

Robotics in packaging

Mixed pallet loads: the next frontier

ASSEMBLY OF MIXED PALLET LOADS FOR RETAIL DISTRIBUTION – HELPING RESHAPE THE SUPPLY CHAIN – IS FAST BECOMING THE NEXT AREA FOR ROBOTICS TO MAKE THEIR MARK IN PACKAGING.

Warehousing and distribution packaging – particularly the assembly of mixed pallet loads for delivery to retail outlets – is now turning increasingly to robotics, reflecting demand from retailers for custom pallet loads that suit the store, rather than the shipper.

“Robotic-based material handling in distribution systems is among the fastest growing applications in flexible automation, alongside packaging,” says Frank-Peter Kirgis, segment manager for consumer industries at ABB Robotics.

“This is due to manufacturers and distributors responding to the demands of their retail customers – particularly large, influential ones – who require that products come to their facilities palletised in a structure that suits them. The configuration of each pallet is customised to meet their specific needs, a task that has been difficult to execute in the past.”

In turn this means that mixed load pallets are emerging as one of the most efficient technologies currently available for the supply chain – and robots, maintains Mr Kirgis, are the only viable and flexible option for creating mixed load pallets.

In justifying the capital investment, the most obvious benefits associated with the installation of robots are those of displacing tasks that are monotonous or present strain risks to human labour, the overcoming of potential and existing labour shortages, better package quality, and improved working conditions.

However, as Mr Kirgis explains, less obvious are the savings linked to a reduced head count such as a reduction in cafeteria facilities, staff recruitment and training costs, tax and health contributions and even the number of parking spaces required. In many cases a work area reduction alone offers cost savings in real estate.

Placing boxes, trays, bags, bottles or other items on a pallet seems a straightforward task. But the demands of mixed-load palletising are much more complex.

For example, in Canada ABB Robotics has

ties to build up the pallet load, and with on screen and printed graphics.

Marc Ducharme of Axium explains: “The concept of Cube-IQ is very simple, but the software is very powerful. It uses the same concept as configuring lorry combinations, but just builds pallets. We have demonstrated this with potential customers using their real-life scenarios, and results have shown that the cost savings can be substantial, especially when order errors, inaccurate shipment, improper stock rotation and double deliveries are eliminated.”

The fast handling speeds are due, in part, to the fact that today’s generation of robots have high speed, low inertia motors and fast processors within the controllers. PC-based controller solutions, with their open architecture, have really made their mark.

Some applications use machine vision systems and image processing and, for more reliable operation, this can be directly integrated into the software and motion controller of the robot.

Frank-Peter Kirgis at ABB Robotics points out that users are now able to control robots

via user-friendly programming interfaces.

“These have been simplified so that engineers familiar with programmable logic controllers are also able to program robots. The user interface for every robot is an intuitive screen. The user can easily implement parameter changes during operation, which significantly increases the quality and efficiency of the system. Simple machine programming can also be used for new



Creating mixed pallet loads: ABB Robotics in Canada is developing the concept

worked with Axium Industrial Automation which specialises in complex robotic palletising/depalletising solutions for warehouses and has developed a system for mixed-load palletising. This involves the use of the Cube-IQ load planning programme from MagicLogic Optimisation in the USA.

It has a complete graphical user interface, with point-and-click and drag-and-drop facili-

product shapes and sizes as well as the possibility of viewing production statistics."

Meanwhile, one of Norway's principal meat processors, Gilde, is using a Kuka KR 180PA robot to handle a daily 10 tonnes of the fastest moving lines at its plant in Tonsberg, placing crates of various meat products on the correct conveyor for despatch.

The nature of the goods varies according to the season, with packed mince, steaks and sausages, for example, the most popular in the summer barbeque season while goose liver and similar more highly processed goods are in greater favour at Christmas.

Unmixed product

"In order to be able to order-pick these large quantities of goods as quickly as possible, we need the robot. It works 24 hours a day, seven days a week," explains Jon Brekke, project manager for the order-picking robot installed at Gilde.

The system operates from pallets of crates – each containing large quantities of unmixed product – delivered by fork truck. Customer orders and the products to pick are downloaded from the warehouse's central computer to the robot, which then checks for itself whether it is holding the correct product by presenting the crate's bar code to a scanner.

A new bar code is then applied to the crate, identifying the customer and destination. The robot then sets it down on a conveyor which transfers it to the next storeroom where it is scanned again and transferred to the loading ramp of the appropriate lorry.

"The most challenging task in the implementation of the system was unquestionably designing the gripper in such a way that it recognizes and can grip the plastic boxes in all their different positions," explains Frode Grimsbo, service engineer at Kuka.

For this reason, the gripper was fitted with an ultrasound sensor system for checking distances. This allows the robot to be guided at the fastest possible speed to the first pick position. Once it has reached the crate, the clamping gripper initially remains loosely closed until it has found the ideal gripping position. Only then does it tighten its hold.

Once a pallet has been emptied, the clamping elements on the gripper are raised and the pallet is moved aside by vacuum grippers.

Although robots are often seen as simply cost-cutting installations, greater flexibility is just one of the additional benefits, as David

Bradford, managing director of RTS Flexible Systems points out.

"Clearly every project needs to have a robust justification for return on investment, but more and more we are seeing people who are experiencing additional benefits and unexpected returns. These are the areas that will drive automation forward in the future.

"What drives them? In our experience, they tend to have an entrepreneurial vision of the impact of robotics on their business and we encourage them to take a holistic view of their processes.

"Successful automators ask the question: 'What else can we achieve with automation?' They think outside the box, rather than looking at automation as a bolt-on or straightforward replacement for labour."

Increasingly, he adds, packaging operations are using robotic technology to achieve greater complexity and flexibility in production processes. High-speed pick and place robots with throughputs of up to 120 picks a minute, advanced vision-guided technology, line-balancing software and innovative robotic gripper designs all make a contribution.

However, more than the technology, it is the ways in which robotics can be used which is really yielding rewards. Robots are turning out to be able to improve the flexibility of production, and even have an influence on product quality.

For example, RTS Flexible Systems developed a solution to pack multiple product variants into mixed trays. Originally developed for a chocolate biscuit manufacturer, the system has wide applications for confectionery, dairy or bakery products.

Adapt to changes

Replacing a complex and repetitive manual operation, the system is able to adapt quickly to cope with changes in pack configuration due to the introduction of new flavours or 'limited edition' offers. Typically the application achieves under two years' investment return, but there are other advantages, says RTS. The system significantly increases throughput and improves quality control, and there are benefits for hygiene and personnel health too, because of the reduction in human intervention.

A robotic system can now pick up products as delicate as poppadums. What's more it can pick up four in succession and put them down together at 100 picks a minute, 24 hours per day, seven days per week with a very low break-

age rate. RTS says it has proved this can be done reliably and repeatably – and pay for itself in two years by significantly reducing labour costs.

The RTS system is able to collect four poppadums one by one from a conveyor and place them for packaging in the vacuum forming machine. It is also capable of handling multiple product variants for variety packs while the vision system instructs the robot to avoid any that are damaged or overlapped with another.

Indeed, an installation by RTS Flexible Systems at the Ilchester Cheese Co demonstrates how the justification for robotics can stretch beyond simply reducing manual labour costs.

RTS installed its Pixcell pick-and-place unit on one of the company's cheese portioning lines. While the primary reason for investing in the unit was to save labour costs on a line manned by two operators, Ilchester Cheese also wanted to reduce costly product giveaway that arises as a result of portioning.

Slipping through the net

Prior to installing the Pixcell pick-and-place unit, line operators were expected to identify overweight cheese portions. However, as it was difficult to differentiate between the thicknesses of 20g portions at production speeds, oversized portions were slipping through the net.

Now, individual cheese portions are conveyed to the picking unit, where a sensor measures the height of each portion. The information is communicated electronically to the Pixcell controller, which estimates the weight of the portion and combines it with information about the product's position, determined by a vision system. Products within the manufacturer's height and weight parameters are picked and placed into a vacuum-forming machine, while over and underweight portions are let through the Pixcell unpicked, and collected for recycling. The line operates at speeds up to 150 portions a minute.

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Order assembly: Kuka robot at Norwegian meat processor Gilde directs containers to lorry loading bays



Reducing giveaway: RTS system at Ilchester Cheese measures portions as they are picked

PARTNERS IN PACKAGING

Case packer top loads yoghurt for Russia

German manufacturer Dienst-Vepatec has supplied a top load case-packing system to handle pots of children's yoghurts and baby food for distribution throughout the Russian market.

Built to a full washdown dairy industry specification the line consists of a stainless steel Dienst ZAMS servo-controlled case erector, a Unigrabber 2 robot to pick and load the pre-formed 3 x 4 collation of pots at speeds up to 16 a minute and a stainless steel Vepatec DSV 200 case closer, operating with adhesive.

Partners in Packaging says that significant savings in packaging material are being achieved using a top-load style case which is erected from a blank using the ZAMS servo erector, together with increased speeds and labour savings from the integration of the Unigrabber robotic collating and loading station.

The Unigrabber 2 twin axis robot is part of a family of newly developed robots available with either Elau Packdrive or Allen Bradley servo drives.

"With its parallel kinematics, the Unigrabber 2 is clean, fast, silent and maintenance free," says Duncan Macintyre at UK representative Partners in Packaging. "Specifically designed to perform light to medium weight pick-and-place tasks, the versatile control system makes it the ideal starting point for top loading projects.

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IMA UK

Palletiser can be integrated with case packer

Four or six axis Fanuc robots are employed in the compact Flex Palletiser developed by IMA, which is able to take cases through ink jet printing, labelling or weighing operations before placing them on the pallet.

The machine can be equipped with a large capacity empty pallet magazine and, as a result of its modular design, the pallet handling section can be customised to suit any particular needs of the user.

The Flex Palletiser can also be integrated



Mascara line: Robotics pick and orientate components on Kugler's machine



Pick and place: Herbert Matrix 80i cell

with the IMA CP28 automatic case-packing machine to provide a compact monobloc machine able to load and palletise up to ten cases a minute

For lower throughput, up to five cases a minute, IMA's CP18 case-packer is combined with the Miniflex palletiser.

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OPTIMA PACKAGING MACHINERY

Mascara line requires just one operator

A filling and capping line to handle lip gloss and mascara, using robots to orientate and feed containers, wands, brushes and caps into pucks for handling at the filler-capper has been built for a European cosmetics manufacturer by Optima group company Kugler.

It runs at 60 products a minute and needs just one operator, who also loads containers and closures.

The machine will eventually produce ten different formats of product, with regular changeovers during the day which, points out Kugler, was far too complex an operation to be trusted entirely to manual work.

Instead, all containers and components are delivered to the robot which sits between the filling and capping machine. The two-arm machine takes the bottles from the tray and places them in the pucks of the first conveyor

loop. In parallel, the second picker of the robot takes up the wands, brushes or caps and places them in the pucks of the second conveyor loop.

During picking from polystyrene trays the robot, which is equipped with a vision system, rotates the bottles to the correct orientation. Any identified by the vision system as faulty are left on the trays.

At the filling station, the mascara or lip gloss bottles are filled with product followed by insertion of a wiper. Next, the capper places and closes the wands, brushes or caps. Finished products then progress to the secondary packaging process.

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SCHUBERT UK

Tray loading line eliminates double handling

Ginsters the Cornish pasty manufacturer has installed a fully automatic display tray loading system from Schubert, replacing a manual operation in which double handling of the product sapped efficiency. A second line is now on order for the company's Callington factory.

The system was purpose designed by IPS, Schubert's specialist automated packaging division, to pack a wide variety of Ginsters' chilled savoury products including Cornish pasties, bakes, slices and sausage rolls, at speeds up to 400 a minute.

Empty display trays are loaded onto a conveyor by a Schubert TLM-F2 robot which removes them from a storage station with a special rotating tool. Simultaneously, products are fed into the system from an upstream machine and scanned to check for correct shape and surface decoration. Any faulty goods are rejected at the end of the product conveyor.

A Schubert TLM-F44 robot equipped with a vacuum gripper tool picks and places products into the display trays, which are then conveyed to the next packing stage.

Ginsters' production director Ray Hanly says the business has not only been able to improve efficiency, but has also eliminated the costly double handling made necessary by manual packing.

One of the hidden benefits of the new line, he adds, is that automation "insists on process excellence".

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HERBERT INDUSTRIAL

Case packer gives flexibility on food

Herbert Industrial says its latest Matrix 80i pick and place cell is designed for food industry case packing operations where system flexibility is a key criteria. The system incorporates a Fanuc M6i robot, which is capable of picking and placing up to 80 packs a minute.



Juice merchandising: Kuka robot at Arla Foods in Sweden handles brik and gable top cartons

Variable position marshalling and low friction conveyors enable the cell to be programmed to collate different sized packs prior to picking by the robot. Zoned picking hands use vacuum cups, enabling partial drops which, when combined with the Fanuc's rotational axes, are said to create particularly flexible pick-and-place operations.

The cell can be controlled via Herbert's Gemini Lightening weigh labeller or, for standalone systems, through the robot's interface.

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TMG MARCHESINI

Vision system helps feed at 100 a minute

Robotic systems from pharmaceutical and cosmetics packaging machinery specialist Marchesini include the Robovision, a four-axis machine with carbon limbs and an integrated vision system.

Developed to pick up loose items arriving on a conveyor belt and feed them to a continuous motion cartoner, the machine can perform 90-100 pick-ups a minute, using the vision system to recognise and adjust product orientation for loading the cartoner buckets.

Marchesini also builds the Robocombi, which is available in various formats to transfer items such as blister packs, tubes and flow-wraps from an infeed belt to the buckets of a continu-

ous motion cartoner. Models are available to handle products singly, or in multiples and to adjust orientation.

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KUKA AUTOMATION + ROBOTICS

Palletising line handles cartons of juice

A palletising system that allows 2-litre Tetra Pak cartons and 1 litre gable-top Elopak containers of juice to be palletised as merchandising units, at speeds up to 5000 an hour, using a polystyrene tray between each layer and stretchwrap to secure the load, has been devised by Kuka for Arla Foods in Sweden.

Cartons are conveyed directly from the filling line to a collation point where a complete layer of 48 x 2 litre or 80 x 1 litre containers is assembled, and the content and position of each individual carton checked using a bar code.

The layer is picked up by a Kuka KR 360 robot with a clamping gripper and set down on a half Europallet delivered from a magazine. The robot then picks and places a polystyrene tray – which is specially shaped to provide support when gable-top cartons are loaded – on top of the layer.

Stretchwrapping and labelling then follows and the pallet is transferred to a turning device. This allows the pallet to be rotated either left or right so that when two are finally placed on a

ROBOTICS

full size Europallet, their labels face outwards on opposite sides.

"The robot works round the clock in three-shift operation," explains Thore Bengtsson, product co-ordination manager at Arla Foods. "We need less than one person to operate the entire system, which means that the operator also has time to carry out further tasks."

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AEW DELFORD SYSTEMS

Batching for fixed weight packs

The new AEW Delford IPL Batcher automatically loads pre-formed trays or thermoformers with individual product portions to produce fixed weight packs of products, reducing labour costs considerably and raising hygiene.

More than one nominal pack weight in different tray sizes can be produced at the same time depending on production needs and incoming product size.

The IPL (Intelligent Portion Loading) Batcher weighs incoming portions and decides which tray or pack to load. A vision system determines product position and orientation, then, at the appropriate point, the relevant robot head makes the transfer into the final pack in the required style and orientation.

A wide variety of products can be handled, says AEW Delford, thanks to the range of grippers available.

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AMJ MATERS

Linear drive robot aimed at food industry

The four-axis T-robot now available from AMJ Maters has been developed by Dutch specialist Roboxis specifically for the food industry.

Built in stainless steel and sealed for hose-down, the machine employs servo controlled linear drives said to provide high speed – up to 120 cycles a minute – and high accuracy over a large working area.

The design of the machine is such that different size working areas can be readily accommodated while the integrated vision system can



Linear drive: Roboxis T-robot uses linear drive and is aimed at the food industry

also be optionally equipped to perform a quality control check on product prior to picking.

The linear drive also means that extra vertical movement, to load deep cases, is also easily achieved. In addition, deep cases can be loaded in layers of product dependent patterns, all being set up or changed rapidly via the touch screen control.

Equally, the T-robot can be employed to orientate and load products onto belts or lugs for feeding a packaging machine. Single or multiple products – naked or packed – can be handled by a variety of gripper systems, including both vacuum and mechanical devices.

Recent installations include loading frozen pastry, frozen sausage rolls, tomatoes and bags of bread rolls.

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BOSCH PACKAGING SERVICES

Quick change grippers load 18 types of biscuit

Sigpack Systems has provided Swiss baker Midor – part of the Migros retail group – with a robotic tray-packing line capable of handling 18 different products, many of them quite fragile and difficult to handle, at speeds in excess of 800 biscuits a minute.

The line employs eight XR31 Delta robots on which three different picking tools can be fixed

to suit the characteristics of the product – vacuum suction cups, the Sigpack Airflow tool for crumbly items, and the Sigpack Finger gripper.

Sigpack explains that the flexible vacuum suction cup is crucial for packing Midor's Edelweiss' wafer thin biscuits since, if one of the 32 biscuits in each tray is damaged, it can make the pack unsealable.

To handle Midor's Linzer biscuits, which are covered with jam that is still liquid immediately after baking, the Airflow tool is used, avoiding damage caused by suction from vacuum cups or constant cleaning of gripper systems.

Instead, explains Sigpack, the Airflow tool uses the same principle of pressure differential that gives aircraft wings lift, using variable air speeds to create lift that carries the product without contact.

Several fragile products can be picked individually or, to increase picking performance, a stack of several biscuits can be held within the gripper.

The third tool used on the Midor line – to handle icing sugar coated products – is the Finger gripper. This uses small rubber fingers mounted on a membrane which, depending on the internal pressure applied, arches inward or outward, causing the fingers to open or close accordingly.

At the same time the design allows the force of the grip to be distributed evenly across the product.

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HANSEL UK

Vision control suits tray and case-packing

Italian packaging machinery group OPM, represented by Hansel UK, has developed a new generation of modular frame-mounted heavy duty robots with vision-controlled robotic arms. One recent installation is a line for loading plastic trays or display cases, lidding and palletising.

The system receives product in vacuum formed trays from eight independent lanes and merges them into two lanes where the trays are first scanned by a vision system. Acceptable product is then picked individually by the robots and placed into either a display case or a plastic tray. The display cases are held on a special servo-driven step chain that tilts the case to receive the product standing upright, while the plastic trays are loaded flat.

Plastic trays are then sent directly to the palletiser, while display cases are delivered to a robotic lidding module, which forms the lids from flat blanks and folds and glues them around the open top cases.

The system has a capacity of 12 to 37 display cases a minute and six plastic trays a minute. It can accommodate tray sizes of 144 x 232mm up to 400 x 600mm and changeovers are said to take just a few minutes.

The OPM Samas palletiser has a single infeed lane, single pallet station and single pick-up tool. The unit incorporates paper interlayer positioning as well as de-nesting and feeding of empty pallets, with height detection of each pallet load.

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SPRINGVALE EQUIPMENT

Automatic line provides safe enzyme filling

German liquid filling specialist Feige – represented in the UK by Springvale Equipment – has opted for robots in its latest drum filling system, an automatic line developed for a Danish manufacturer to handle enzymes within an isolated filling cabin that protects operators from the products and their vapours.

Five products are filled by two Feige type 91 RobotFiller systems, which employ ABB IRB660 four-axis industrial robots as the central component. Fully automated product changes, which include cleaning the exchangeable filling valves, can be carried out via a portable touch screen control that avoids any need for operator intervention in the filling cabin.

Drums enter the filling cabin on pallets via airlocks. The IRB660 robot traverses the calculated co-ordinates and calculates the positions of the bungholes. It then establishes the height of the pallet and picks up the filling valve to fill the containers one after another.

Once all drums on the pallet are filled, the robot exchanges the filling valve for a bung screwing unit, closes the drums and adds metal sealing caps as a sign of authenticity.

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For full details of all PPMA members able to supply robots for packaging, consult the PPMA machinery finder service, tel: 020 8773 8111, or visit www.ppma.co.uk