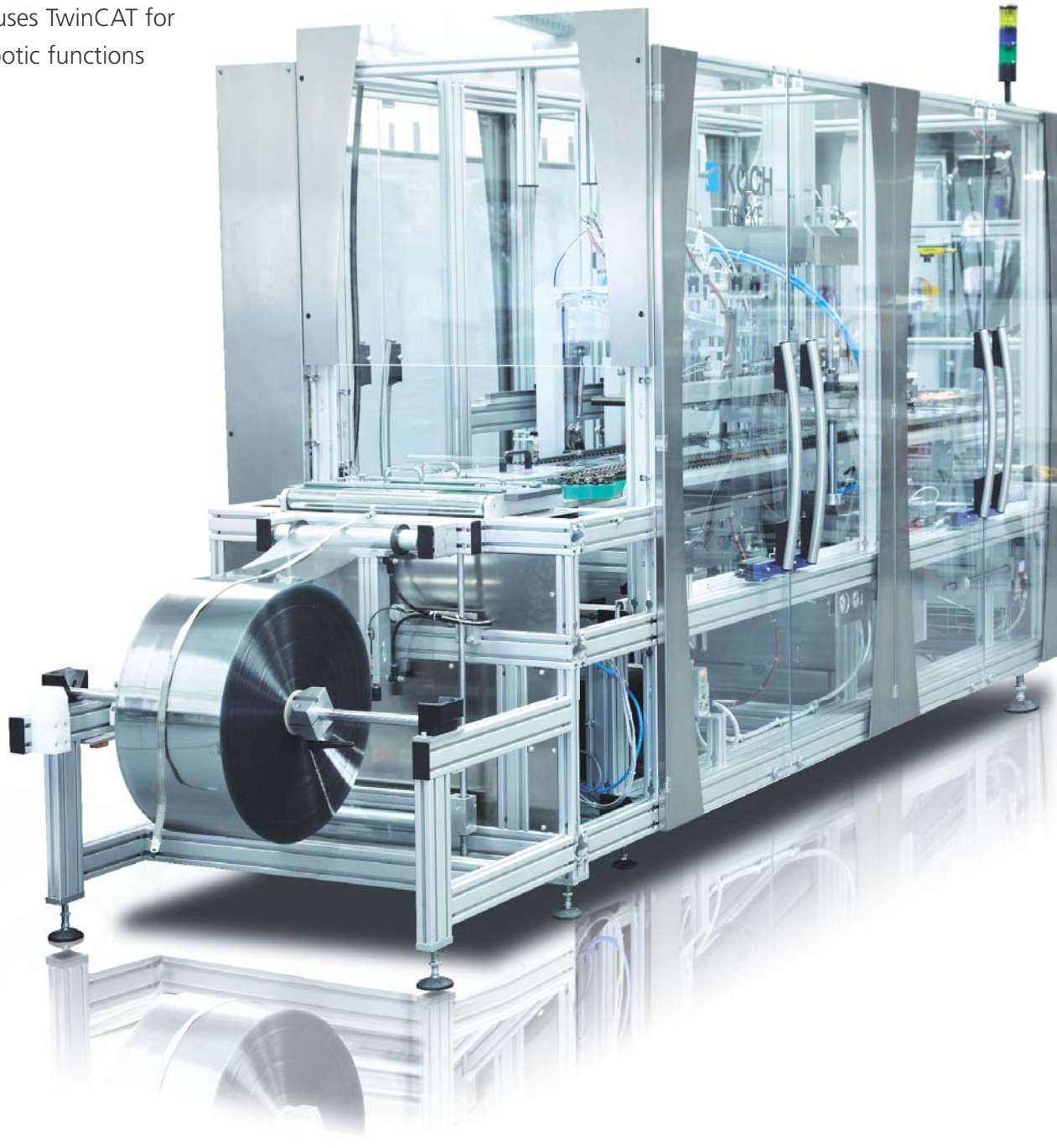
KOCH Pac-Systeme uses TwinCAT for PLC, motion and robotic functions



The KBS-KF blister machine developed by KOCH Pac-Systeme represents the high end of packaging machines with its integrated ultrasonic cut and seal device and fully automatic product feed by delta robot.

Fast, cost-saving packaging: high-end solution for blister packs

The KBS-KF blister machine developed by KOCH Pac-Systeme offers tomorrow's packaging technology today. This high-end solution among packaging machines is equipped with an integrated delta robot for fully automatic product feeding and an ultrasonic cut and seal device that eliminates the previously necessary, so-called "victim film." As a universal automation platform for the robotics, PLC and motion functionalities, KOCH Pac-Systeme uses the Beckhoff TwinCAT control software together with EtherCAT as the fieldbus system.

KOCH Pac-Systeme GmbH from Pfalzgrafenweiler in southern Germany specializes in the development and manufacturing of customer-specific blister machines for packaging lines. KOCH had two interesting innovations in store at Interpack 2011 – the industry's most important trade fair in Düsseldorf, Germany: the KBS-KF blister machine which, as a modular packaging machine, is the company's flagship solution and has been supplemented with a delta robot – the KRH-D for automatic product feeding. The second innovation is the integration of an ultrasonic cut and seal station into this machine; i.e. the process steps of sealing and cutting have been combined into one step here: the blister and cover film are sealed and cut simultaneously in one station.

Modularity with innovative potential

Everybody is familiar with blister packs nowadays. Put simply, they consist of a transparent plastic film, in which the blister is formed, and at least one cover film, which forms the upper closure after inserting the packing item. The blister packaging machines from KOCH are mainly designed for the non-food sector, as Karl Kappler, Engineering Manager of KOCH Pac-Systeme, reports: "The KBS-KF is intended for blisters with cover films made of the most diverse materials and for medium to large batch sizes. We pack goods with a medium format, e.g. medical products, batteries, toothbrushes, light bulbs, cosmetics, tools, electrical appliances, razors and stationery. Exceptions are pharmaceuticals, foodstuffs and luxury items."

The machine, which offers a fast format change and a very high cycle rate (up to 30 cycles/min), is referred to by KOCH Pac-Systeme as the high-end solution among blister machines. It consists of a total of eight process stations, which are partly connected with one another. The process starts with a film roll and a film take-off device, followed by the heating station in which the transparent blister film is heated up. This is followed by the blister forming station, in which the positive forming of the blister takes place. The subsequent product insertion section can be designed according to the customer's requirements for manual packing or for automatic packing with the KRH-D delta robot. Then comes the card inserter, which places the inlay card in the blister. The sealing station (in which the cover film is drawn off the roll, fed and sealed to the blister) and the punching device (in which the finished blister packs are separated after sealing by longitudinal and lateral cutting) had been two successive process steps until now. "The integrated ultrasonic cut and seal device, which combines sealing

The KRH-D delta robot in the insertion station area. The inserted part is a text marker, which is inserted into the blister adapted to its shape.

Karl Kappler, Engineering Manager of KOCH Pac-Systeme GmbH, and Frank Würthner, Business Manager Packaging at Beckhoff, in conversation by the blister packaging machine with delta robot.

View inside the control cabinet, with EtherCAT AX5000 Servo Drives and EtherCAT Terminals for the dynamic, reliable control of the delta robot.

and punching into a single process step, was developed in collaboration with Maschinenfabrik Spaichingen and is an absolute innovation in the packaging machine market," reports Karl Kappler. "It makes do without the expensive victim film that previously had to be fed between the sonotrode and anvil to prevent damage to the punching tool. Around 20 to 30 % of the consumable materials can be saved by eliminating the victim film."

Automation as a key competency

"The packaging machine features demanded today by customers are: flexibility, quick change-over times and a wide range of variants," says Jürgen Welker, General Manager and Head of Automation and Service at KOCH Pac-Systeme GmbH. "Just-in-time production is also found increasingly in the non-food sector. For that reason we must ensure, by means of mechanical engineering and appropriate automation, that the end customer can pack not just one product, but its entire range of products." Jürgen Welker co-designed the solution for this purpose himself: "Our machines are conceived in such a way that they fulfill these requirements by modern control and Servo Drive technology, convenient operator control and the use of high-quality components. Format changes are also possible at the push of a button. The user merely enters another program number in order to retrieve a different set of parameters, which adjusts the machine to the new conditions."

One software platform for all tasks

"The performance range of packaging machines has changed a great deal. This concerns both the electrical modules used and the fundamental automation concept," explains Jürgen Welker. Apart from TwinCAT, KOCH Pac-Systeme uses Beckhoff EtherCAT Terminals as well as Servo Drives and servomotors from Beckhoff. "KOCH Pac-Systeme took a chance on PC-based control technology at an early stage and has been using our TwinCAT control software since 1996. In the KBS-KF with integrated delta robot, TwinCAT NC PTP is used as the PLC and Motion Control platform and TwinCAT NC I for interpolating motion control," adds Frank Würthner, Beckhoff Business Manager for packag-

ing technology. KOCH uses the TwinCAT Kinematic Transformation software library based on TwinCAT NC I and G-code (DIN 66025) to control the delta robot. It was developed by Beckhoff especially for robot kinematics, e.g. for pick-and-place tasks.

TwinCAT ensures accurate synchronization

The integration of the delta robot into the KBS-KF blister machine is by no means trivial: the blister film is guided through the forming and sealing station by a grab chain. In the insertion zone, the robot must now pick up the non-oriented item to be packed from a continuous conveyor belt running parallel to the chain and place it into the blister. Whereas the chain is cycled and can thus be stopped briefly for insertion into the three parallel blisters, the conveyor belt runs continuously. On the one hand, the conveyor belt must be synchronized with the cycle of the blister belt and, on the other, the precise position of the non-oriented item to be packed must be detected and its coordinates integrated into the position of the robot's gripper.

The necessary synchronization to the conveyor belt for picking up and setting down work pieces is enabled by the TwinCAT 'Flying Saw' and 'Cam Plate' libraries. KOCH Pac-Systeme uses an image processing system in order to detect the precise position of the item to be packed. As Jürgen Welker reports, the image processing system also interacts extremely well with TwinCAT 2.11. "We import the graphic data into the controller by Ethernet in order to implement the conveyor tracking, which we use with the delta robot. The graphic data are converted into position data in the controller, on the basis of which we can determine where the product is at that moment." The robot then grasps the released item and places it into the blister.

TwinCAT Scope 2 facilitates commissioning

The packaging manufacturer was particularly taken with the TwinCAT Scope 2 software-based oscilloscope solution offered by Beckhoff. Jürgen Welker says about this: "The scope functionality is very important to our programmers during commissioning; we use it intensively for debugging, for example." Frank Würthner also sees important benefits here: "TwinCAT Scope 2 is particularly helpful for the commissioning of the drive controllers. It offers advanced display options that are used intensively by the software engineers at KOCH. Errors such as an overshoot can be quickly discovered with it."

KOCH Pac-Systeme delivers its blister machines across the globe. "The machine's remote maintenance concept is therefore a must in the context of the service offering nowadays," reports Jürgen Welker. "We can search for the possible reason for a fault practically from our desk and give the customer appropriate hints, so that they can examine this or that station and identify the cause and take action."

KOCH Pac-Systeme GmbH **www.koch-pac-systeme.com**
PC Control for Packaging Machines **www.beckhoff.com/packaging**

Various products such as batteries, toothbrushes, light bulbs, cosmetics, tools, electrical appliances, stationery or toys can be packed with the KBS-KF blister machine; exceptions are pharmaceutical articles, foodstuffs and luxury items.

Jürgen Welker, General Manager and Head of Automation and Service at KOCH Pac-Systeme GmbH

Karl Kappler, Engineering Manager of KOCH Pac-Systeme GmbH