

Robot or pick-and-place? A matter of definition

AS INDUSTRIAL ROBOTS AND PICK-AND-PLACE MECHANISMS COME CLOSER IN TERMS OF COST AND PERFORMANCE WHAT IS THE DIFFERENCE? AND TRADITIONAL MACHINES CAN SOMETIMES BE HARD TO MATCH, WRITES MARTIN KEAY.

Most people who went along to the Total 2004 exhibition at the NEC in late March could be forgiven for thinking that manufacturers have abandoned conventional designs of palletiser, such as high-level and low-level systems, and are now only building robot or pick-and-place machines.

At Total I cannot think of a single stand that was displaying a conventional palletiser, but this does not mean they are no longer made or that robot palletisers can now do everything that a conventional palletiser can do. Indeed, conventional designs of palletiser are still hard to match on price and performance in high throughput applications and can also offer cost effective solutions at low throughputs.

However, it is quite understandable that manufacturers would want to show off their robot and pick-and-place machines at an exhibition, not least because they occupy such a small area compared to conventional machines, but also because they attract lots of attention. There is something strangely fascinating about robots at work, don't you think?

But I am in trouble with terminology already. What do I mean by a robot palletiser and what is the difference between a robot and a pick-and-place palletiser – and does it really matter?

The term robot palletiser is used fairly freely in the packaging machinery field, but in the rest of industry a robot – or industrial robot to give it its full title – is a five or six axis machine, which can be programmed to perform a wide range of tasks from paint spraying to loading and unloading machines and, indeed, palletising and depalletising.

This is opposed to a pick-and-place mechanism, which has been specifically designed to carry out palletising or depalletising tasks and will normally only have three or at most four axes, but may also be described as a robot palletiser.

Does it really matter? There used to be a sig-



Depalletising robot: Cermex machine for Pascual Mexico can cope with faulty pallet load geometry

nificant cost difference between an industrial robot and a pick-and-place mechanism and so it was difficult to justify the extra cost of a fully manipulative five or six axis robot, when all you were using was three axes of movement.

However, the price of industrial robots is now coming down steadily, so widening the market for robot palletisers and depalletisers.

Lifting capacity limitations

Another limitation in the use of palletisers based on industrial robots was their lifting capacity.

Typically, industrial robots will have a maximum lifting capacity of 25kg, which is fine if cases or sacks are being lifted one at a time, but no good if the application is to move a whole layer of packs at a time. In contrast, it is comparatively easy to design a pick-and-place mech-

anism with whatever lifting capacity you need.

However, here again the limitations of industrial robots are much less than they used to be with robots now available with lifting capacities of 100kg or more, making them suitable for lifting loads a layer at a time.

For example, Cermex has recently installed a high capacity robot depalletiser, as well as two layer style palletisers, at Pascual Mexico as part of two lines to handle PET and glass for still and carbonated fruit juices.

This depalletising machine for full and empty plastic cases had to overcome the limitations of the existing conventional equipment, which required an operator to be present at all times and, often, needed loads on incoming pallets to be manually re-centred.

Cermex overcame the problem by increasing the tolerance of the gripping tool and by

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developing a fully automatic and self-correcting system in which the robot uses ultrasound sensors to detect any faults in pallet geometry – slanted loads or uneven layers – and can then correct the settings for picking up the layer.

The robot has a 400kg load capacity which provides high speed: 60,000 bottles an hour, some 42 cases a minute.

The classic use for an industrial robot based palletiser is, of course, for applications where the robot's full range of movement and axes needs to be used.

Two robot palletisers

Wallpaper manufacturer Graham & Brown has recently installed two Costi MP 35 robot palletisers from Adpal to automate the palletising operation at its Blackburn plant. Here, some half a million rolls of wallpaper are produced each week and packed horizontally into about 40 different case sizes. Previously the palletising was carried out by hand.

On the new system, every case is printed with two bar codes – one for the case size and the other to identify the product – which are read by a scanner to allow each case to be conveyed automatically to the appropriate robot.

The horizontal boxes are tipped 90deg before being picked up by each robot, as the wallpaper rolls need to be stacked on end for storage and transport. Each robot handles up to eight different products at one time and the cases are placed onto one of three pallet sizes – UK, Euro and US – in the appropriate pattern, up to three layers high.

Board interleaf sheets are also placed automatically by the robots on the pallet base and between some layers.

A twin trolley car is employed to dispense empty pallets to each robot, and remove full pallets, held securely by a top clamp, to the Pieri stretchwrapper, also supplied by Adpal.

Aetna UK signalled its entry into the robot palletiser market last year with the announcement of an exclusive distribution agreement for the UK with Italian manufacturer Euroimpianti.

The company's top of range model is the Skilled 504 which is said to operate to a positional accuracy of $\pm 0.5\text{mm}$. Available as a four or five axis machine it has a working area of 360deg and a maximum payload of 120kg. Speed is up to 1600 items an hour.

Euroimpianti's latest model is the Skilled 101 palletiser for smaller users, providing speeds of seven to eight cycles a minute. It oper-



Handling wallpaper: One of the two Costi MP 35 robot palletisers installed by Graham & Brown

ates within a footprint of just 9sq metres and, says Aetna, is particularly simple to programme.

A zoned safety system based on light beams and photocells gives continuous operation by allowing a completed pallet to be withdrawn while, in an adjacent zone, the machine is starting to load the next pallet.

Meanwhile, a palletiser capable of handling two pallet sizes simultaneously has recently been developed for a US carton printer by German manufacturer A+F, represented in the UK by XJL.

The customer wanted an in-line palletising system with the capability to pick the different footprint and height blank stacks immediately after the press and stacking unit. The A+F machine works with two pallet sizes and, depending on their dimensions, four to 45 stacks of blanks can be arranged on each pallet layer.

Turnkey line

Liffey Mills at Roscrea, Tipperary, one of Ireland's largest ruminant animal feed manufacturers, has recently doubled production and installed a turnkey palletising and pallet wrapping system from Webster Griffin.

The system handles 25kg bags at speeds of 1200 an hour and includes bag infeed conveyors with a flattener to squeeze the bags flat for palletising, an Okura A1600 palletising robot,



Small footprint: Euroimpianti Skilled 101 robot palletiser available from Aetna UK

an empty pallet magazine, pallet handling conveyors, a high speed pallet stretchwrapper and integrated controls.

Webster Griffin points out that Liffey Mills was confronted by some particular problems which were best solved by a robot palletiser.

First, there was limited space available so a conventional palletiser was deemed to be simply too large. Then came speed. "Liffey Mills need to palletise at speeds of up to 1200 bags an hour, therefore a simple low cost pick-and-place palletiser could not be considered," says Webster Griffin.

"For example, when operating at 1200 bags an hour the robot is picking up, palletising and returning to the pick-up position in 3 seconds,



Placing 1200 bags an hour: Liffey Mills has installed an Okura A1600 palletising robot

and changeover of the loaded pallet with the next empty pallet must be completed in under 5 seconds.”

The size of the pallet – 1200 x 1500mm – also dictated the use of an articulated robot with extensive reach.

The Okura robot was designed and developed specifically for palletising, and employs control software that is self-optimising to ensure speed and accuracy are maintained. It can handle different bag or pallet sizes with new palletising programmes prepared, evaluated and downloaded from a laptop PC.

Dedicated to palletising

In addition, points out Webster Griffin, the machine is not dedicated to palletising one type of load so that, in the future, Liffey Mills can use its new machine to palletise pails, bins, boxes or even cattle licking blocks.

To allow bagged product to be packed and despatched immediately to the farm or merchant the robot was combined with an automatic pallet wrapping line.

Uhlmann has announced its P5020 robot

palletiser offering speed up to ten cycles a minute, a 25kg maximum load, and a hygienic design suitable for a pharmaceutical environment.

The centrepiece of the P5020 palletiser is a cantilever-arm robot with four freely programmable servo axes. It will handle cases up to 600 x 500 x 500mm, open trays or display cartons, packs with or without geometrical shape as well as bundles of bottles wrapped in film. These can be picked up and turned by the system and stacked on all standard pallet sizes.

The ZP1 palletiser from CAM, which occupies a footprint of just 2 x 2 metres, has been specifically designed to sit at the end of a packing line, and can be fitted with a gripper or suction head, single or multi-pick off head to handle shrinkwrapped collations or cases. Speed is up to 12 placements a minute, or more with the multi-pick off device.

The system has industrial PC based controls, which give memory for up to 1000 products, allowing size changeover within about 5 minutes, says UK representative Campak.

Various options are available, including a three or ten empty pallet feeder magazine, and automatic layer pad application. There is also the ZA1 integral pallet stretch-wrapping system, which uses a turntable driven hydraulically from the side, eliminating any need for modifications to the factory floor.

When line speeds are fairly low, palletising and case packing can sometimes be integrated in a single machine, providing an extremely compact solution.

IMA has recently announced a new machine of this type, the BFB Cartopallet monobloc case-packing and palletising unit, which is equipped with a six axis robot. It is able to handle eight cases a minute and can automatically discharge the full pallet and feed the empty pallet without stopping.

Pick-and-place palletisers

Historically, the technical differences between a pick-and-place mechanism and an industrial robot were huge, as was the ability to programme the machine for different tasks. But the modern pick-and-place palletiser which uses servo-drive motors and PC based controllers is technically very similar to an industrial robot and is just as easy to reprogramme for a new palletising task.

KHS has announced the Innopal PKS crate palletiser/depalletiser, aimed at medium-size operations. Capable of outputs up to 380 layers

an hour, it has a single-column design which, says the company, keeps travel paths short and reduces space requirements. PC-based controls allow the machine to be quickly re-programmed with new travel paths and also to control the speed of peripheral equipment.

Gantry mounted pick-and-place palletisers are often a very cost effective solution for low and medium speed applications.

For instance, the Comman GRP 100 from AMJ Maters has a single pick-up head yet can be programmed to take product from several conveyors and stack it on a single pallet or take product from one conveyor for stacking at two palletising positions. Speed is up to 12 packs a minute.

Secure compartments

When the machine is equipped to run with two palletising positions, the gantry is fitted with a mechanical hatch at the top of the partition between the two pallet compartments.

This hatch is closed when the access door to one of the compartments is opened, which prevents the pick-and-place head from entering this compartment. In the meantime the pick-and-place head continues to palletise in the other compartment. The hatch is opened when an empty pallet has been positioned and the compartment door has been closed.

The machine also uses a light bus system, which allows additional equipment such as pallet conveyors and a pallet magazine to be added to the machine after it has been delivered with very little difficulty.

A series of compact palletisers that combine the programmable flexibility of robotics for product placement with a simple product elevator system, to reduce cost and complexity, was introduced at the Total exhibition by Sussex & Berkshire Machinery, aimed particularly at manufacturers handling a wide variety of pack styles.

Built in Germany by Oli Spezialanlagen, the Oli-Pal series of palletisers is modular in design, starting with a basic semi-automatic palletising unit that occupies a floor space of just 2 x 2 metres, little more than the pallet itself. Pallets are taken in and out of the machine by fork truck.

For full automation, empty pallet and layer pad magazines can be added, one above the other, together with a full pallet outfeed.

Empty pallets accepted by the machine are first lifted to loading height while cases, trays, drums or sacks enter on a conveyor. A simple

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lifting fork elevates the product singly, or in groups, to loading height where a placement head, operating only in X and Y directions, completes the palletising operation.

This placement head, which is said to provide accuracy to within 0.5mm, can be equipped with grippers or suction cups to suit the product, and also 360deg rotation to orientate packs to suit the layer pattern, and ensure that labels or other pack features face to the outside of the load.

The Oli-Pal machines can also incorporate a pallet manager programme which, once product dimensions are entered, will calculate the optimum layer pattern, indicating also any alternatives and their percentage space utilisation.

When more than one case or drum is placed per cycle, the program also instructs the machine how many to lift at various points in the process, to complete the load.

"By dividing the operation into two sets of mechanical movements, which can be carried out simultaneously, the Oli-Pal design provides improved speed, up to 15 cycles a minute, and reduces complexity," points out Andy Bannister, sales director at Sussex & Berkshire. "New products can be programmed within 2-3 minutes for push-button changeover."

Robot palletisers and pick-and-place palletisers are certainly taking over many of the roles of conventional designs of palletiser for low and medium speed applications and have extended the use of automatic palletisers to tasks which were previously thought to be too difficult or too expensive to automate. But the conventional machine is by no means redundant.

Low-level plate palletisers are still the answer for many high speed applications and multi-layer low level palletising systems are still a cost effective solution for customers who need to palletise a wide range of products simultaneously.

For example, to meet the needs of a Canadian customer, A+F has built a system capable of handling 105 different case sizes, loading up to 1800 cases an hour onto 12 different pallet types and using 13 different size layer sheets.

The plate type palletising system has eight separately operated pre-dosing stations and two moveable, four-station palletisers. Product is fed to the pre-dosing stations via a central infeed conveyor with scanners employed to direct each case to a pre-selected station where each of the 105 case sizes can be formed into an individual pallet layer.

A portable text display, carried by the machine operator, gives information on any



Sweep-off depalletiser: One of two new Dawson high level Spacesaver machines at Britvic, Leeds

malfunctions while a modem allows A+F engineers to access and service the machine's controls remotely via the Internet.

Dan-Palletiser's MK1 palletiser is also readily programmed for handling a number of different sizes of pack. Capacity is up to 10 layers a minute, which makes the MK1 of interest for many sizes of operation and Dan-Palletiser says it is prepared to give potential customers a month's free trial. The only cost is the transport from the company's headquarters.

Depalletisers

There are two distinct groups of depalletisers, those used for depalletising bulk packs of rigid containers such as cans or glass bottles and those used to depalletise crates or cases.

Robot and pick-and-place machines are being used increasingly to depalletise crates or cases, but conventional sweep type depalletisers are still preferred for cans and bottles.

For example, Dawson has recently installed two new fully automatic Spacesaver high level sweep-off bulk glass depalletisers at Britvic's Leeds factory. The first machine was installed along with new Dawson slat band conveyors into an existing returnable bottle line, to enable new glass to be introduced. The second machine was installed as part of a new line.

Both machines operate at 48,000bph on round bottles ranging from 115ml up to 180ml and are equipped for inverted tray removal.

The Spacesaver depalletiser was chosen, says Dawson, because of the small footprint, total

stainless steel construction and high level discharge, which was needed in both applications.

Finally, Italian manufacturer Mondo & Scaglione, represented by Wrapid Packaging Systems, produces a range of depalletisers for small and medium capacity packing lines, giving speeds up to 15,000 an hour.

The machines can handle bottles, jars, cans and aerosols but Mondo & Scaglione has also developed a number of solutions for handling unusual shaped containers which would not normally have been suited to this style of depalletising. ■

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