

Kraus

Cutting at maximum speed Efficient automation platform for packaging machines

Speed and automation go hand in hand, especially in the packaging industry, which has to keep pace with the production line. Speed is also of the essence away from packaging, namely in the development of the packaging machines themselves. Time-to-market is the keyword. The right automation solution can speed up both the production process and system development.

Kraus Maschinenbau GmbH specializes in solutions for dispensing, counting, cutting, feeding, and positioning paper and flat products with thicknesses of up to 30 mm (see text box 1). The latest solution from the Spaichingen (Germany) based company is the High Speed Pouch Cutter BS 320 for cutting desiccant (hygroscopic substance filled) pouches and other continuous pouch webs (image 1).



Image 1: The High Speed Pouch Cutter BS 320 cuts desiccant pouches from a continuous web of pouches at up to 400 cycles per minutes.

Full speed ahead

Cutting at more than 400 cycles per minute, or 150 ms per cut, the machine's speed is currently unrivaled on the market. In addition to its high speed, the BS 320 boasts impressive reliability and maximum cutting accuracy between the individual products. The machine is an ideal addition when packaging delicate products at high speed, cutting desiccant pouches from a continuous pouch web and feeding these into the packaging. Non-stop operation is enabled by a product store, which is based on a sophisticated pulley block principle, together with a sealing unit, which allows the end and start of two continuous pouch webs to be sealed together (splicing) during the run. A further major benefit is the rotating blade, which cuts the individual desiccant pouches from the continuous web. Existing solutions often rely on a shearing process, which only achieves around 200 cycles per minute.

The main areas of application of the pouch cutter are the high-speed processing of critical premium products. In addition to speed, reliability is also of the essence, both of which require sophisticated control technology. Joachim Kraus (image 2), Managing Director of Kraus Maschinenbau GmbH, relies on Omron solutions in the field of control technology and automation systems and components, and justifies his choice as follows: "Our experience with the products over the past few years has been very positive. We have been particularly impressed by the compact construction of the various products and the expert support we receive. That's why the automation experts from Omron are our first choice for machine automation components and systems."



Image 2 Joachim Kraus, Managing Director of Kraus Maschinenbau GmbH: "Omron is our first choice for control technology and feedback control systems. We have been particularly impressed by the compact construction of the various products and the expert support we receive."

Short control times ensure accuracy

Because the pouch cutter is a product with great potential, the packaging machine experts rely on the future-proof NJ machine controller (image 3), which forms part of the powerful and robust Sysmac automation platform. Other components from Omron are also fitted in the pouch cutter: three servo drives (image 4) help feed the continuous web, drive the rotating cutting edge,

and ensure synchronous transfer of the cut desiccant pouches to the downstream process. Desiccant pouches detected by the machine controller as faulty are discharged from the current process by means of a pneumatic cylinder. Omron also supplied the NB-series 7-inch widescreen touch panel, a frequency inverters with EtherCAT interface, digital I/Os fitted on the machine controller (image 5), and all safety door switches together with the accompanying safety module.

As previously mentioned, a rotating cutter cuts the desiccant pouches from the continuous web in precisely the right length. This continuously operating solution offers a speed that the intermittent shearing process cannot achieve, but at the same time imposes several challenges on the automation technology used. Since the individual desiccant pouches are of exactly the same length only in theory, the cutting point always has to be determined time and again in the current operation. To this end, a complex correction algorithm was developed which, together with information from the corresponding sensors, reliably detects the position of the cutting point within 16 μ s, thus allowing precise cutting.

Automation platform reduces development times

Alongside the process speed requirements, another major challenge is presented by the increasingly shorter development cycles for new machines. The automation solution employed can also make a big difference here. All the components of the Sysmac platform are perfectly coordinated with one another. In addition to process benefits, this also offers advantages for software development and further development. The Sysmac Studio development environment, which is based on IEC 61131-3, is the central part of the automation platform. As such, it can be used to program, parameterize and test all of the components in-one. In contrast to solutions from a variety of competitors in the market, software developers now no longer have to switch between different programming environments.

A further advantage for software development is afforded by the seamless integration of PLC and motion control within an NJ machine controller task. The resulting elimination of software interfaces simplifies the structure of the software and increases transparency in addition to reducing software development times.

Anyone who has ever developed software knows how much time can be spent troubleshooting. Here, too, the development environment can support the troubleshooting process. In addition, a data trace function is useful for commissioning, allowing various signal sequences to be mapped easily and making it easy to determine whether the individual software steps are running in the intended sequence.

External components also accommodated

Although its components are perfectly coordinated with one another, the Sysmac automation platform is also happy to accommodate alternative components, where these are required. The pouch cutter, for example, did not require an expensive HMI (human machine interface), so a low-cost interface unit was chosen that is not part of the Sysmac platform. The NB7 Widescreen7" display offered the precise high resolution and Ethernet port required by the application (image 6). Its integration into the overall project was very straightforward, as was the linking of two light conductor sensors for measuring the pouch length, which, for historical reasons, also had to be procured from a different manufacturer.



Image 3 The pouch cutter is controlled by the future-proof NJ3-1200 machine controller of the Sysmac automation platform.



Image 4 Three servo drives are used to position the continuous web, drive the rotating cutting edge, and ensure synchronous transfer to the downstream machine.



Image 5 Digital I/Os from the new NX series installed in the machine controller.

Re-using software

Like the Kraus company, many packaging machine manufacturers specialize in a particular area. During the development of new machines, it is then often important to program software for similar processes. In this respect, it is of course helpful for the development environment to support general programming if possible. Recurring functions can be stored in customers' own libraries. These can then simply be re-used in other projects alongside the manufacturer's predefined libraries.

The packaging machine experts took approximately two weeks to develop the software for the pouch cutter and two weeks to get the cutter fully operational. Since similar projects had already been completed at the company in the past, time was saved in the development thanks to the new Sysmac automation platform. Perfectly coordinated components, the correct field bus and a

development environment incorporating all of the components therefore clearly help to reduce the time to market. At the same time, the user benefits from the highest speeds in the process. As Hans-Peter Beckenbach (image 7), Field Application Engineer for Integrated Automation at Omron, sums up: "In this application, our strategic decision to opt for EtherCAT for the field bus has proved itself once again. The machine controller and field bus operate at cycle times of a millisecond."

For this reason, and thanks to the integration of PLC and motion control functionality into our machine controller, we were able to achieve the short response times required by many applications. Short time to market and fast processes are both advantages from which the packaging industry and mechanical engineering as a whole are likely to benefit."

All images courtesy of Omron



Image 6 HMI, configured to meet the precise needs of the application.



Image 7 Hans-Peter Beckenbach, Field Application Engineer Integrated Automation: "In this application, our strategic decision to opt for EtherCAT for the motion bus and field bus has proved itself once again. The PLC and field bus operate at cycle times of a millisecond. For this reason, and thanks to the integration of PLC and motion control functionality into our machine controller, we were able to achieve the short response times required by many applications. Short time to market and fast processes are both advantages from which the packaging industry and mechanical engineering as a whole are likely to benefit."

About Kraus Maschinenbau

Kraus Maschinenbau GmbH based in Spaichingen, Germany, specializes in solutions for dispensing, counting, cutting, feeding, and positioning paper and flat products with thicknesses of up to 30 mm. These include paper sheets, brochures, booklets, plastic products, samples, sachets, CDs, ISO cards (e.g. loyalty cards and prepaid cards), greetings and greeting cards, labels, packing box and folding box blanks, labels (also multilayer), and much more besides for all conceivable sectors and applications. The systems are frequently found in combination with finishing processes, such as printing, embossing, labeling, checking, stacking, packing etc. The machine components and systems developed by the company—tailored to individual requirements in most cases—are used in mechanical engineering for the packaging and labeling industry, in print finishing, in letter shops, and in personalization and security concepts.

About Omron

Omron Industrial Automation is a leading manufacturer of high-tech products and solutions for industrial automation. The company is part of the Omron Corporation founded in 1933 in Kyoto, Japan, and employs more than 35,000 people worldwide. The wide product range includes control, drive and safety technology, image processing and sensor systems, as well as control and switching components. The aim is to provide mechanical engineers with demand-driven, integrated automation solutions from a single source. In addition, Omron offers its customers comprehensive application know-how, as well as region-wide on-site service. In Europe alone, Omron has 19 sales offices and operates its own production sites, visit the Omron website at www.industrial.omron.eu