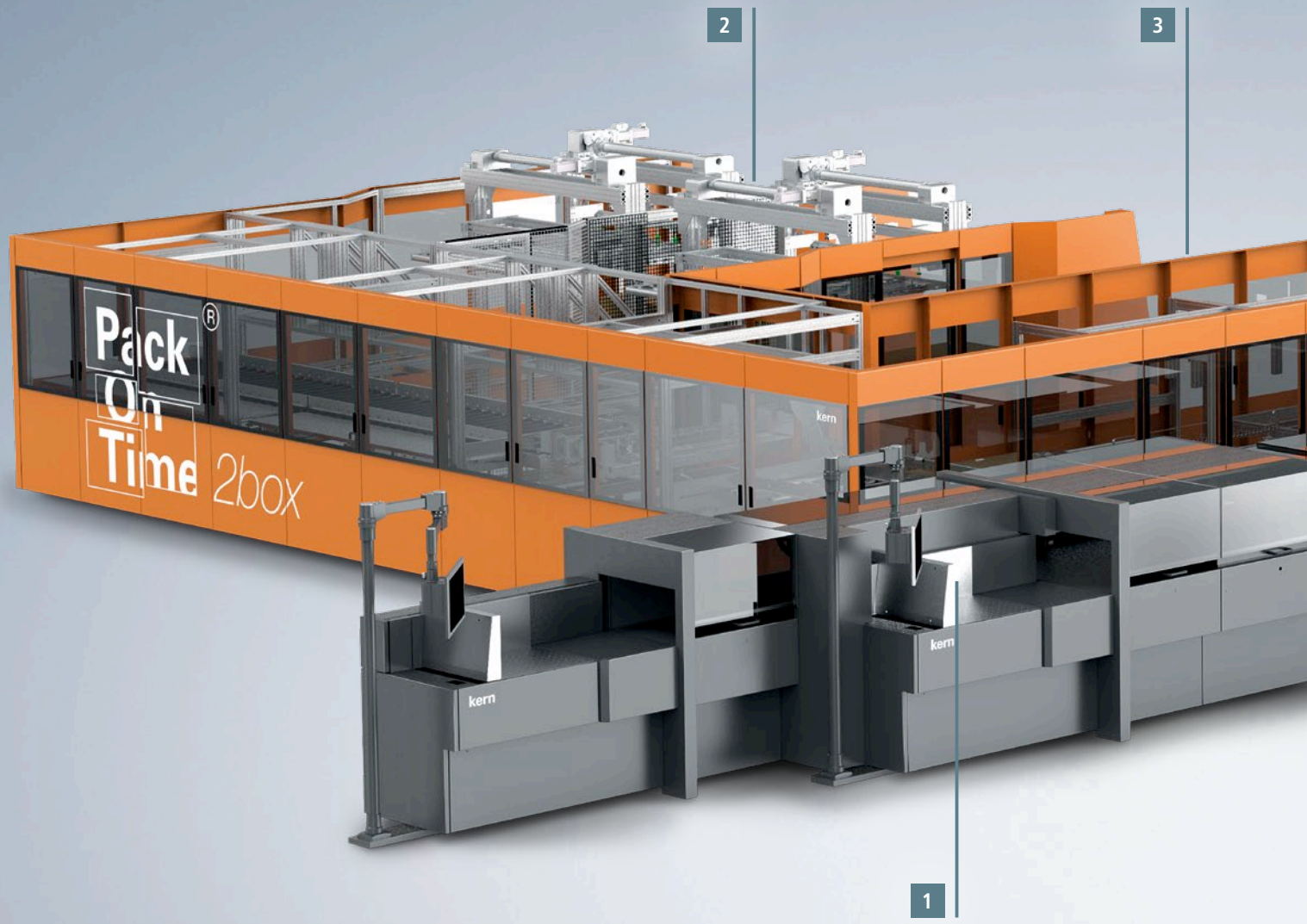

PC-based control enables product-specific, resource-saving packaging

Produce packaging on demand and made to measure with more than 100 precisely controlled axes

Online retail is booming and the packaging that is indispensable for this is becoming even more important. However, goods are often shipped in unnecessarily large packaging. This increases costs, resource consumption and the environmental impact. To avoid this, Swiss company Kern AG has developed the PackOnTime 2box packaging system. Using this system, shipping boxes can be made to measure and exactly when it is needed. The project was implemented with the high-performance PC-based automation solution from Beckhoff.

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The PackOnTime® system consists of various modules: Placing and measuring (1), feeding the corrugated board (2), processing the corrugated board (3), packing the articles (4) and closing the packaging (5).

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The system is controlled by a CX2062 Embedded PC.

Kern AG in Konolfingen, Switzerland is a family business founded more than 70 years ago and originally rose to success with enveloping machines. "However, the market for enveloping machines, in particular at banks and insurance companies, is progressively diminishing as conventional letters are increasingly replaced by paperless communications," explains Reto Schori, Subproject Manager Electronics at Kern AG. This decline provided the impetus to establish a new foothold in a related, promising market with PackOnTime®: e-commerce. This sector still offers a great deal of potential for growth and innovation, particularly with regard to sustainability. Currently, conventional packaging often utilizes standard cardboard boxes, which are considerably larger than the goods being shipped. As a consequence, they are partially filled with filling material. Furthermore, excessive volumes take up unnecessary space during transport to the customer along with increased storage space. Simply put, oversized boxes and filling material create an unnecessary amount of waste.

The corrugated cardboard is cut to size, perforated and grooved to perfectly match the contents; the packaging can then be assembled, glued and transported to the insertion station.

The newly developed PackOnTime® system enables automated and on demand packaging of ordered products in shipping boxes produced to the perfect size. This saves resources such as packaging material, space and time. "We measure the length, width and height of the object or group of objects and then create a package with precisely the right size in the space of only 30 to 40 seconds," says Reto Schori, explaining the concept. "The only materials we use are sustainable corrugated cardboard and glue." The system is capable of producing and filling up to 750 customized packages per hour. The system can be operated efficiently by just one person.

PC-based control succeeds in evaluation

"We spent a long time developing and utilizing our own control systems. However, in 2016, we realized that we could no longer maintain the workload necessary to do so. In addition, with our own controllers we did not achieve the speeds desired the way we do today with the Beckhoff solution," reports Marcel Stalder, Head of Development at Kern AG. "When evaluating a suitable control system, we approached several control system manufacturers, two of which were able to implement their solutions for a specific project. Based on our positive experience during evaluation, we decided on Beckhoff as our control systems supplier. Since then, all new projects have been implemented with PC-based control from Beckhoff. This also applies to PackOnTime®."

One of the reasons for using PC-based control is its open design allowing different standards. "We initially had the idea of reusing software elements developed for our own controls systems. However, that ultimately turned out to be unnecessary," adds Reto Schori. Kern chose a high-performance CX2062 Embedded PC with Intel® Xeon® CPU (2.0 GHz, 8 cores) for the PackOnTime® control system. CP3224 Economy Panel PCs with 24-inch multi-finger touch-screens serve as operator interface terminals.

After switching to Beckhoff automation technology, the control software was initially created with Structured Text. "However, this type of programming required additional documentation overhead," says Reto Schori. "That is why we decided to switch to TwinCAT 3 UML. The TwinCAT Editor for the Unified Modelling Language (UML) offers the advantage that the software is comprehensibly documented simultaneously with the development."

Optimal design and synchronization of drive axes

Drive technology plays a major role in PackOnTime®. Currently, around 100 drive axes are utilized in the plant prototype and a further 30 are planned. "It is very important that Beckhoff offers an extremely wide range of drive technology. With previous suppliers, we usually had to decide on one type of motor and one type of motion controller and then implement almost all of the applications with these. This sometimes proved extremely difficult with regard to the parameterization," explains Reto Schori. "In contrast, this is far easier with Beckhoff. Because they offer an extensive product catalogue, enabling us to select the optimum motor for every application as well as the ideal drive technology with the AX8000 Servo Drive and the EL72xx servomotor terminals. One Cable Technology (OCT) is another benefit because it significantly reduces the amount of cabling required."

Along with the decision to go with PC-based control, EtherCAT was also selected for the fieldbus and is utilized consistently with PackOnTime®. "EtherCAT has truly proven its value in our system. The ability to synchronize the axes with each other extremely easily via EtherCAT was a new experience for us. This was not possible with the previous control system and CANopen bus technology," says Reto Schori. "The fact that a great number of suppliers now support EtherCAT was another advantage during the project implementation."

Kern AG is also impressed by the performance of EtherCAT, which in addition will increase significantly with the new EtherCAT G technology upgrade. "Currently, the performance when implementing PackOnTime® is thoroughly adequate. However, EtherCAT G, which is based on 1 or 10-Gbit Ethernet, may become an important factor in the future, as our modular system will be expanded to include additional modules," adds Patrick Vogel, PackOnTime® Project Manager at Kern AG.

Service tool increases reliability

Kern AG recommends that service organizations use the Beckhoff Service Tool (BST) to maintain their systems and machines. "We believe it is essential to be able to replace a component in the field at any time, even an IPC. That is why a tool like this is simply indispensable from our point of view," continues Reto Schori, explaining this recommendation. BST is a user-friendly, graphical backup and restore program for Industrial PCs with a Windows operating system. In the event of failure, the operating system image can be restored or used to create a new IPC system with identical configurations and settings.

The PackOnTime® system merges the articles fully automatically with the tailor-made packaging.

More information:
www.kernworld.com
www.beckhoff.com/packaging

Marcel Stalder, Head of Development, Reto Schori, Subproject Manager Electronics, and Patrick Vogel, Project Manager PackOnTime®, all from Kern AG, and Andreas Iseli, Head of the Beckhoff Lyssach office, in front of the prototype of the Pack-on-Time system (from left to right)

More than 100 drive axes implemented with AM8000 servomotors enable the numerous movements necessary to produce the packaging, transport the goods and insert the articles into the packaging.