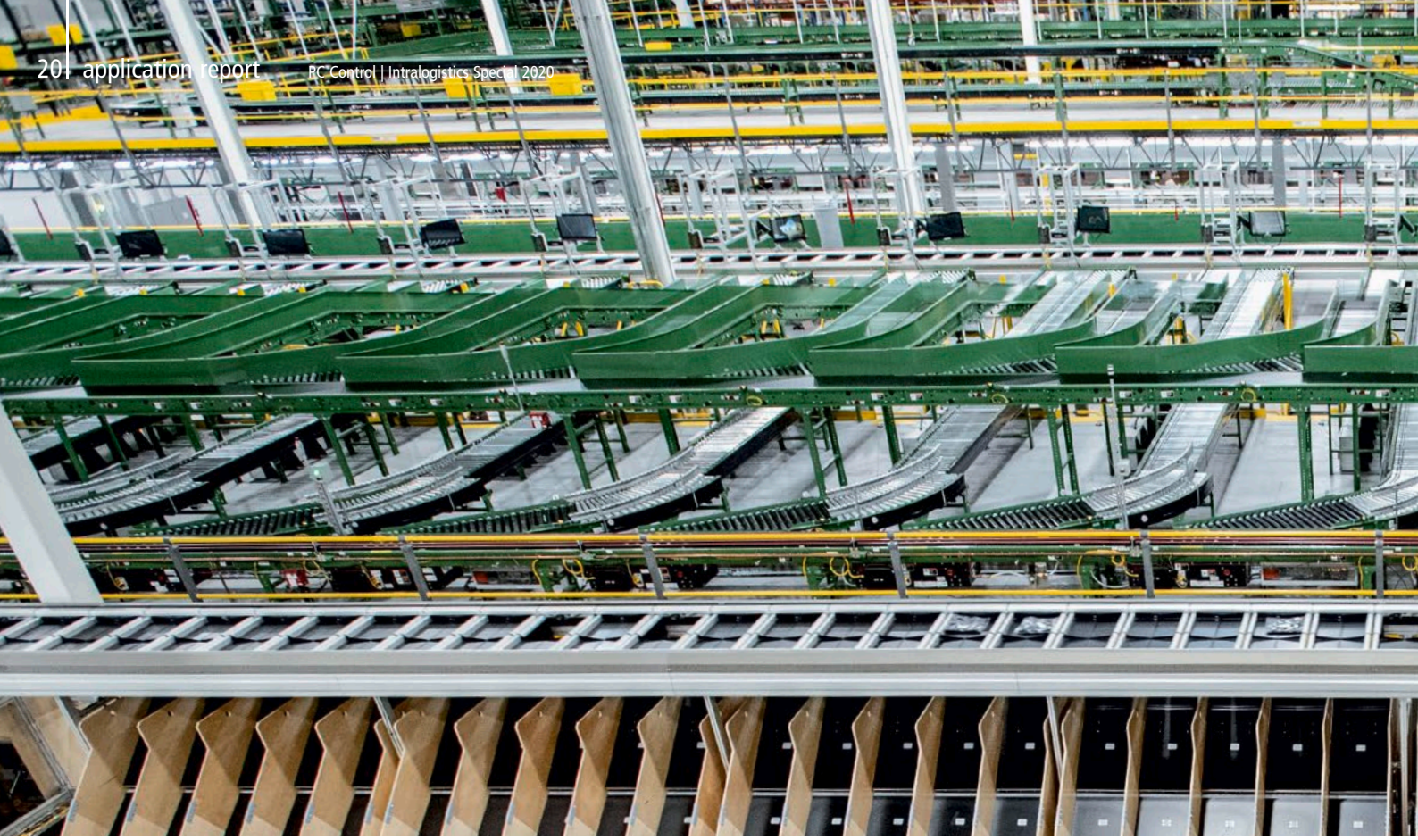
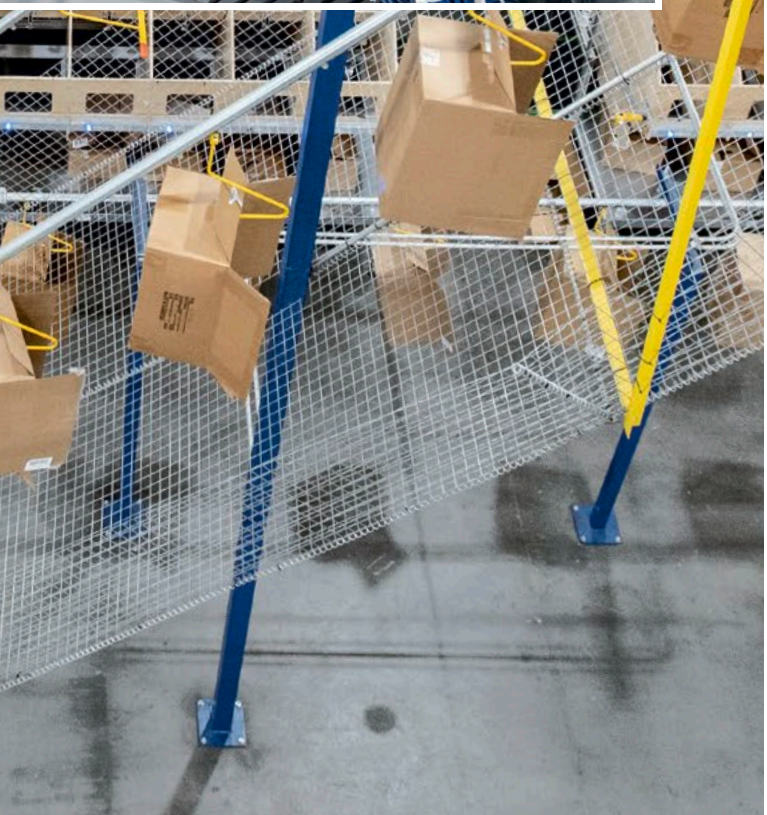


Upgraded Gap Inc. distribution center uses new split tray sortation solutions to take on difficult-to-transport products using PC Control and EtherCAT

Non-conveyables in material handling? No problem for EuroSort.



The material handling and intralogistics are industries on the move, literally. Products of all shapes, weights and sizes must rapidly move through distribution centers and warehouses with ever-increasing efficiency as e-commerce continues to transform global supply chains. When clothing retailer Gap Inc. needed to redesign its Fishkill, New York, distribution center in 2017, it tasked intralogistics specialist EuroSort with providing the most capable solution. Gap Inc. also needed to finish the complete overhaul with limited time before the busy holiday shopping season. That required automation technology that could keep pace with rapid change and promote efficiency in highly complex supply chains. A company built from the ground up to take on these challenges for North American applications is EuroSort, Inc. based in Owings Mills, Maryland. Its globally operating parent company, EuroSort Systems, was founded in Amsterdam just as e-commerce was emerging as a world-changing industry in 2001. The company's success to date is readily apparent: there are now more than 150 sprawling EuroSort systems operating in North America alone.

These systems encompass many sorter types, including push tray, cross tray and sweep sorter variants. Through direct sales and system integrators, EuroSort serves many high-profile clients in the apparel industry, both in the traditional retail and e-commerce segments. Other important markets for EuroSort include fulfillment for the postal industry, biotech and pharmaceuticals, book publishing and multimedia applications. EuroSort aggressively develops new, efficiency-boosting sortation technologies that reduce equipment footprint, installation time, operation complexity and price points.

Lightweight items put up a big fight

While many core material handling and intralogistics processes have widely accepted best practices, many lingering challenges remain. One trouble spot involves items that are dubbed 'non-conveyable' – usually small, lightweight items that are flexible and rounded in shape. Because the Gap distribution center ships an incredible amount of clothing and accessories, these items have always presented a unique challenge. Effectively transporting non-conveyables represents a singular challenge for modern material handling and sortation systems, especially in e-commerce applications. "In 2019 EuroSort addressed this by introducing our new cross tray sorter at the ProMat exhibition, which has become a disruptive technology for intralogistics," says Greg Meyer, VP of Sales and Marketing at EuroSort. "This patented solution combines many of the features and benefits from the EuroSort portfolio of split tray and push tray sorters into a comprehensive offering."

Split tray, also known as bomb bay, sorters represent a well-established sortation technology standard with many competitive offerings in the marketplace, but EuroSort has pushed innovation in this area as well. EuroSort recently patented a new tray-opening mechanism for split tray systems that effectively handles round non-conveyables. The split tray features a concave tray surface that helps sort non-conveyables and other odd-shaped objects by containing them within the tray. This also improves sorting of numerous loose items. These sorters are designed to deliver the tightest drop in the industry for polybag and non-polybag items in a wide range of sizes, which is especially important for EuroSort's clients in the apparel industry.

By implementing split tray sortation solutions from EuroSort, Gap Inc. increased order fulfillment accuracy by 2% at its distribution center in Fishkill, N.Y., avoiding thousands of costly returns.

EuroSort's split tray sortation solution offers the tightest drop in the industry for polybag and non-polybag items, ensuring high throughput while accommodating numerous drop destinations with a reduced footprint.

Beyond innovative tray design, EuroSort can put more destinations in the same footprint with sorters that are simple to maintain and operate at a cost that is significantly less than competing products that promise the same kind of throughput. "As a result, the technical demands on the automation and control system to realize the new split tray sorters were intense," says Scott Fry, VP of Operations at EuroSort. "The new systems had to meet our usual standards for high throughput and accommodate numerous drop destinations with a reduced footprint."

In the effort to reduce equipment footprint, EuroSort targeted the network architecture and I/O systems as areas for improvement because the company's sorters are gigantic, stretching hundreds of feet long. Complicating matters for EuroSort, legacy networks and most industrial Ethernet systems couldn't effectively connect field devices on the widely distributed networks needed by their clients. Network cycle times were also limitations, particularly when an array of sensors was installed as far as 200 feet away, for example. "Because most available I/O systems rely on a low performance sub-bus for the backplane to connect hardware modules, like our previous supplier, we couldn't just run wires to distributed I/O modules. We had to connect the devices all the way back to a main panel," says Jeff Zerr, Advisory Controls Engineer at EuroSort. "After much research into modern industrial Ethernet systems, our attention turned to EtherCAT. The simple fact that the EtherCAT protocol and all its features are preserved across the I/O hardware backplane to all individual terminals throughout a line instantly neutralized these limitations."

EtherCAT sorts out a wiring problem

Because of flexible topology characteristics and the ability to distribute I/O across long distances using IP67 equipment-mounted and IP20 DIN rail-mounted hardware, the EtherCAT industrial Ethernet system has been the EuroSort networking standard since 2013. EtherCAT was also selected for its ability to interface with other protocols that are still used in the field, such as EtherNet/IP, PROFINET, DeviceNet, PROFIBUS and AS-Interface. "We often have to connect with new and old equipment from other manufacturers, so we leverage EtherCAT gateways from Beckhoff Automation to easily establish connectivity wherever needed," Zerr says. "This led to a closer look at control hardware from Beckhoff, which later became our standard. Today, the standard automation technology for all four types of sorters from EuroSort is Beckhoff PC-based control and EtherCAT."

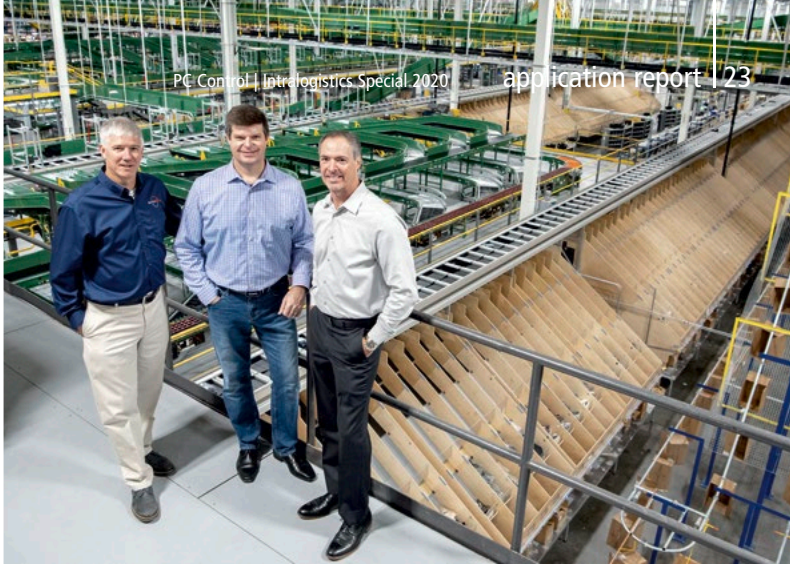
The new control and networking architecture faced some challenging EuroSort projects right away. One of the pilot applications for the new split tray sorter had around 600 destinations and over 400 trays. It also required more than 2,000 I/O points, which were networked over EtherCAT. Subsequent split tray sorter applications were much larger with over 11,000 I/O points. Here, EuroSort leveraged High Density (HD) EtherCAT Terminals, which offer up to 16 channels in a 12 mm housing. The field-mounted EtherCAT Box modules also proved useful to eliminate the cost, space and materials otherwise needed for numerous enclosures to house I/O stations. The EtherCAT I/O connects a huge number of devices in the sorters such as sensors, solenoids and variable frequency drives (VFDs). "This all-inclusive connectivity promotes lower costs and a smaller equipment footprint for our customers," Fry says.

EuroSort uses TwinSAFE technology to network machine safety devices in every sorter equipped with Beckhoff controls. TwinSAFE I/O and Safety over EtherCAT (FSoE) cover numerous e-stops and pull cords spread across material handling lines. "The more safety devices you have and the more spread out they are, the more it makes sense to have networked safety," Zerr says. "When a EuroSort customer needs to add a safety function, it's easy to add it no matter where the equipment needs to go. We also get the added benefit of built-in EtherCAT diagnostics, so TwinSAFE just makes sense."

"A major reason Beckhoff continues to see significant growth of EtherCAT technology in intralogistics is because there are no restrictions on network size and topology," says Doug Schuchart, Material Handling & Intralogistics Manager at Beckhoff Automation LLC. "In addition to this flexibility, EtherCAT offers the winning combination of high performance with microsecond updates, cost savings and inherent flexibility. EuroSort, for example, offers impressive scalability of its sorting solutions based on the number of customer SKUs and can design different sorting systems without re-engineering – even when systems require as many as tens of thousands of I/Os and field devices."

"By using Beckhoff Embedded PCs and TwinCAT as our EtherCAT masters, we reduced the initial 200-millisecond scan time in the first sorter application to a 2-millisecond scan time without any problems," Zerr adds. "In an alternate control and networking architecture EuroSort tested, we couldn't get the traditional PLC to run fast enough. At the time, this was the fastest CPU this particular vendor offered, with the most memory you could fit into the device without ex-

Operator interface with the EuroSort split tray sorters via Beckhoff CP2900 series multi-touch Control Panels.



At the Gap Inc. distribution center: (from left) Greg Meyer, VP of Sales and Marketing at EuroSort; Thomas Gyles, Senior Director Distribution, Eastern U.S. and Asia at Gap Inc.; and Doug Schuchart, Material Handling & Intralogistics Manager at Beckhoff Automation LLC.

panding the rack." Today, EuroSort relies on the compact CX2040 Embedded PC with 2.1 GHz Intel® Core™ i7 quad-core processors and 4 GB RAM to run PLC, safety and HMI on one device. EuroSort connects the embedded PCs to compact CP2907 Control Panels with 7-inch screen to display the HMI. For local data storage, the CX2040 also accommodates CFast memory cards up to 160 GB. Maintaining a compact footprint, this DIN rail-mounted automation controller measures just 144 mm x 99 mm x 91 mm and features a backplane connection to the EtherCAT Terminal system. This preserves the full performance and functionality of the protocol to every I/O point and all the way back to the main controller.

Programming for all aspects of the EuroSort split tray sorters, including PLC, safety and high level communication, is handled in the TwinCAT 3 engineering environment. "TwinCAT 3 offers a good mix of tools for traditional PLC programmers and computer science-oriented programmers alike," says Zerr. "Engineers can continue to program with ladder logic if desired, but many are seeing advantages to structured text and function blocks. Also, the TwinCAT 3 integration with Visual Studio® is a boon for EuroSort. Team Foundation Server has helped our programming teams collaborate on code, stay organized and keep track of all project revisions and changes."

EuroSort has migrated to different Beckhoff Embedded PC types over the years based on CPU requirements, but has been able to keep all programming in the same free TwinCAT 3 engineering environment. "With our previous PLC vendor, not only did we have three or four different software packages for each controller type, but the engineering software all added considerable cost to our projects," Zerr adds. "There wasn't an easy migration path."

Reaching the point of few order returns

Considering the perfected ability to take on non-conveyables, equipment footprint reductions and higher system performance, tangible benefits of the new EuroSort split tray sorters have already piled up for Gap Inc., as well as other clients. "Achieving 100% faster scan times and increasing overall accuracy of PC- and EtherCAT-based sorters have been huge advantages," Meyer says. "Once Gap Inc. began using the new EuroSort split tray sorters in a new fulfillment center, order fulfillment accuracy went up 2% compared to the technology it replaced. These improvements avoided what otherwise would have been thousands of costly returns for the retailer."

Increased efficiency and accuracy with non-conveyables at the redesigned distribution center positively affected the company's bottom line as well. "The entire Gap Inc. team came together at the Fishkill distribution center to modernize our distribution technologies and processes at a key moment in our company history," says Thomas Gyles, Senior Director Distribution, Eastern U.S. and Asia at Gap Inc. "And with the help of significant automation upgrades from EuroSort at our facility, we have been able to gain significant operational efficiency that has led to overall lower operational costs while improving speed to the customer. This has enabled us to extend our product availability during the critically important holiday seasons moving forward."

Not satisfied to stop here, EuroSort is also laying the technological groundwork to be ready to adopt Industrie 4.0 concepts for retail and e-commerce customers. Beckhoff control solutions with OPC UA, for example, are already used in a large percentage of EuroSort systems today to aid with general connectivity and remote support. With data security being so critically important today, the encryption capabilities of OPC UA are driving considerable interest at EuroSort and in Beckhoff PC-based controllers that can be used as OPC UA servers and clients. "The intralogistics industry is increasingly data-driven, so having a secure PC-based automation platform as your standard is a good place to be," Zerr says. "I believe we'll see even more of the factory floor merging with the back-end database side of operations. In addition to emerging Beckhoff IoT technologies, being network savvy with EtherCAT and OPC UA helps us securely share data horizontally and across fulfillment centers."

Further information:

www.gapinc.com
www.eurosortinc.com
www.beckhoffautomation.com