

Specifying a palletising system should be a bit like planning a garden. With a garden, you don't just plan on the basis of the plants and trees at their current height and spread, you should also think forward several years to when these plants may be two or three times their present size.

Unfortunately it is rare for production volumes to grow as inevitably as *Leylandii*. However, even if production volumes remain the same, it is quite likely that the marketing department will want to change the size or style of transit pack, run three for the price of two promotions or alter the shape and size of the primary pack, all changes which can alter the pallet stacking pattern and therefore have a direct impact on the palletising system.

Moves into export markets may also trigger a change to the palletising system, because while the UK prefers the 1000 x 1200mm pallet, Continental Europe has standardised on the 1200 x 800mm Europallet. Another market development with a direct impact on palletising systems is the increased use of dollies and half sized pallets for in-store display.

Of course, special promotions can always be handled using manual palletising or by restacking product from standard sized pallets onto non-standard sizes. But increasingly, factories simply do not have access to spare staff. The patience of production managers is also likely to wear thin if, every time marketing requests "a small change to the product", it cannot be handled on the automatic palletising system which has just been installed.

So apart from investing in a crystal ball how can you plan for the future?

Given that most changes to the product are likely to alter the pallet stacking pattern, the first principle ought to be that the palletising system should allow all pallet stacking patterns to be changed, which is not necessarily the case with every palletising machine.

Where the product is placed on the pallet one at a time or a layer at a time, it is usually possible to accommodate a wide range of pallet stacking patterns. However, if products are moved in rows, columns or small groups the choice of stacking patterns may be quite severely restricted.

If the system is expected to handle more than one size of pallet, the problems go further than altering the pallet stacking pattern. For instance, chain conveyor is often favoured for moving pallets around the palletising system, but if several pallet sizes or designs are contem-

Planning for the future



Flexible system: Costi MP25 robots at Twinings were able to adapt to changing requirements

Since most future changes to a company's products are likely to alter the pallet stacking pattern, any new palletising system should ideally allow all stacking patterns to be changed, writes Martin Keay.

plated it may be better to use roller conveyor or even AGVs. Of course it is only really with the benefit of several years' hindsight that you can judge if a palletising system was as flexible as you really wanted.

Two robots installed in 1992

For example, Twinings has found that the robot system it bought nearly ten years ago has been able to grow and adapt to the company's changing requirements.

Twinings installed two Costi MP25 Multipallet robots when its North Shields factory was commissioned in 1992. The original concept was for the robots to handle all export orders, stacking

product on to Europallets, so the Costi system was designed to handle up to eight different packs simultaneously, arranging them on accumulation conveyors, and placing them on the appropriate pallet, in the correct pattern.

Each robot is mounted on rails so that it can move between four pallet positions, placing cases in the programmed layer pattern as they arrive in the palletising area.

By 1999, UK sales for Twinings had increased substantially. Aware of the extra burden placed on its operators and the need to reduce manual handling activities across the site, Twinings asked Costi if the existing system could be modified to handle both Euro and UK size pallets.

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So Costi designed and installed a second pallet dispenser and interleaf manipulator for UK pallets while also providing larger grippers and programming new patterns for three or four new UK style packs to be picked up at a time.

"The Costi robots have made a significant impact on reducing manual handling across the site," says Albert Openshaw, engineering manager for Twinings. "End-of-line operators have been re-assigned and trained to run the production machinery. Production continues to increase year on year and Twinings is feeling the benefit of having the extra key operators involved with core activities, while the Costi robots cope with the extra throughput."

In 2001, Twinings' palletising requirements changed again with a need to stack an extra layer of product on every pallet, so achieving significant savings in both warehousing and transport costs. Costi's technical department has identified that the extra layer can be accommodated by raising both robots 100mm, which will be carried out early this year.

Modified as needs change

Robots are being used increasingly in palletising systems by many manufacturers, particularly because they can be programmed to carry out so many different tasks and lend themselves to being modified as the demands on the palletising system change.

For example, drum palletising specialist Feige has also developed a range of robot palletisers for drums and barrels, working in partnership with ABB.

At a recent installation at BASF in Ludwigshafen, Germany, Feige supplied a single robot system both to depalletise and palletise drums. The robot takes empty drums from their pallets, removes the lids and then places the drums and lids on two separate conveyors.

The same robot then collects filled drums and places them on pallets, using sensor technology to locate and correctly orientate the locking clamps on the lids, so that the drums can be stacked. Springvale Equipment, Feige's UK agent, advises that this robot can handle drums weighing up to 200kg at a rate of 250 an hour.

Meanwhile, Italian manufacturer CAM, represented in the UK by Campak, has developed a new robot palletiser which can be supplied with an integral stretchwrapping mechanism. Called the ZP1, the three axis robot palletiser can be equipped with either a gripper or vacuum head, making it suitable for handling both



Handling almost anything: Cermex PR5 robotic palletiser uses the same head for a variety of products

shrinkwrap packs and cases. Speed is up to 12 movements a minute and the machine can be supplied with a layer pad inserter.

The integral stretchwrapper has an hydraulically driven turntable with the drive mounted to the side of the turntable. This avoids the need for a pit under the turntable which can be an inconvenience to machine users and a potential hygiene hazard.

Impossible without a robot

Kettner also is making increasing use of robot technology for palletising systems to perform tasks which would have been impossible with conventional palletiser technology. UK representative Krones points out that in one recent application a single robot palletiser is being used to palletise sacks from one line and corrugated cases from an adjacent line.

Cermex confirms that robot palletisers have the edge over conventional machines when it comes to adapting to different palletising requirements.

For instance, the Cermex PR5 robot palletiser



Energy saving: The Fuji Ace EC-141 from Morray Engineering is said to be 80 per cent cheaper to run

can handle shrinkwrap packs, cases, pallets, slip sheets and layer pads using the same pick-up head. The PR5 can accept production from several lines, produce double height pallets and also work with products such as wine barrels,



High weight capacity: *The Okura A Series robot will handle a 200kg payload*



Turning unit: *Dan Palletiser system for Tate & Lyle turns sack tops inwards to protect the handles*

which conventional palletisers would be unable to handle. However it is restricted to approximately 10 movements a minute.

Energy saving is a key feature of the new Fuji Ace EC-141 palletising robot introduced by Morray Engineering, which says the machine is up to 80 per cent cheaper to run than comparable palletising robots.

The principal innovation is the use of regenerative power amplifiers which balance and recycle the energy from the servo motors while they are slowing down, and feed this potentially wasted power to motors that are accelerating. However, Morray points out that optimisation of the palletising movements, with smoother motion, also

contributes to more efficient use of energy.

High positioning accuracy, said to be within $\pm 0.5\text{mm}$, is among features of the Euroimpianti Skilled 504 robotic palletiser supplied in the UK by Propack Automation.

Variety of gripping heads

The four axis machine employs brushless servo drives and a pneumatic weight counterbalance system to provide smooth operation, while a variety of gripping heads is available to handle a wide range of items. These include pallets, layer sheets, cases, open trays, sacks, flexible packs, paper products, shrink-wraps and even products such as car wheels or rolls of film.

A graphical interface for creating different layer patterns, operating under Windows, is a key feature of the Skilled 504. It allows cases or other items to be manoeuvred quickly and intuitively on-screen via shortcut keys. In addition, Propack supplies laser guided vehicles (LGVs) to work with the Skilled 504 as an alternative to traditional fixed pallet handling systems.

The A Series robot just introduced by Okura Automation includes a range of features which, says the company, provides the machine with a combination of versatility and ease of operation. These features include high speed, with up to 1600 movements an hour, minimal space requirement as a result of the compact wrist axis offset design and a high weight capacity, up to 200kg. In addition, the machine offers a maximum operating height of 2300mm, through some 32deg of travel.

Controls include 50 standard product patterns already built into the system, although further patterns can be created off-line using a PC and Oxpadiy software, then downloaded into the machine. Alternatively, new patterns can be added at the control panel, even while the machine is running.

Reduced cost and complexity

A series of compact palletisers said to combine the programmable flexibility of robotics for product placement with a simple product elevator system, to reduce cost and complexity, has been launched on the UK market by Sussex & Berkshire Machinery. The machines are 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 floorspace 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 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 provides 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



Recently redesigned: Cermex P4 palletiser can handle 60 cases or shrinkwrap packs a minute

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 program 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 Graham Hughes at Sussex & Berkshire Machinery. “New products can be programmed within 2-3 minutes for push-button changeover.”

Not right for high speed

Cermex points out however that while robot machines are ideal for low and medium speed applications they are not the right machine for high speed palletising operations, generally being restricted to 10-12 pick-up head movements a minute.

For faster throughputs Cermex has the P4

palletiser, which has recently been redesigned to improve its performance and reduce its price. The P4 is a conventional layer-by-layer machine which can be configured for either a low level or a high level infeed, and can handle both cases and shrinkwrap packs at speeds up to around 60 packs a minute. It can also be equipped to load different sizes of pallet and insert layer cards.

Suitable for the beverage industry

The redesigned P4 is particularly suitable for the beverage industry in general and for shrink-wrapped packs of PET bottles in particular. Six-packs of 1.5 litre PET bottles can be handled at 21,600 bottles an hour.

Kensal's range of modular palletisers from Italian manufacturer Lita also has the ability to be expanded and upgraded as palletising requirements change. Lita palletisers include the Eco for low speed applications, the Primo for medium speed applications, the Presto for speeds up to 70 packs a minute and the high level Alto for speeds up to 120 packs a minute.

Palletising challenges don't come much greater than the one presented to Automation & Fordertechnik (A+F) by one of its Canadian customers who wanted a system able to handle 105 different case sizes arriving at a rate of 1800

cases an hour, 12 different pallet types and 13 different layer sheets.

The A+F solution was a plate type palletising system which has eight separate layer pattern forming stations as 'pre-dosing' units and two four-station palletisers mounted on rails. Cases are fed to the palletising system on a single conveyor with the different case types identified from their bar codes and directed to one of the eight pattern forming stations. Each pattern forming station can handle any one of the 105 case sizes and form them into a pallet layer, explains UK agent Jagenberg (London).

When a layer is completed at one of the forming stations, the palletiser moves up and removes the layer, transferring it on to the appropriate pallet stack on the palletiser, before moving off to the next pattern forming station with a complete layer.

Folded cap sheet

Two types of layer sheet are used to secure the pallet loads, a standard flat slip sheet and a pre-folded cap sheet, which is folded downwards around the pallet load like an inverted tray. The folded sheets are fed from a central dispenser and placed on the top of each pallet, while the slip-sheets are collected directly from the manufacturer's pallet, which avoids the need for loading a special magazine.

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 machine 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 products from one conveyor for stacking at two palletising positions.

When the machine is equipped for running 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 uses a light bus system which allows additional equipment, such as pallet conveyors and a pallet magazine, to be added after the machine has been delivered with very little difficulty.

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Palletising individual 1kg and 2kg bags of granulated sugar for in-store display has been a speciality of Dan Palletisers for some years, so when Tate & Lyle decided to automate its Thames refinery line for producing 5kg and 10kg bags of sugar for the catering industry, Dan was called on to supply the palletiser.

A key requirement for the design of the machine was careful handling of the packs to prevent damage to the full colour graphics and the carry handles. This involved programming the layer pattern forming station so that the handles always point towards the centre of the pallet, avoiding risk of damage to the handles when the pallet is moved, but also ensuring that the height of each layer is even around the perimeter.

Handle points inwards

Bags are fed into the Dan MK11 low level palletiser lying on their sides with their long dimension across the direction of travel. The standard pallet layer configuration for 10kg bags is two rows of five bags and one row of three bags with the third bag turned so that the handle points inwards. Every layer of bags is then squared before it is placed on the pallet, so that the whole pallet is neat and stable.

The system is currently using 1200 x 1000mm pallets for the UK market although Europallets can be handled as well.

Planning for future developments is the key for pack palletising systems, but when it comes to choosing a palletiser or depalletiser for rigid containers the issues are rather different. Careful handling of the containers is required and different containers require quite different handling techniques. So, for instance, techniques which are suitable for open top aluminium cans, will be quite unsuitable for glass bottles or PET bottles.

The latest addition to LAN's range of palletisers and depalletisers is a low level palletiser-depalletiser that uses a sweep system to transfer the containers and incorporates layer pad clamps that provide a positive grip on them.

Six of these new LAN palletiser/depalletisers have now been installed at one of Europe's largest glass manufacturers, handling bottles from 200ml to 1 litre. F Jahn & Co, LAN's UK agent says that one of the advantages of the new machine is that size changes can be carried out quickly and no change parts are required.

Kettner's latest high speed high level depalletiser can handle a variety of containers at speeds of up to 300 layers an hour, using a four

way centring device to control the layer of containers positively during the sweep-off or transfer operation. The machine can depalletise glass bottles, glass jars, cans, plastic containers and composite cardboard containers.

Nico magnetic palletisers and depalletisers are being used in the food industry to stack and then unstack filled, but unlabelled cans and glass jars with metal lids after pasteurisation or sterilisation, so allowing these products to be stored unlabelled until called off by a customer.

Depalletising takes place immediately before labelling, ensuring that the cans and jars leave the factory in the best possible condition. UK agent Planet Flowline explains that Nico magnetic palletisers and depalletisers can operate at up to 2500 containers a minute and are available in stainless steel construction.

Zechetti lift-off palletisers and depalletisers are now widely employed for stacking and unstacking empty PET bottles. Planet Flowline says that there are now 30 Zechetti machines in the UK, handling 2 litre bottles at speeds in excess of 24,000 bottles an hour. Zechetti machines are also being used as palletiser-depalletiser combinations for in-line storage of PET bottles between blow moulding machines and filling lines.

First steps in palletising

For low speed lines it is frequently difficult to justify the cost of a fully automatic palletiser. However the most significant manual handling hazards of lifting packs from the conveyor on to the pallet can be eliminated using a semi-automatic palletiser.

With a semi-automatic machine, an operator is needed to form the layer pattern on the infeed conveyor by turning packs as required. However once the row or layer has been formed the machine transfers the packs on to the pallet.

Schering Plough has recently installed a Dawson Series 30 semi-automatic palletiser for one of its medical hand and skin care products. The new machine, which is the first to be sold in the UK, is handling cases and shrink-wrap packs at 4 to 6 packs a minute.

The Series 30 is a compact machine, which loads layers of packs on to a pallet, which is placed directly on the floor, so that it can be removed easily with a pallet truck. The machine can load pallets as large as 1200 x 1000mm up to 2000mm high and is available in painted mild steel and also in stainless steel if the machine is to be located in a wash-down area.

Cermex has two semi-automatic palletisers in its range, both of which can be upgraded to fully automatic machines as production volumes increase. The Cermex P6 machine picks up products one at a time or in small groups operating at about 11 movements a minute. Cermex's P82 palletiser picks up packs a row at a time, but has the additional facility to turn packs at the end of the rows to produce complex stacking patterns.

Reducing the entry cost

One way of reducing the entry cost of automatic palletising when just one line is to be served per machine is to opt for a combination case packer and palletiser.

For example Marchesini's MC820 case packer is available with a palletising module which connects directly to the machine. Designated the MP830, the palletiser picks up cases using a vacuum arm which moves in three axes and can also rotate. The arm is powered by brushless motors which are situated on the machine body, while programmes for different case sizes and layer patterns can be selected on an operator control panel.

If a new case size is to be palletised, its dimensions can be entered into the control panel and the software will calculate the appropriate machine movements and optimum loading pattern. Empty pallets are fed into the palletiser singly or from a pallet magazine. ■

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