

Talk of servo drives in all areas of packaging machinery has become so commonplace that sometimes, and cartoners are a good example, it can be a good idea to go back and remind ourselves why it is that this type of drive is becoming so widespread.

Servo motors have been used on cartoners for many years to achieve automatic size changes, or to power one or two subsidiary mechanisms. However, only in the last two to three years or so have the major machinery manufacturers adopted widespread use of independent drives – synchronised by software – to replace the single motors and mechanical transmissions of the past.

The incentive to break away from conventional power transmission methods may well have its origins in faster size change, particularly for applications in which a large number of carton sizes and product collations is required, but there are now equally compelling arguments covering most other aspects of machine operation and management.

For example, Bradman-Lake launched its first 100 per cent servo-motor driven cartoner – the FCC Triliner – at Interpack in 1995, while the first completely servo driven end-load cartoner from the company – the SL9000 with nine servo motors- made its appearance at the end of 2001. Both are controlled by an industrial PC rather than PLCs.

As Paul Jeffery, European sales director at Bradman-Lake explains, the elimination of all gearboxes, chains and transmission shafts typically associated with this style of machine, means that reliability and consistency of operation are very much improved.

“A lot of components that wear, develop backlash, require maintenance, lubrication and adjustment have been eliminated, particularly chains which require periodic re-tensioning to compensate for wear. So reliability is improved and the machine will operate consistently across thousands of hours,” he says.

“Should a component fail, it can be replaced and the machine be immediately restored to give the same performance it did when new.”

In the Bradman-Lake SL9000 machine, one servo motor drives the infeed, another drives the planetary motion carton opening mechanism and another powers the barrel loading mechanism, which pushes product from the bucket infeed conveyor into the cartons.

There are separate drives to the chains carrying the carton transport flights, and two more controlling the tucker discs that close the flaps,

Servos drive on

JUST AS INDEPENDENT SERVO MOTORS, SYNCHRONISED BY SOFTWARE, HAVE REPLACED TRADITIONAL MECHANICAL DRIVES IN MANY TYPES OF PACKAGING EQUIPMENT, SO CARTONING MACHINERY IS NOW FOLLOWING SUIT, WITH IMPROVEMENTS IN FLEXIBILITY, RELIABILITY AND CHANGEOVER TIME.

allowing the timing of the tuckers to be adjusted on the run as well as with the machine stationary. The final pair of servo motors drive the outfeed belts.

One of the ways in which servo drive makes changeover faster is in adjusting the flight chains for different width cartons. No longer is there a clutch to disengage and a handwheel to adjust the distance between front and rear flights. Both chains are independently driven and so their relationship to each other, and hence pitch, is controlled electronically as part of a product menu.

Size change in ten minutes

“Before servo drives, a size change that would probably take about 25 minutes can now be carried out in about ten minutes,” Paul Jeffery explains.

“However, in terms of automatic size change, the law of diminishing returns is obviously involved. So first you attack the items that consume a large amount of time, such as changing the pitch for different widths of cartons. But some of the other adjustments can be made so quickly by hand there is no payback by having an extra motor, since there will be little time saved.”

Servo machines do not come cheap and therefore users tend, says Mr Jeffery, currently to be among the larger groups such as the major biscuit companies and confectionery firms.

Even so, he points out, the advantages of faster size change apply to anyone with short runs of different size cartons and also to operations on three-shift working where the extra reliability of servo machines, particularly in the



Caddy carton: The PG Tips style carton is now available to other manufacturers

middle of the night, provides additional security against the consequences of downtime.

Diagnostics, and indeed preventive maintenance, are another important benefit of using servo drives.

“On a servo machine there is now a tremendous amount of information available on the status of the machine and how well it is operating,” Paul Jeffery explains. “For example feedback is available on the actual current, the load on the servo drives, so that we can see if they are finding it hard going. Is there a resistance? Is attention required now to prevent a failure in the future?”

In fact Bradman-Lake has now set up its own



Nine servo drives: Bradman-Lake's first 100 per cent servo driven end-load machine, the SL9000



Reverse taper: Cooking foil carton erected and loaded on Vepatec machinery



Shaped solutions: Vepatec has developed methods of erecting shaped carton styles, including these profiled containers

company – BL Technology – specialising in diagnostics and production monitoring, based on its own experience with these systems (see separate story overleaf).

Molins ITCM also uses a number of servo drives within the 'Caddy Box' cartoning system it developed for Unilever's award winning PG Tips Pyramid tea bags and which is now being made available to other manufacturers.

Award of Excellence

Machinery to produce and package the tea bags won Molins ITCM a PPMA Award of Excellence 2002 for design and manufacture by a UK supplier and now, following an agreement with Unilever, the company is able to market the caddy style cartoning system for other packaging applications in which a freshness seal and reclosable feature is of benefit.

Typically these could include biscuits, cereals, tissues, granular products and confectionery.

Based on Molins' experience of hinge lid style cartoning for the tobacco industry, the carton is

made up from a pre-glued skillet into a rigid, stackable and sift resistant caddy with a reclosable flip-top lid and removable inner panel that helps retain freshness in the product.

The reclose feature and rigid construction of the caddy box is aimed at encouraging consumers to use the carton within the home, rather than decanting products into other containers for storage, so extending point-of-sale exposure and encouraging brand loyalty.

For the PG Tips application the caddy carton is film overwrapped, giving the shelf life required as well as tamper evidence. However, when employed for wrapped products such as confectionery, the carton itself could be left unwrapped and the tamper evident function performed, for example, by a small pressure sensitive label.

Key innovations within the cartoning machine include patented features to perform folding and gluing operations in both the machine and cross-machine direction, as dictated by the pre-glued skillet form, while the top

load format is said to be particularly flexible in terms of the type of products that can be accommodated.

Unrestricted access from above gives the opportunity for a wide choice of filling methods. In addition, servo drives are employed for flexibility in size changeover, to achieve the hot melt patterns required, and to link the machine up with the filling and end-of-line equipment chosen for the application.

Flip-top carton designs are also a speciality of the Model 120 continuous motion vertical cartoner from Tisma Machinery, part of the US-based SWF Company represented in the UK by DS Smith Packaging Systems. Made entirely in stainless steel, the 120 can be built for low to high speed applications ranging from 50 to over 600cpm on three different frame sizes.

The flip-top design allows one-handed use by the consumer while an internal reclosable locking feature inside the container holds product in the carton and, says DS Smith, prevents spillage of any kind. A counter-filler system is available to give an exact count of confectionery or pharmaceutical products at speeds in excess of 20,000 a minute.

Vertical cartoners are, of course, often employed for bags of cereal, loose tea and similar

products that tend to aerate during filling but settle during transit, sometimes to 60-70 per cent of the carton volume.

Since this tends to give the consumer an impression of poor value for money as well as wasting cartoning materials, case-packing materials and shipping space, Rovema has now come up with a new machine that incorporates a vibration station to allow product that requires settling to be packed at high speed. The first to be sold in the UK is to be used for loose tea.

The CMV machine incorporates one or more bagging machines which load cartons with open top bags, loose filled to typically 110 per cent of carton volume. As the cartons are taken round the machine, the product is vibrated and settled to around 90 per cent carton volume before the bag is lifted proud of the carton top for sealing.

At this point air is evacuated mechanically from the over-sized bags, excess material is trimmed off, and the bag allowed to drop back down into the carton before it, too, is sealed.

Meanwhile, German top load and specialist

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cartoning machine manufacturer Vepatec has developed methods of erecting a variety of complex carton styles, including reverse taper, hexagonal and profiled shapes, using its Type 100/200 servo driven erectors.

UK and Ireland agent Partners in Packaging says that erecting the carton as a conventional top load carton, and using the largest aperture to load the product keeps carton costs to a minimum. The carton is then closed on a conventional closing machine using profiled compression plates.

Kliklok Woodman has recently announced the Vari-Right right-angle three-flap closer for top-load cartons which, it says, has the benefit of incorporating both lugged carton control and random infeed timing.



Right-angle closer: The Vari-Right three flap closer from Kliklok Woodman

It is able to accept random, unevenly pitched cartons but, once the cartons enter the machine, variable pitch pop-up lugs come into play, controlling the carton throughout the length of travel through the machine. Speed is up to 120 cartons a minute.

New from Curti-Ciba, Italy, is the Futura vertical cartoning machine which UK representative Engelmann & Buckham explains has been designed to provide faster size change and to reduce the amount of cleaning required, particularly with the powders and dusty products for which vertical cartoning machines are frequently employed.

Five different pitches

First, the machine is built within a hygienic design of frame, with an integrated suction system to ensure coverage of all critical dust deposit points, and a shaped machine bed that helps direct any dust or spillage automatically to the suction zones.

Second, the machine can be set automatically to a choice of five different pitches and be equipped with a number of different product infeed stations, enabling it to handle a wide variety of carton styles and dimensions at speeds from 100 to 400 a minute. In addition, the carton blank magazine, available in four different versions, is built in-line with the

machine body, minimising floor space required.

Two ranges of vertical cartoners are built by CAM, represented in the UK by Campak: the AV intermittent and AVC continuous motion machines, which are available to suit most applications including powders and granules.

The AV intermittent cartoner is a low cost, short lead time machine that operates at speeds up to 70 cartons a minute and can be fed by either hand or a range of ex-stock automatic systems, while the AVC machine operates at

Monitoring systems check on packing line efficiency

A series of monitoring systems to provide details of packaging machine efficiencies, and analysis of any deviation from standard, is now available from a new company, BL Technology, launched by Bradman-Lake.

Introduced under the VisProM Visual Production Monitoring banner, the systems are based on Bradman-Lake's own experience in developing monitoring and diagnostics systems to prove the efficiency of cartoning equipment.

However, the systems cover all types of machinery, with additional sensors installed on the equipment when necessary, and are expandable from a single machine to an entire line, and then on to a factory-wide or multi-site system.

Information can be distributed throughout an organisation in real time via an Ethernet network giving, for example, a daily efficiency report. Alternatively, graphs and tables from the monitoring system can be pasted into printed reports.

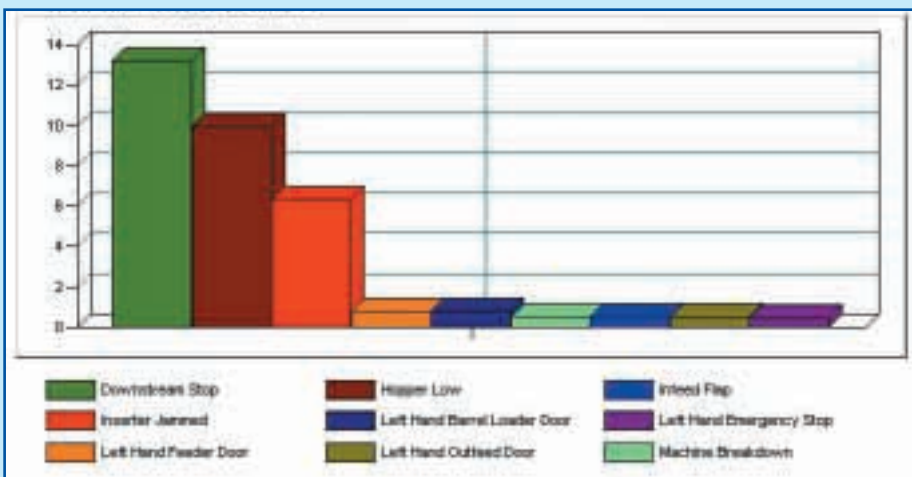


Robot loader: Bradman-Lake SL904 with overhead robot inserter. A smaller footprint is one advantage

speeds up to 300 cartons a minute, and incorporates CAM's Mechanical Memory system. This series of colour coded dials, together with simple release and slide mechanisms, is said to provide quick and repeatable operator size

changes, with no need for fine tuning.

Cartoning equipment now available in the UK from Soudal includes the Wueste SK3 box and tray erector which forms an open top hinged lid tray from corrugated or cartonboard.



Monitoring stoppages: Graph from the VisProM system shows cause and duration of machine stoppages

“Clearly, to manage efficiency you have to be able to measure it,” points out BL Technology managing director Ben Cann. “The significance of VisProM is that it has been developed using the experience of a packaging machinery manufacturer who knows what to look at. Experience to date shows that savings will cover costs in a very short time.”

Typically, VisProM reports can show the duration and reason for stoppage: lack of product, lack of containers, machine jam and so forth, and can also compare changeover times by line, product and shift.

“We also now have an objective method of assessing whether cartons from one printer do in fact run better than those from another,” points out Ben Cann. “And because the system is counting, we can link to stock control and re-order points.”

In addition to efficiency monitoring, BL Technology has developed the VisBarC system which, via scanners, monitors bar codes to ensure that packaging is correct and that any rogue containers are ejected from the machine or line.

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Small footprint: The Compact vertical cartoner built by U-E-T occupies about 1.5 sq metres

Trays are then taken through an automatic or manual loading station, the lid folded down onto the carton base and secured by glue, tucking or pressure-sensitive label.

Wueste also builds in-line vertical cartoners which consist of three modules: the erection module, the transport module – which can be up to 10 metres long for product loading – and a closing module. Transport is via polymer belts rather than chain, to prevent marking sensitive

varnished or embossed cartons, while speed is typically 50-60 cartons a minute depending on size and design.

In addition, Soudal markets the Compact range of rotary vertical cartoners built by U-E-T in Germany. The machines occupy around 1.5sq metres of floorspace, yet can handle 50 cartons a minute, primarily for hand loading although automatic systems are available. There is an optional centrally adjustable carton transport disc, which is said to eliminate change parts in most cases.

Top-load refinements

Refinements in top load cartoning systems from Bradman-Lake over the past year are centred on linking the new LJ Series Toploader collating and loading machinery with the company’s own carton erecting and closing systems, so providing fully integrated packing lines.

Bradman-Lake 2/60 and HS2/60 carton formers use mechanical lock or hot melt adhesive methods to deliver open top cartons or trays onto the line, ready for loading, at speeds up to 180 a minute. After loading in single or multiple layers by the pick-and-place robot arms of the LJ Toploader, filled cartons are automatically transferred to either a Bradman-Lake FCC Compact or Triliner Closer. Speeds,

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depending on carton size, are up to 200 a minute.

Both machines feature Bradman-Lake's Flexible Carton Control system with servo drives and electronic motion control that supercedes chain or flight timing. The rubber fingered conveyors are able to handle cartons with variable size contents without jamming and also, says Bradman-Lake ensure accurately square cartons.

Moving to end-load cartoning systems, Bradman-Lake has introduced two new machines over the past year, with servo drives and digital controls. Electronic motion control, often via touch screens, enables machines to run either intermittently or continuously from the same drive, to vary speed smoothly and to automate size changeovers.

The SL904 end-load machine, capable of speeds up to 160 cartons a minute, also offers the option of an overhead robotic inserter mounted above the machine body as an alternative to traditional barrel loaders. This has three principal advantages.

Less space needed

First, space requirements are reduced, particularly when long items are being loaded. Second, size changes are faster since there are only three pushers to replace, against the 15 or so of a barrel loader, and access to the robot gantry is much easier than to barrel loader components.

Third, the servo drive of the robot pushers gives the opportunity to control their acceleration and deceleration throughout the cycle, unlike a barrel loader where motion in both push and retract stages is the same, as dictated by the cam track.

It means, for example, that pushers could be set to accelerate slowly to carry the product gently into the carton, but retract very much more quickly to keep the total cycle time to a minimum.

Also recently introduced by Bradman-Lake is the fully automatic SL6000 indexing end-loader which provides rapid, electronic size changes. When two cartons are fed and loaded at the same time, speed is up to 100 cartons a minute.

Handling flexible packs on a side-load machine inevitably raises issues of product control that become more critical as speed increases. A novel solution now available from US manufacturer Tisma, represented in the UK by DS Smith Packaging Systems, is the Flexo-



Vibration for loose products: *Rovema CMV line ensures more densely packed products, such as tea*

Tray infeed bucket which, essentially, consists of a pair of opposed and overlapped L-shaped components.

When product is loaded, the buckets are open at their widest dimension but then begin to narrow, so shaping and aligning the product for smooth transfer into the carton, which is achieved with the bucket penetrating the carton a few millimetres as the product pusher moves across.

The Flexo-Tray is adjustable via handwheel, eliminating need for size parts, and is one of a number of options available on the Tisma TC-600 series cartoning machines, capable of speeds up to 500 cartons a minute.

Tisma also has various systems to feed each Flexo-Tray bucket with a number of bags or sachets as flat or on-edge collations which are then shaped and slightly compressed as the bucket contracts, giving clearance for loading into the carton.

Another way of handling flexible packs, and avoiding bulking up the product with a pusher, has been developed by US manufacturer Triangle and operates with a tunnel of four servo-driven belts – top, bottom and one either side – that propel the bags into the carton. Accelerations and speeds are programmable to suit the shape and weight of the bag.

No infeed buckets

As UK and Ireland agent Ultrapac explains, this reduces space requirements – a system occupies an area of just 1 x 1.5 metres at the side of the cartoner – and eliminates risk of jams caused by bags that bunch up or burst. No infeed buckets or mechanical pushers are required and, if more than one bag per carton is

required, the carton is indexed downwards after each bag is fired in.

Called FlexCell, the system can be incorporated in a full Triangle bag-in-box line and runs at speeds in excess of 100 bags a minute to absorb the output of a single tube bagger. A complete three-dimensional size change takes about 20 minutes.

Meanwhile, IMA has introduced a new family of eight Flexa end-load cartoners following the introduction of the first Flexa machines two years ago.

Each machine has been developed for a specific application but is based on a common chassis featuring stainless steel construction and an easy-clean balcony design, particularly suited to the pharmaceutical and cosmetics industries.

Intermittent or continuous

Speeds range from 100 up to 200 cartons a minute, in intermittent or continuous motion, depending on the upstream equipment to which the cartoner is being linked. For example, the two latest additions to the Flexa range are designed for packing tubes and blisters and are both intermittent motion machines. The tube cartoner handles up to 100 cartons a minute and the blister cartoner up to 170 cartons a minute.

IMA has also announced a new high speed continuous motion cartoner capable of speeds up to 350 cartons a minute.

CAM's HV continuous motion end-load cartoning machine is the latest development from the company and is available in two pitches of 5 or 7.5in to suit a wide variety of applications. Cantilever construction meets GMP hygiene

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requirements and provides ease of access, points out UK representative Campak, with the mechanical drives completely separated from the product and carton handling areas.

The HV uses CAM's Rotary carton erection system to give progressive and positive carton opening at speeds of up to 400 cartons a minute while speedy size change, by the operator, is via the CAM Mechanical Memory system.

Demonstrated at PPMA

New also in the UK is the Langenpac Chinook high speed end-load cartoner demonstrated in Britain for the first time at last November's PPMA show by UK representative Springvale Equipment. Servo controlled, the machine is built in stainless steel particularly for the food and pharmaceutical industries and can operate at speeds up to 250 or 450 cartons a minute, depending on set-up.

Finally, Kliklok Woodman has just delivered two paired automatic in-line pizza stacking and transfer units to one of the world's largest sole brand pizza manufacturers which will use the machines to feed two of four Kliklok K170 high speed end-load cartoners installed in 1998.

The pizzas are frozen and pre-packed in modified atmosphere by Multivac machines with a stable polystyrene base and easy tear-open film top panel. Kliklok's equipment will be handling four different pizza sizes, at speeds of 110 cartons a minute for single product, 55 a minute for double packs, and 37 a minute for triple packs.

Typically, points out Kliklok, an installation of this nature is able to save as many as three or four operators. ■

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Blister feeding: Four station blister feeder designed by IWKA for the Cartopac SC4 machine

High-speed cartoning lines provide format flexibility for Organon

Organon Pharmaceuticals in Dublin has installed two new high speed cartoning lines from German manufacturer IWKA, to allow two different types of contraceptive to be packed in a variety of formats for world markets.

Supplied by UK subsidiary IWKA PacSystems, the two dedicated lines are based on the new generation continuous motion IWKA Cartopac machines, each capable of speeds up to 300 cartons a minute. The lines also include purpose designed labelling stations, leaflet and booklet inserters.

The first line is for oral contraceptives. These are initially blister packed in relatively large batches, sealed into sachets and then stored, to be called off for cartoning against specific orders. In this way, Organon is able to maintain high efficiency on blister packing, with the flexibility to meet the different demands of various markets and customers.

Based on an IWKA Cartopac SC4 100mm pitch cartoner, the line is equipped with four rotary pick-and-place feeders able to load sachets of blisters into the pockets of the machine in counts of one to three at speeds of 300 sachets a minute each. The fourth feeder provides the extra capacity to allow continuous running while feeder magazines are recharged with blisters or can be used to add a booklet when required.

Pre-folded and/or flat sheet leaflets can be inserted in each carton as well as a day strip and etui label strip used by French pharmacists to claim Government refunds.

In total, the Cartopac SC4 line provides the

facility to create 12 different pack permutations, using two carton sizes.

The second line is employed cartoning Organon's new contraceptive device, the Nuvaring, which is packed initially in a reclosable sachet and then called off from stock for cartoning in singles or in threes at the moment, although the line is capable of producing a carton of six. Two carton sizes are used.

Sachets are fed initially to two labelling stations which then deliver into the infeed of the Cartopac SC6, a 150mm pitch machine.

Each labelling station has two labelling heads for automatic changeover of reels. A single label is applied to the top of the sachet. The transfer system includes a turnover device and space for ink jet printers to be mounted, which will allow Organon to add extra information to the reverse side of the sachet in the future. In addition, there are two booklet feeders.

Organon Ireland has started to launch Nuvaring throughout the world and will build up from an initial ten countries in 2002 to world-wide marketing over the next two to three years, with the exception of America.

"Both lines have been designed to provide complete flexibility to meet current and future market demands," explains Mike Nicol, sales and marketing director at IWKA PacSystems.

"Single point set-up is provided for the different pre-programmed formats, allowing Organon to make quick changeover to meet the different requirements of its customers throughout the world."

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