

Steadily, robots are staging a Quiet revolution

WITH ROBOTS WELL ESTABLISHED IN END-OF-LINE OPERATIONS, UPSTREAM APPLICATIONS FOR PRIMARY AND SECONDARY PACKAGING ARE THE NEW GROWTH AREA. THE UK IS BEGINNING TO MAKE MORE PROGRESS, BUT MUCH OF THE QUIET REVOLUTION IS BEING PLAYED OUT ELSEWHERE IN EUROPE, AS MICHAEL MADDOX DISCOVERED ON A VISIT TO GERMAN MANUFACTURER GERHARD SCHUBERT.

Britain may still be some way down the European league of robot packaging machine users but the pace of change is quickening.

For example, when snack food manufacturer Walkers sought a more flexible and lower cost means of producing multipacks, the company opted for robotic systems that can place up to three different varieties of crisp bag in any chosen combination directly into the in-feeds of flow-wrappers.

Four TLM-F44 picker lines from German manufacturer Schubert, each feeding two flow-wrappers, were installed in 2006 and now, with efficiencies in excess of 97 per cent, more machines are to be installed later this year.

Speed is up to 480 bags a minute with six and 12 counts fed to the flow-wrappers providing up to 80 finished multipacks a minute.

"It was important to find an innovative and efficient packaging solution as we focus on reducing costs and raising efficiencies every day. The payback period had to be right because our return on investment target is very high and it is essential that every new investment reaches this target," explains Mark Grover, director of potato crisp production at Walkers.

"It was a challenging proposition to find a viable technological solution for packing our multi-packs, which delivered high efficiency and flexibility. While the Schubert solution was not the cheapest, it became the preferred solution when all aspects were considered."

Elsewhere across Europe the inherent flexibility, reduced labour costs and rapid format changes available from the latest robotic systems are, it seems, challenging traditional packaging concepts, particularly in creating primary, secondary and even tertiary packs on the same machine.

For example, a Dutch brewer is soon to take delivery of a 26 metre long, 11-station Schu-

bert robotic system that loads bottles into multipack clusters and then trays at the rate of 917 bottles a minute.

While at first glance this speed may not be that exceptional within the bottling industry, the key to the brewer's decision to buy this, its second line, lies very much in the rapid changeover between three bottle sizes, and four formats of clusters and final tray sizes.

Apart from creating the clusters, inserting a partition and closing before erecting and loading the tray, the machine also erects and secures the lid. Up to 38 trays a minute can be handled.

Further expansion

Although Schubert initially established its name largely in the confectionery industry with multiple picking systems to load trays and cartons of chocolate assortments, the company is now experiencing increasing demand from a broad spectrum of industry with the result that, early next year, Schubert will complete a further 5000sq metre extension to its factory and begin to expand the current workforce of 650 by a further 150 employees.

Gerhard Schubert, who founded the company 40 years ago, agrees that the growing success of robotic packaging systems generally is very much down to fast changeover and flexibility to handle new products in the future but, he points out, space considerations and a quest for simplicity are important factors as well.

"Years ago one used lots of different machines – cartoners, fillers, closers – all linked by conveyors. But that's out. Now we can integrate the operations in the same compact machine – particularly primary and secondary packaging.

"Electronics and software give us the overall flexibility but we have also reached the point where our mechanical components are so flexi-

ble that our TLMs – Top Loading Machines – can be built up from just seven different types of module."

The Schubert philosophy is immediately apparent in the fact that robotics are used for virtually all of the packaging process, rather than, for example, the more conventional mix of robotic loading with more traditional methods of carton, tray or case erection and closing.

For example, carton or tray blanks are usually held in multiple magazines at the transfer unit, a two-axis robot that delivers the blanks – or indeed other packaging such as thermoformed trays – into the line. Picking is usually on multiple tooling.

Carton and tray blanks are usually plunge erected in multiple female dies – equipped with rollers to prevent scuffing the graphics – while blanks for open-ended multipacks will be plunge erected into pucks as carriers. Equally, closing is carried out by robotics with glue and tuck mechanisms handled by the tooling.

Further modules are the grouping chain or "racetrack collator" to create collations, a vision system for applications involving random product in-feed, the high speed TLM-F44 picking robot for handling piece parts, a vacuum conveyor – one of the latest developments – and the TLM-F2 robot for loading collations.

Making tooling simpler

Tooling for all tasks is clearly crucial and is currently very much under the spotlight as Gerhard Schubert explains:

"The temptation for designers is to make tooling too complicated. We have always to think about how we can make it simpler and so make it more reliable. Currently the average price of tools is €16,000 but my goal is to reduce the average to €5000."

Machine frames are modular, sharing a com-



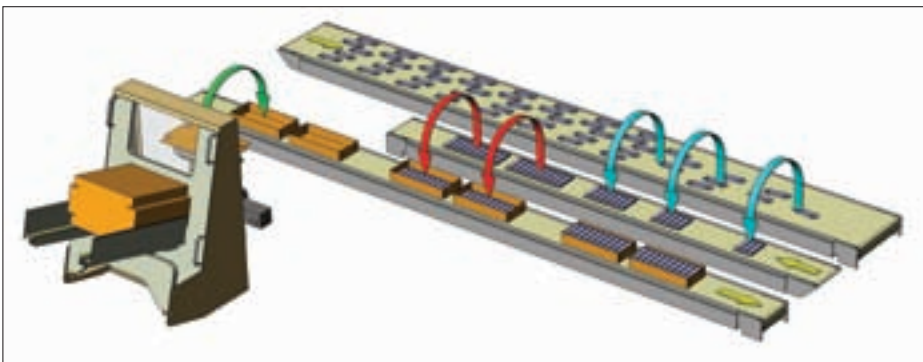
Crisp multipacks: Installation for Walkers loads mixed flavours into flow-wrapper infeeds



Yogurt pots: Multipack assortments are created and loaded into board sleeves by this line



Bottles: One of several machines for loading bottles into board multipacks, erected and carried in pucks



Collation by robot: Schubert's latest system dispenses with racetrack collators and is faster to change over

mon style with all electrical control cabinets installed at the top for improved access and hygiene, and are all sized to the application.

However, the grouping chain module may well give way in the future to Schubert's latest development, the grouping robot, offering the flexibility of changeover mostly via software, rather than size and format parts.

The system was demonstrated in the UK for the first time at last year's PPMA Show and will return in May this year for the Total exhibition, but set up for a different product to further demonstrate its capabilities.

Instead of directing a lane of product into the pockets of a racetrack collation system to achieve the correct count, the new system operates with product arriving at random orientation on the infeed conveyor.

Four-axis robots guided by vision systems pick the products and build appropriately pitched collations on an intermediate conveyor. Further robots then pick whole layers from the intermediate conveyor and load the cartons or trays.

The result is a system in which count, pitch, and orientation are all under software control, allowing this element of the line to be changed over instantly.

A further time-saver is Schubert's new vacuum conveyor in which lateral guides and interchangeable suction plates, sized to the job, replace flights. Located via pins on servo driven belts, and also held in place by the vacuum, these are able to transport containers between stations at speeds up to 9 metres/sec and to a positional accuracy of 0.1mm.

However, for the future Gerhard Schubert is looking towards even higher levels of automation and, at Interpack next year, the company will unveil a system in which tools are stored and automatically changed, in very much the same way as a machining centre in the metal-working industry. Even further automation could also be on the way.

"Lights-out operation is my vision," he says. "It may of course never be possible, but it is a direction we have to follow."

This direction could lead to RGV-mounted robots, tool carriers and materials magazines that position themselves automatically around a base conveyor to carry out the job in hand. Each robot could be virtually self-contained and move off line in the case of a fault, to be replaced by a spare that moves itself into place.

Schubert's factory is now working to full capacity, hence the expansion planned for next

ROBOTICS

year, and it is significant that of some 14 or so lines under construction in mid-March, just one was for the confectionery industry.

Indeed, cereals, cheese, snack foods, pharmaceuticals, personal care products, pet foods, yogurt pots and beer bottles are just some of the goods now handled on Schubert's machines, illustrating the way in which the application of robotic packaging systems continues to spread across a broad sector of industry.

In cereals, for example, four machines currently being built for a UK customer to handle flow-wraps each containing two bars will each be capable of producing three different carton sizes – for 12, 16 or 20 bars and 24, 30 and 40 bars – at speeds of 252 flow-wraps a minute. Two, three and four layers are loaded into an erected carton to achieve the desired count.

The design of the machines also allows options of eight and 48 products to be handled in the future if required.

In operation, the carton blanks are taken two or three at a time from the magazine, plunge erected and carried into the loading area on vacuum conveyors. Two or three collations of product are created in a racetrack collator and transferred by robot onto a grouping table where each collation is tightened between expanding flights to eliminate inter-product spacing. Layers are then placed in the cartons by a further robot.

Each machine is also fitted with a station for loading premiums and the top load approach allows items such as CDs or booklets to be handled easily.

For handling vials of eye drops at high speed



Tea bag cartoning: Product is loaded into the blue carriers and then tipped into the cartons

– up to 500 pieces a minute – Schubert has built a machine capable of providing packs holding 25, 50, 75 and 100 vials, which come supplied in trays in groups of five, moulded and filled together.

Particular features of this machine include six robot arms to load the groups of vials alternately at 180 deg in a nesting pattern, a packaging security system that reads 2D codes on the product, carton and leaflet, and a laser coder to mark each carton.

In the dairy industry, Schubert has built a number of machines to handle various forms of multipack yogurt pots and has just completed a machine capable of sleeving four packs and mixed flavour eight packs at the rate of 800 pots a minute. It is built in stainless steel and to

an IP67 specification to enable wash down.

Fed straight from the thermoformers the machine ends with an elevator that takes trays of sleeved product to an upper floor for end-of-line packaging.

Teabag cartoning is not traditionally associated with robotic packaging systems, but Schubert is also just completing a third system for a customer to load up to 80 cartons a minute, with a choice of three carton sizes and counts – 40, 80 and 160.

The key here is a carrier system of mini tote bins that accept the teabags in the appropriate count straight from the bagging machine and, once at the loading position, are lifted and tilted by the robot to empty into the cartons, pre-erected on the machine. As they travel to the robotic closing station the cartons are gently vibrated to settle the contents.

Further machines recently completed by Schubert include a system to load pet food tins into trays at the rate of 650 tins and 80 trays a minute, and a machine to erect and pack octagonal slip-lid cartons with cheese at 80 a minute.

One of the largest machines still to be completed is a 40 metre long line to provide a variety of multi-packs and final packaging for 200ml cups of babyfood.

Meanwhile Schubert's TLM-F4 robot has also been recently upgraded with carbon fibre arms to reduce weight by 25 per cent compared with the previous aluminium components, giving higher speed and also longer life by reducing stress on the gearbox. ■

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Continuous motion raises thermoform-fill-seal efficiency

Schubert last year applied its TLM concept to thermoforming with the introduction of a continuous motion form-fill-seal machine - the TLM T800 - in which trays formed on two outer thermoforming lines are filled by its TLMF44 picker robots from product arriving at random on a central conveyor. Four Schubert thermoforming lines are now in operation in Europe.

Applications extend from cosmetics to confectionery while the thermoforming process can be employed equally for solids, pastes or liquids.

Continuous motion improves efficiency, allowing the robots to work uninterrupted with no dead time and avoids any problems with products that could move out of place or slop



Continuous motion: The thermoforming lines are fed by robot from the central product infeed

when subjected to the stops and starts of intermittent motion.

The machine creates the cavities with recip-

rocating top and bottom tools that travel with the webs and run at speeds up to 20 cycles a minute. All types of thermoformable packaging films can be handled by the machine, which has forming areas of 300 x 400mm wide and can provide a maximum 80mm depth of draw.

Depending on the type of product, Schubert is able to place up to 15 robotic picker stations in the loading area allowing some 3300 items a minute to be placed if necessary.

The sealing and punching stations – which also move with the webs – are equipped with ultrasonic sealing tools that provide a particularly secure seal and handle all tray sizes. Only the bottom tool is a size part.

Facilities to produce modified atmosphere packs can also be mounted on the TLM-T800.