Smart positioning systems pave the way for fast, fully automated adjustment of system components to different packaging formats

Fig. 1: Gerhard Schubert GmbH wants to guarantee a consistently high level of packaging quality and one of the best ways to achieve this is through standardisation of workflows in machines.

Fast and flexible format changeovers are vital for maximising the efficiency of automated packaging lines. Gerhard Schubert GmbH is a market leader in top-loading packaging machines (TLM) and therefore decided to invest in positioning systems (PSE) from halstrup-walcher GmbH to switch between package formats. Positioning systems use intelligent control system technologies to adjust the various axles of a machine to the packaging format specified for the product. This saves time, reduces the number of rejects, prevents machinery standstills caused by incorrect settings and thus ensures high quality standards.

"Standardisation makes an important contribution to a company's efficiency and performance. And this is exactly what our customers are looking for in product packaging solutions," explains Rolf Bögelein, control technician at Gerhard Schubert GmbH. The company manufactures packaging machines and other technology products for the pharmaceutical, cosmetic and food processing sectors. Well-known customers include Nestlé, Danone and Unilever. Gerhard Schubert GmbH aims to guarantee a consistently high level of packaging quality and one of the best ways to achieve this is through standardisation of workflows in its machines. At the same time, its wants its customers to have the flexibility and tools to cope with frequent changes in packaging sizes. The trend towards individual, customised products means this adaptability is becoming increasingly important.

Modular packaging lines offer outstanding flexibility

Schubert's machines are principally used for packaging individual products in trays or folding boxes before dispatch. "Our range includes a box erector, grouping, loading and closing machines and a palletizer," explains Bögelein.

Fig. 2: Schubert uses positioning systems from halstrup-walcher GmbH for format adjustment.

Schubert assembles every packaging line from its portfolio of sub-machines. "The smallest TLM packaging machine could be just a single sub-machine but our lines contain 5 or 6 on average," he continues. Large packaging lines can comprise 11 to 15 sub-machines – the largest line Schubert has built so far had a grand total of 26.

A standardised range of sub-machines allows Schubert to supply equipment more quickly while simultaneously responding to the individual wishes and packaging processes of its customers.

Fig. 3: Rolf Bögelein, control technician at Gerhard Schubert GmbH, trusts positioning systems from halstrup-walcher.

The sub-machines are assembled from TLM system components. "For example, these include F2 robots for erecting, loading and closing boxes, F3 robots for removing packaging materials and 4-axle F4 robots. Our pick-and-place robot uses the TLM Vision System to pick products from a continuously running product belt and group them in a box, tray or transmodule," says Bögelein. The transmodule is the first transport robot in the world which moves products through all the sub-machines on a rail system. TLM Operator Guidance – i.e. the master computer of a TLM packaging line – and the TLM Machine Frame complete the range of system components manufactured by Schubert.

A box erector, for example, has a swivelling blank magazine. Unlike the usual safety doors, this is easy to access as it is mounted on the front side of the machine. The magazine itself is an interchangeable part, i.e. a size-dependent tool which still has to be changed manually. During the process, the box blanks are removed from the magazine using a TLM-F3 robot. In a single step, a TLM-F2 robot guides the blanks over the gluing nozzles and erects them with a maximum output of 120 boxes per minute.

Automated positioning replaces manual adjustment

"In the past, operators had to use hand wheels to adjust machines when the packaging format changed. But hand wheels always require an operator to be at the machine itself. The adjustment process can be very time consuming, especially if several axles have to be adjusted in one machine. Moreover, it is impossible to eliminate the risk of human error which can lead to rejects or machine stoppages," explains Christian Sura (Dipl.-Ing.), Managing Director for Sales at halstrup-walcher GmbH. For example, the glue application module for gluing the boxes must be correctly adjusted because it is vital to apply exactly the right amount of adhesive in exactly the right place. Before these processes were automated, companies had to stop production and perform the format changeover manually. This was a daily event that resulted in long stoppages and considerable lost production time.

Hand wheels have now been replaced by actuators which adjust the machine axles automatically. Yet these too have disadvantages. Although they are able to move independently to a specified target position, they can be interrupted or prevented from doing so by an obstruction. The operator would be unaware of the problem because the actuator has no way of reporting its position. "But positioning systems from halstrup-walcher know exactly where they are – and enable the operator to view their position at any time via the machine control unit," explains Bögelein. "Actuators without smart technology cannot do this." In other words, halstrup-walcher's intelligent positioning systems move to their specified target positions, monitor their own position and report this information

Fig. 5: Automatic adjustment of the glue application module for gluing boxes: It is vital to apply exactly the right amount of adhesive in exactly the right place.

back to the control unit. As a result, they can perform format changeovers at the touch of a button – quickly and precisely for a number of axles at the same time. "Automated format changeover makes production of any batch size profitable – even of just one piece. The advantage of this is that the machine user can package the product in exactly the right way," continues Sura outlining the benefits of the system. PSE units can also be installed in locations which are poorly accessible. With hand wheels it is vital to ensure that the wheels are easy to access for operators. This must be taken into account when designing the machine and sometimes involves additional, complex and costly diversion mechanisms.

Intelligent technology for easy handling

The positioning systems comprise a brushless EC motor, gearbox, absolute distance measurement system and motor control. They are self-monitoring and communicate via BUS interfaces. The integrated motor control guarantees accurate positioning of the module being adjusted. The PSE receives the run command from the control via the BUS communication. It uses the same mechanism to report whether it has reached the target position in the specified time. The positioning system automatically accelerates or decelerates if values deviate from the expected range and thus keeps the typical drag error at a very low level. It is also possible to synchronise a number of PSE units in this way.

The absolute distance measuring system helps to maintain the specified position with outstanding accuracy. It does not require a power supply or battery and thus operates reliably without the need for maintenance. It records a change in position, e.g. due to manual turning, even when no power supply is connected. In addition, it will send a message to the control unit reporting that the axle has been turned manually. In contrast to other similar systems, the absolute measuring system records the revolutions directly on the output shaft rather than in the motor. Consequently, gear backlash has no impact on the accuracy of the measurements.

Preventive maintenance minimises standstills

The positioning system is not only able to record whether it has reached the target position but also to monitor a number of other relevant precautionary parameters. "Preventive maintenance is another special feature of positioning systems from halstrup-walcher which we will definitely be using more widely in the future," says Bögelein. All the relevant parameters, such as the required torque, are reported back to the control unit. This informs the operator, e.g. if a spindle is no longer running smoothly, a bearing is becoming worn or the internal temperature of the device is too high due to overload. He can then take action to remedy the problem before it becomes serious. This feature simplifies the task of preventive maintenance for the packaging machine. The device also features intelligent "condition monitoring" algorithms. These monitor the positioning systems and are capable of differentiating between reduced performance due to dirt and more serious obstructions. When residues such as solidified grease apear the torque will be increased shortly. More serious obstructions, which must be removed by the operator, trigger an immediate stoppage and a corresponding error message is then sent to the control unit.

Positioning systems from halstrup-walcher have many advantages – which is the reason they are a reliable solution for automating format changeover in Schubert's packaging processes. "Almost all the components are manufactured in Kirchzarten and assembled on an optimised production line. Every finished product is tested automatically to ensure it is functioning correctly," explains Sura. The enormous depth of production expertise at halstrup-walcher allows the company to produce different versions and small batch sizes quickly and flexibly. The result: halstup-walcher is capable of manufacturing customer-specific versions of its products.

Its positioning systems are based on a modular principle which can easily be adapted to specific requirements: With a choice of IP protection classes and BUS communi-

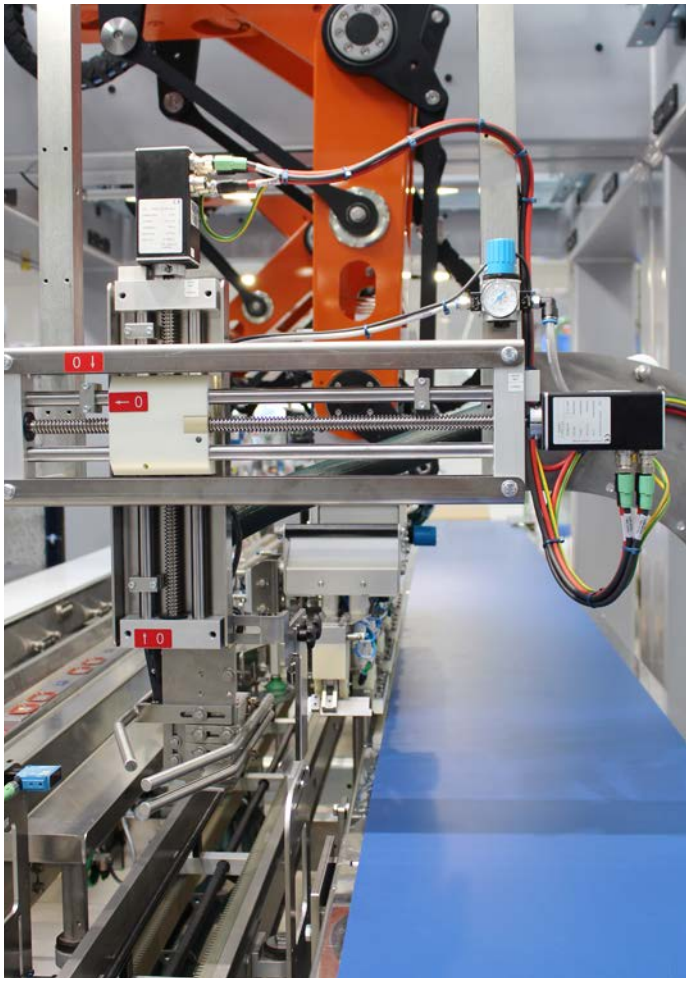

Fig. 4: Positioning systems can perform format changeovers in packaging machines quickly, precisely and at the touch of button.

cation systems, they can be installed in machines in many ways. This is because the dimensions of the components do not change – whatever protection class or one of the ten buses the customer selects.

This flexibility has enabled Schubert, for example, to introduce a standardised communication interface for its packaging machines. The company converted all its components from CANopen to Sercos and halstrup-walcher was able to adapt the positioning systems quickly to the required interface. Standardisation simplifies every area of programming and controlling the machine. Sercos offers better diagnostics and is already being used in the drive control units which – like the 3- and 4-axle robots – Schubert builds itself.

An enduring partnership – with further cooperation on the horizon

The number of PSE units supplied to Schubert by halstrup-walcher has been growing continuously for many years. Partly, this is because Schubert is gradually automating its packaging lines to make them simpler and more flexible for its customers. But it also reflects the steady growth in demand for Schubert packaging machines. The company is now using PSE units at every point in the machine where positioning is required during format changeovers. "The solutions manufactured by halstrup-walcher guarantee reliability in our customers' packaging processes. The operator can switch to the new format at the touch of a button or using the touch panel and be certain that every setting is accurate. He can also monitor each of the settings. The speed and precision of these adjustment operations for every format and at every axle enhance flexibility and significantly boost product quality," says Bögelein.

The control technician is an enthusiastic supporter of the partnership between the two companies. "We expected halstrup-walcher to supply advanced, high quality technological products with punctual, quick and flexible delivery – they have met all our expectations. In the rare instances that we discover a problem, it is quickly solved by open and honest communication." Gerhard Schubert GmbH will therefore continue to use positioning systems from halstrup-walcher for automating its packaging machines. In the future, it plans to take even greater advantage of the positioning systems' diagnostic capabilities in order to optimise preventive maintenance of its machine.

Gerhard Schubert GmbH was founded in Crailsheim in 1966 and now employs 1,050 staff at its headquarters and sales subsidiaries in the USA, England and Canada. The company maintains close links with global market leaders and supplies customer-specific, automated packaging processes. It is the only manufacturer which produces packaging machines on a production line. The corporate philosophy emphasises quality, flexibility and quick delivery times.

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