

Numina Group: process optimization in warehousing and distribution management

EtherCAT helps address speed and precision challenges

Process optimization by integration is a trend that is becoming more and more important in the field of warehousing and goods distribution. Isolated picking and dispatch solutions are being replaced by concepts that integrate the entire process chain in one control platform, from the manufacturing and quality control of the end product through to the packaging and distribution. The automation technology is also facing new challenges: robust Beckhoff Industrial PCs and the ultra fast EtherCAT fieldbus system provide the basis for a real-time distribution system that offers the highest computing performance with reliability and speed with 24/7 operation capability.



The Numina group specializes in high-performance conveyor controllers and automation systems. In the case of mass distribution operations, customers can eliminate 30 or more picking errors in one shift thanks to the use of the inline visual inspection, measurement and weight checking technology from Numina.



The 'Pick Execution™ System' from Numina uses wireless barcode scanners, which are worn on the wrist and are characterized by the greatest possible flexibility and ease of use.



Numina's innovative 'Pick Execution™ System' picking solution is equipped with voice-directed picking technology. This enables the introduction of 'hands-free' processes and, as a result, increased safety and reliability in the picking of goods.

The Numina Group, based in Woodridge, Illinois (USA), is specialized in high-performance conveyor system controllers and automated solutions for the sorting, picking, packaging and shipping of goods. The company promises its customers a growth in productivity of 20 to 30 percent and considerable savings by avoiding incorrect deliveries. Numina's considerable technical know-how is intently focused in the improvement of 'pick, pack and ship' processes, which are used in all fields of the manufacturing and the distribution of food and beverages, pharmaceuticals and electronic products, for example.

Integration of real-time manufacturing and distribution in a continuous process

"The trend away from the separation of production, packaging and distribution is posing new challenges to automation," says Dan Hanrahan,

Business Development Manager of the Numina Group. "Together with our customers, we are increasingly developing applications on the basis of an integrated, continuous manufacturing and packaging concept, which extends over the entire process, from manufacturing and quality control of the end product to the picking, packaging, shipping and loading onto trucks." Numina's system architecture is an answer to limitations of the conventional automation world with separate PLC, motion controllers and monitoring systems. "There are still inefficient bottlenecks and islands of automation in numerous manufacturing and distribution facilities even today," explains Marks Woodworth, Vice-President of Design of the Numina Group: "Our software and control architecture is based on real-time Linux. We work with modular controllers and provide information management with pre-developed tools, which can be easily tailored to the specific requirements of our customers."



The new 'X-Press PAL Plus™ System' reduces the processing time of a shipping box by an impressive 30 to 40 seconds. Absolute distribution accuracy and less manual work lead to increased facility throughput and a growth in operational productivity of approx. 20 to 30 percent.

Open system allows the flexible combination of application modules

"Numina's 'flagship' software is the Real-Time Distribution Software (RDS)," says Dan Hanrahan. "This platform unites the best features from the controller and MES, without yielding to the limits of closed systems." RDS has numerous pre-developed application control modules, in order to meet the requirements of production, order processing and distribution centers. In this way, for example, the box packing can be combined with the sorting control or other automatic picking modules from Numina, for instance in order to evaluate orders and to determine the correct box size for each shipment.

In complex distribution centers, the Numina order optimization regulates the release of the job orders, so that the work on the sorter or in the entire facility is evenly distributed and bottlenecks are avoided. Each automation module can work independently or cooperate in an integrated control platform with other modules, which results in high flexibility.

Increased reliability and speed due to voice-directed picking

A further highlight is the multimode picking solution, Numina's 'Pick Execution™ System,' which is equipped with voice-directed picking technology. With 'Pick Execution' the operator wears a wireless headset and a barcode scanner on the wrist. The system gives spoken instructions for the

correct picking position of the articles, which must be picked and placed into a cardboard box, onto a pallet or onto a cart. Data transmission by radio offers mobility and allows hands-free working, as a result of which the operator can concentrate on picking instead of having to read long picking lists on the screen. The reliability, speed and safety of the picking process are increased as a result.

Another Numina solution that focuses on increasing the throughput and accuracy of the packing and shipping process is the new 'X-Press PAL Plus™' modular inline packing and distribution system. It permits the complete automation of all procedures, from the packing to the preparation of the shipping documents and distribution. Even the printing and application of the labels take place automatically. "Thanks to the feedback from sensors, barcode scanners and scales, 'X-Press PAL Plus™' turns the labeling process into a closed cycle," explains Dan Hanrahan. This tool can be used as an independent automation system; however, it can also be integrated into other RDS control modules, such as 'Pick Execution,' as well as into inline process measurement and validation technologies, such as barcode identification, scanning, weighing, box size determination and visual checking.

By means of linking to the dimensional data and/or the weight of the packaged goods, 'X-Press PAL Plus™' also supports full case picking. Boxes with suspected incorrect picking are removed from the labeling line and fed to an inspection/error line.

Data-intensive procedures require high computing performance and fast communication

Numina applications are extremely data-intensive and require real-time communication. "Only a PC-based control architecture is able to manage the frequent querying and storage of data by 'X-Press PAL Plus™.' More than one million data records have to be administered here while at the same time coping with control, sorting and product tracking," says Mark Woodworth, giving food for thought: "The PC-based controller has the data memory capacity and the means to integrate serial devices simply, and the necessary speed, in order to meet these requirements."

High availability due to PC- and EtherCAT-based automation

A Beckhoff C6340 Industrial PC (IPC) and EtherCAT I/O Terminals form the backbone of the Numina RDS control platform and 'X-Press PAL Plus™.' "Numina impresses in particular with customer projects that require control and automation solutions with 24/7 reliability," Dan Hanrahan stresses. "In order to be able to offer operational availability of 99.99 percent or more, we need absolutely reliable hardware components. The Beckhoff IPCs provide the great advantage for us that we don't need to accommodate them in separate air-conditioned cabinets," explains Dan Hanrahan. "Not only that, they are so efficient that we can handle automation, control, data management, web-based user interface and database server with just a single device," adds Mark Woodworth and he goes on: "In the case of larger projects, the system can be extended flexibly to several IPCs with reduced development expenditure. However, we normally use just 1 or 2 percent of the CPU bandwidth of the C6340. Considering that four, eight or more CPU cores will be available at some time in the future, Numina can scale the hardware in such a way that it will actually be possible to cope with any performance requirements in the field of automation and system data archiving."

Data transmission within the microsecond range

"Thanks to EtherCAT, which is faster by several orders of magnitude than any other fieldbus system that we have used so far, we can optimize our system still further," emphasizes Mark Woodworth. "That is important, because delays of one millisecond are already not tolerable in high-speed sorters or demanding printing and labeling applications." Thanks to data transmission within the microsecond range and the high accuracy of



The backbone of the control system is a Beckhoff C6340 Industrial PC, equipped with an Intel® Pentium® M 1.8 GHz processor.

EtherCAT, Numina has been able to solve all speed and precision challenges. "It is also decisive for us that the performance does not decrease with the scope of the application and the number of necessary I/Os," explains Mark Woodworth. "With EtherCAT we achieve the fastest real-time speeds throughout with a consistent performance, regardless of the number of I/Os."

Conquest of new markets through lowered entrance costs

'X-Press PAL Plus™' already pays off with relatively small conveyor systems with a daily dispatch volume of 700 to 1000 packages. However, the system can also cope with distribution operations with up to 100,000 packages per day. On the basis of the Beckhoff control platform, Numina has been able to lower its system costs by 40 percent compared to earlier printing/labeling systems. "That lowers the barrier to entry so far that small and mid-sized enterprises can also benefit from modern warehouse and distribution automation," explains Mark Woodworth. "Even a 20-foot (approx. 6 m) automated weighing, label printing and application system can pay for itself relatively quickly in a small distribution center due to the reduction in work expenditure and the avoidance of errors."