Board handling underlines The case for servos

A NEW MACHINE FROM EUROPACK THAT BRINGS FILM AND BOARD TOGETHER TO CREATE THE SMART KARTON TRANSIT CASE MAKES EXTENSIVE USE OF SERVO DRIVES, WHICH ALLOWED IT TO BE DESIGNED AND BUILT IN JUST FIVE MONTHS FROM INITIAL CONCEPT.

Drives specialist Lenze has worked with end-of-line machinery manufacturer Europack – part of the Bradman Lake Group – to help create a custom-built machine for producing the Smart Karton transit case. This employs shrinkable or self-adhesive film, glued to the case inner, to secure the contents, with no void fill required.

Typical applications are books, small electrical items and gifts while field tests have shown that smaller box sizes can be used, in one case reports Lenze, reducing warehouse shipments from seven to four vehicles a day.

The Europack machine handles up to 40 case blanks a minute. A stack of pre-cut board is conveyed to the infeed de-stacker where a servo driven pusher mechanism presents individual boards to the infeed conveyor, correctly gapped to the preceding board.

The servo driven infeed conveyor transports the board under the glue guns and then on to the compression rollers which are also servo driven and at that point the film is applied to the board under tension.

A fourth servo drive controls the rotary knife which cuts the film between the boards in such a way that there is a film overlap to make it easy for users to grip and wrap over the product. Finished boards with glued-on film are stacked and removed by an outfeed conveyor.

While the Bradman Lake Group's engineers worked on the machine structure, glue process, film handling and external controls, the Lenze engineers established a detailed specification for the drives, wrote the software, gave drive training and helped with commissioning. The result was a machine running after just five months from the concept stage and approaching target performance one month later.

With board speeds of up to 50 metres a minute, precise and smooth handling from servo drives was required. Lenze specified the Servo PLC model 9323 rated at 3.9A. This is a drive with a powerful built-in PLC running programs to the standard IEC61131-3. The control concept requires each drive to handle its own motion control while a central PLC looks after safety functions, the glue patterns and the conveyors. The four servo drives communicate between themselves with an integrated CAN system bus, and each drive is fitted with a DeviceNet module to communicate with the central PLC. So the system can be considered a hybrid, with a mix of centralised and decentralised control.

All four servo axes are driving Lenze synchronous geared motors of frame sizes 56 and 71 with type GKS helical bevel gearboxes. The high efficiency of the gearboxes at 96 per cent and low backlash at about 10 minutes of arc are said to make them well suited for servo motor operation.

The pusher axis is a good illustration of decentralised motion control, points out Lenze.

As details of each new board are entered by the operator on the HMI, a new profile is created within the drive based on the board length and the required gap between boards, which can be set between 20 and 100mm. The drive then directly controls the vacuum heads to pick up a new board from the stack before beginning the calculated profile.

Meanwhile, the pusher drive fine tunes the motion profile to allow for small variations in timing in the operation of the vacuum heads.

The drive accelerates the board smoothly to a speed above the line speed to catch up with the preceding board and then, as the required gap is achieved, the drive slows the board down to line speed and runs in gearlock. Once the board is taken into the infeed rollers, the pusher drive returns at high speed to the start position.

The infeed is the master drive on the

Servo driven: *The Europack machine (above) secures film to board to create the Smart Karton transit case blank (left)*

Europack machine. It is programmed to stop so that the board is always under the compression rollers in order to maintain the film tension. The compression roller drive follows the infeed except during start-up when it waits for the leading edge of the next board and ensures the gap between the boards is maintained.

The knife axis is another example of effective decentralised drive control, says Lenze. The synchronous helical bevel geared motor drives a single blade rotary knife of 160mm diameter with the knife speed profile calculated for each new board. The drive accelerates the knife into position and then cuts at a speed synchronous to the line speed. This method ensures high accuracy and means that a single knife can handle all sizes of board.

There are six glue heads on the machine. Four are high capacity twin nozzles that apply a carton-specific glue pattern on the base with different adhesives according to customer specification. The remaining two single heads apply a light tack of glue to the carton flaps.

Geared motors supplied

Lenze also supplied all the other ac geared motors including worm and helical models for the outfeed, stackers and conveyors. The infeed destacker and out-feed stacker are specified to handle up to 500kg. Lenze supplied 1.5kW helical bevel geared motors, chosen to withstand high starting torques and to run efficiently. These geared motors inch the stack up and down with position feedback from an incremental encoder mounted on the output shaft and speed control from Lenze 8200 vector inverters.

During operation, the machine reads bar codes from the cases and records a detailed profile of the output while an on-board wireless modem allows this data to be transmitted to the machine owner.

In addition, the modem can interrogate the drives allowing diagnosis of faults and, potentially, correction without a service engineer travelling to site. Software for new box formats can be downloaded remotely.

Europack technical director David Burlingham sums up the development process: "All the servo sizing and programming worked from day one so our partnership with Lenze was a great success. The machine is up to specification inside six months and we are already looking at the next generation that will run faster."

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Camera-based safety system suits robotics

A CAMERA-BASED GUARDING SYSTEM DEVELOPED FOR THE AUTOMOTIVE INDUSTRY COULD PROVE VALUABLE IN MONITORING LARGER ROBOTS USED IN PACKAGING, PARTICULARLY END-OF-LINE MACHINERY.

The SafetyEye camera system for three-dimensional zone monitoring now being introduced by Pilz has the potential, says the company, to reduce machine downtime significantly, as well as save floor space compared with traditional machinery guarding, safety light curtains and laser area scanners.

In comparison with traditional hinged and sliding machine guards, safety light curtains and laser area scanners are highly advantageous for applications requiring frequent access by operators. Not only is opening a physical guard time-consuming and fatiguing, but maintenance can be hindered by the presence of the guard and its supporting structure.

Camera-based safety: *New Pilz SafetyEye gives three-dimensional zone monitoring*

Nevertheless, light curtains and laser area scanners only monitor a flat plane – although mirrors and/or multiple light curtains can be used to create faceted protection zones.

As a result, Pilz points out, the protected area is often greater than the hazardous zone, which is a waste of floor space and can also mean that the barrier is triggered earlier than is absolutely necessary, costing process time.

In addition, Pilz reckons the cost of installing and maintaining a SafetyEye system is up to 70 per cent less than safety light curtains, mainly because a typical SafetyEye system takes just two hours to install and configure.

Each SafetyEye system comprises a sensing device with three greyscale cameras – to give three-dimensional coverage – and an analysis unit that contains high-performance computers for processing the images, plus a programmable safety system to deliver the safety-related functions and process safety-related and non-safety-related inputs and outputs.

The system is configured by means of an intuitive drag-and-drop software package, with extensive diagnostics help to minimise the time required for troubleshooting.

In operation, the system benefits from separate three-dimensional 'warning' and 'detection' (danger) zones. If a person enters a warning zone, an alarm is sounded and the hazardous machinery is slowed down; if the detection zone is entered, the machinery is brought to an immediate standstill.

Pilz developed the SafetyEye system in collaboration with DaimlerChrysler. Pilz took overall responsibility for system development and provided the expertise behind the safety functionality, while DaimlerChrysler specified the practical requirements, developed the image processing algorithms and supported the test programme.

The first SafetyEye application is in fact now on the production line for the new C-Class Mercedes-Benz.

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