train end-users on how to quickly learn how to operate our machines," Morrissey said. "This feature allows us to further differentiate with other machine manufacturers. It's something that couldn't be easily done using conventional controls platforms."

"Because we run Windows CE on the CX1020 Embedded PCs, creating the human-machine interface (HMI) was quite straightforward for us," Koenigs said. "Another added bonus from the use of Embedded PCs is that all the software resides on a Compact Flash (CF) card so changes can be made very easily in the field if needed."

Seamless integration into production line

The new control platform has proved very positive in all respects: Conflex machines are now better suited to integrate more seamlessly into lines with machines from a variety of manufacturers and extract data from the entire line. "The Ethernet capability is a huge benefit for our customers and helps us deliver the most flexible machines possible," Morrissey said.

The controls replacement cost on Conflex machines has been highly optimized. "The old drive system with integrated intelligence cost about triple what we're paying for a Beckhoff system that does more work," Morrissey said. "With the kind of success we experienced on the ServoFlex line, Conflex will be expanding the use of Beckhoff controls into other machine lines to fully apply our expanded PC-based control expertise."

→ Conflex, Inc. www.conflex.com

→ Beckhoff USA www.beckhoffautomation.com