Printed material moves through the i-Web finishing equipment for further
production steps such as folding, gluing, cutting, perforating, and stacking.

Highly flexible machine concepts enabled by hot-connect functionality in EtherCAT

Modular web finishing systems put the finishing touches on commercial printing

Despite the rise in the use of electronic media, direct mail continues to be a preferred tool in business-to-consumer (B2C) communication. Almost every day we receive elaborate mailings from companies advertising their products and services or trying to get our attention through discounts. i-Web in Avon, Massachusetts, USA, specializes in this market by developing modular web finishing systems for the processing and finishing of commercial print and packaging products.

One of i-Web's key commercial printing customers is Japs-Olson Company in St. Louis Park, Minnesota. Japs-Olson produces printed products in a wide range of styles and formats, such as direct mail with high-quality UV coatings, single-sheet mailers (letter and envelope in one), direct mail with die-cut return cards, integrated labels, and many more. While attractive design, high quality processing as well as personalization combine to increase the response rates of end consumers, Japs-Olson also strives to reduce the cost of printing and mailing for its clients that advertise through direct mail. This requires machines with the highest level of automation.

Modular machine design boosts production flexibility
The machine modules i-Web developed for Japs-Olson are used in the finishing of printed items, i.e. for folding, cutting, perforating, gluing and stacking. "The flexible machine design and the use of state-of-the-art servo drive technology have solidified the relationship between i-Web and Japs-Olson, which has existed since the early 1980s," explains Michael Murphy, the company's president. "i-Web's machine modules can be combined flexibly, which enables us to respond quickly to changing production requirements."

Although i-Web has employed modern servo drive technology throughout its 30-year history, the company encountered limits in 2008, as president Bob Williams explains: "With our previous system we were only able to control a limited number of axes. We also had to use two different fieldbus systems for our I/O and motion control equipment. When we initiated the development of a new motion control platform, we focused on our network technology and a single bus system for motion, I/O and safety."

After careful market analysis, i-Web selected the PC- and EtherCAT-based control platform from Beckhoff. "We were particularly impressed by the high performance of EtherCAT," remembers Bob Williams. "Since EtherCAT enables communication with up to 100 servo axes in 100 milliseconds, we were able to easily resolve the previous bus system's problems with regard to data throughput and communication," reports Gilbert Peterson, Application Engineer at Beckhoff USA.

Hot-connect functionality, powered by EtherCAT
In finishing systems, multiple hot-connect groups must work together flexibly, because the individual machine modules have to be grouped together depending on the respective print job. Being able to quickly adapt to new product types with minimal machine downtime is therefore an essential requirement. "With EtherCAT and the AX5000 Servo Drives we are able to easily implement hot-connect functionality and control the many moving axes individually," explains Bob Williams. "Since the central Industrial PC running TwinCAT automation software handles the entire motion control system, we no longer have to download

Japs-Olson uses state-of-the-art equipment for variable inline imaging, mailing optimization, intelligent mailing barcode services, transport efficiency, and mail tracking.

records when a single drive must be replaced. This is a huge benefit when the machine starts up. Even non-automation specialists can now exchange a drive as long as they have standard electrician and maintenance skills."

Integrated platform for PLC, Motion Control and safety

As the automation platform for PLC and Motion Control, i-Web uses Industrial PCs from the C6920 and C6930 series with TwinCAT NC PTP for all its lines. The software handles all automation, including Motion Control and hot-connect functionalities. The visualization is handled with various Panel PCs such as the CP72xx series for arm-mounted installation or the CP67xx for installation in control cabinets.

During the printing process, the paper is transported through the i-Web machine via multiple direct-driven rollers. This requires precise synchronization with the additional finishing equipment. The stepper motors, which move the turning station, compensators, print heads, etc., are controlled via the compact EL7031 and EL7041 stepper motor I/O terminals.

EtherCAT also plays a critical role in the system's safety. i-Web implements various emergency-OFF, interlock and other safety-related systems in its lines with the help of TwinSAFE components and the Safety over EtherCAT protocol. "The TwinSAFE I/O terminals enable us to implement significantly more safety technology," explains Bob Williams. "Here, too, EtherCAT offers so much flexibility that we don't have to implement a separate safety network."

Since the finishing modules are flexibly added or removed to/from the line, each must have its own safety system. If, for example, an employee accidentally triggered an "open guard" condition, TwinSAFE makes sure that the system stops

safely and in a controlled manner. This safe mode can be triggered for a single module, a zone or even the entire line if necessary.

Remote access saves time and resources

i-Web also leverages the benefits of remote maintenance and troubleshooting. "The PC- and EtherCAT-based control platform makes it very easy for us to access the system remotely. Since we have converted the entire machine communication to EtherCAT, we can monitor each system component remotely. EtherCAT includes extensive diagnostic functions such as failure detection with no bandwidth limitations. This has cut the time spent on troubleshooting at least 50 percent," reports Bob Williams.

Lean control design also reduces machine footprint

The centralized control system with its distributed I/O components also enabled i-Web to reduce the footprint of its machines. "The compact design of the equipment reduces space requirements in the control cabinets by 50 percent. This also leads to cost and space savings throughout the entire plant," adds Williams.

The company was also able to reduce its installation and testing costs, says Williams: "The time required to install the control components has been reduced by 75 percent, because we only need to connect a power line, an air line and a standard Ethernet cable to the machine modules during final assembly. This enables us to spend more time on customer-specific applications, which in turn solidifies i-Web's reputation as true experts in the industry."

"Japs-Olson will continue to employ modern i-Web finishing systems, because they are highly automated and easy to configure on the plant floor," says company president Michael Murphy.

Further information:
www.iwebus.com
www.japsolson.com
www.beckhoffautomation.com