Individual drives pave way for Intelligent torque

INDEPENDENT DRIVE TO EACH CAPPER HEAD - WITH FEEDBACK - HAS USHERED IN A NEW BREED OF INTELLIGENT CAPPERS ABLE TO GIVE CONSISTENTLY CORRECT TORQUE, THE KEY TO CONSUMER CONFIDENCE. ANDREW SMITH REPORTS.

Capping involves a number of variables and if it goes wrong the consequences can be serious. Product leakage or spoilage is probably the worst fear, caused by loose or incorrectly orientated caps, or even application of the wrong cap.

But over-tightening or excess pressure can also cause similar problems by threatening the integrity of the container or cap through stress fractures. It can also disfigure the cap with scuffing and scratching, a particularly heinous offence in the health and beauty sector.

For the cap is the consumer's introduction to the product. While consumers may open a carton or read a label before opening the product, it is not until the closure is removed that the product itself is exposed and this point of contact is important. If the lid or cap opens too easily, the consumer will be suspicious that this is not its first time of use. If the cap sticks and a tool has to be applied to remove it, the reaction will be rage.

A 'satisfactory' closure provides customer confidence and hopefully therefore repeat purchase. Naturally, an 'unsatisfactory' closure is liable to have the reverse affect. So the key to satisfaction in capping terms is in achieving the correct torque – for screw caps – or downward pressure – for push-on caps.

There are a number of ways of testing torque, both off and on-line, but the latest moves are towards ensuring the capper itself carries out the operation correctly. The ultimate 'intelligent capping' systems analyse in-line application statistics and automatically adjust the parameters of the machine to optimise performance.

In these machines, each individual capping head is able to adjust itself independently of the performance of the other capping heads while the machine is running, so ensuring consistent torque. Full statistical analyses of machine performance are also usually available for validation purposes.

The key attribute, however, is the ability to control and adjust the capping heads quickly and easily and preferably individually, to ensure the correct torque and improve flexibility and productivity.

One manufacturer following this route is Italy's Ronchi, which has developed a number of capping machines featuring a servo motor on each capping head – pneumatic or mechanical depending on the application – with selection of the operating system from screw-on to push-on via a touch screen.

Limits mechanical parts

Ronchi's UK representative Propack Automation Machinery says a major advantage of the servo drive design is that the use of program functions to change the application system limits the number of mechanical parts required, reducing the cost of changeparts. Changeover times are also reduced, as it is only necessary to change chucks rather than complete heads.

When the capper is set to screw-on mode, the head is stationary when picking up the caps and only rotates as the cap is being applied. The torque is set from the touch screen, either for all the heads or individual heads and can be changed during the capping operation. The torque applied to every cap is monitored and any which do not match the set torque can be identified and rejected.

The Ronchi range of continuous motion cappers operate at speeds from 60 to over 300 a minute and can handle all styles of pumps as well as screw and push-on caps. This versatility makes them particularly suitable for the personal care industry although Propack can offer further expertise in this area through its agency for the French manufacturer PKB, which specialises in capping systems for the fragrance and cosmetics industries.

Fewer mechanical parts: *Ronchi servo driven rotary cappers give speeds up to 300 a minute*

Here again, versatility is the key and the PKB machines have been designed to enable the application system to be changed to match the requirements of the product being handled, with both magnetic clutches and servo motors being employed as appropriate. The ability to change from manual component placement to automatic feeding is also catered for through trolley mounted pumps or cap feeding systems, which can be locked into position where required.

Two recent projects illustrate the variety of components and formats the machines can

Individual drive: *Zalkin cappers can be supplied with brushless motors on each capping head*

Servo capper: *Dico 100S can be equipped with a colour vision system*

handle. In one, a machine was equipped to deal with 44 different caps while, in the other, two machines going to a specialist fragrance manufacturer had to cope with crimped pumps, screw pumps, push-on (with or without orientation), twist-on and screw-on applications.

Meanwhile Albro-Dico-Gravfil has introduced the Dico 100S single spindle servo driven capper, available with an optional colour vision system that allows the pick and place mechanism, which can rotate 180deg, to deal with caps that require orientation. This avoids off-line orientation and the use of a shift register, providing an intrinsically more secure system. The vision system will also check that the cap is the correct shape component and in the right colour.

Cap torque is programmable and also adjustable on the run while torque sensing, against number of turns required, provides a quality control function by identifying caps with no wadding – too many turns required – or those that have been applied cross-threaded, and so reach target torque too soon.

"As a standard machine the new 100S now offers all the accuracy and set-up advantages of servo drive, for just 15 per cent more than a clutch-brake capper," points out Albro-Dico-Gravfil sales director Ian Hillaby.

The 100S is also equipped with an indexing table on which speed profile is controlled to prevent slopping when fill levels are high, an Alan Bradley PLC and an internal fault diagnostics system.

Romaco Bosspak's latest model, the Multicap 8000, uses electromagnetic clutches for torque control. The coupling between the tightening head and the driving motor is achieved with an electromagnetic field and the torque is proportional to the strength of the magnetic field and therefore to the applied DC input current. The current is set via a touch screen and can be adjusted individually for each head while in operation. When the cap has been tightened to the set level, the coupling is disengaged.

Electronically controlled pre-tightening is said to allow for consistent final torqueing, independent of chuck speed and inertia.

Torque settings stored

Again, torque settings are a machine parameter and can be stored and recalled for rapid tool-free changeovers. Other variables such as cap sorting and placing speeds and the grip of the pneumatic clamping chucks are also controlled via the screen. Depending on the product, speeds up to 150 caps a minute can be achieved through six rotary heads.

Data such as time, batch number and torque settings used are logged and an optional printer is available if printouts are required.

As an alternative to pole magnetic or hysteresis magnet systems, Zalkin's latest range of capping machines can now be supplied with a brushless motor on each head for torque control. Cap applications programmes are stored in the operator panel and controlled via a PLC to ensure the correct number of turns and torque is applied. Compensation for any variation in line-speed is made automatically to avoid the effect of inertia on the torque level.

When operating with a pick-and-place cap transfer system, non-rotating head movement during cap pick-up and individual stop of head rotation at completion of torque is said to provide very gentle cap handling without over-torque or generation of cap dust.

The company says the machines can allow complete control of the capping operation "to give 100 per cent inspection of every cap on every bottle, with automatic rejection of any application not meeting the set parameters". Most varieties of push-in, push-on, twist-off, roll-on, pilfer-proof, child-resistant and screw caps of plastic or metal can be handled and the range extends from semi-automatic bench-type,

to fully automatic single and multi-head versions, free-standing or synchronised with filling equipment.

Outputs are from 10 to over 1200 a minute and the machines are claimed to be suitable for aseptic installations, since mechanical items are simplified with minimal lubrication points and extensive use of lubrication-free items.

UK and Ireland agent Krones UK says certain features of the machines will appeal to different product sectors. For example, the beverage industry may appreciate the benefits of compensation for the inertia effect generated by high speed lines, while the ability to generate very high torque levels would be of use to the agrochemical sector. In the personal care industry the high speed orientation – 500 a minute – of rectangular flip-top caps may be the attraction.

Increasing productivity

The pharmaceutical industry makes particular demands on machinery manufacturers and DT Packaging Systems says its latest rotary cappers have been introduced to "improve pack quality, increase productivity and reduce downtime" in this sector.

DT's Swiftpack and King products are the Rotary Capper, Starcap Plus and CS60 capping machine. All are said to be easily set up and incorporated into integrated lines and can run at high speed, handling a wide range of bottles and closures, "making them ideal for batch production".

They incorporate quick release changeparts and centralised touch screen controls while menu driven commands are combined with the option of pre-programmed memory settings.

The Rotary Capper is capable of handling both screw and press-on closures, including CRC and induction sealed components. A magnetic clutch assembly is used for consistent torque control and with four, six and eight capping heads available, speeds up to 240 bottles a minute are achievable.

The Starcap Plus uses a star wheel configuration with 12 pockets combined with a push-through placement mechanism and a pneumatically driven final torque-down station. DT says this allows a wide range of containers and closures to be handled, including screw, CRC and snap-on caps at speeds up to 100 a minute. The latest models now have the option of integrated induction cap sealing and by combining capping and sealing, DT says a "significant reduction in space is achieved as well as cost-savings".

King's CS60 is claimed to have the unique capability of being able to perform three types of capping operation – screw, press and ROPP – with just a 10 minute changeover time using quick change container size parts and capping chucks. A two line message display on the PLC screen alerts the operator to any faults and a range of sensors checks for cap presence.

Optional equipment includes automatic cap or container inspection and rejection systems, vibratory or centrifugal cap feeders, and elevators for feeding vibratory bowls on long production runs.

For sterile lines requiring vial capping, IMA's ALU series has been designed to "guarantee low particle generation". The continuous motion rotary cappers apply traditional or flip-off aluminium caps at speeds up to 400 a minute on the eight head ALU 400 or 600 a minute on the 12 head ALU 600 model.

Detecting top pressure

Suitable for installation in either conventional contamination controlled environments, or environments using isolator technology, cap sealing is carried out with an idle edging roller and by rotation of the container support plates. A system that detects the pressure applied vertically on each container and keeps it constant,

Torque control: *Romaco Bosspack's Multicap 8000 uses electromagnetic clutches*

Variety of work: *DT Swiftpack Starcap is able to deal with a wide range of containers and closures*

even if a container is out of tolerance, is said to maintain a consistent seal under controlled parameters.

The machines can handle vials 35-110mm high and 14-52mm diameter with caps 6-16mm deep and 13-40mm diameter. Options include laminar flow enclosures, servo control for adjusting capping tower heights, a unit for adjusting rotation speed of the container during flanging, a stopper presence control system and printer for collecting and processing data on the vertical pressure on each container.

Filmatic Packaging Systems' latest development is a pneumatically actuated cap head design which is said to result in better handling of screw caps with fragile tamper-evident rings.

For higher speeds: *Posicap automatic capper from Universal Filling*

The company says the new system exerts less pressure on the cap and specially designed, accurately cut gripping claws ensure a firm hold without deforming the cap or risking breakage of the tamper-evident ring, a particularly important consideration when running at speeds up to 500 caps a minute.

Available in the UK and Eire through Grunwald UK, the Filmatic range caters for a number of closure applications including press-on, screw-on and foiling at speeds from 50 to 500 containers a minute. Rotary cap unscramblers, including horizontal, centrifugal, incline, vertical and waterfall are also available while stainless steel is used throughout and ultra-violet and rinsing devices can be fitted for ultra-clean applications.

The new PLC-controlled Innofill SV capper from KHS uses servo driven motors on each capping die to orient the die to individual cap specifications as well as set the torque. The motors operate independently of machine speed and changeover is achieved "at the push of a button" via pre-programmed parameters for each cap type used.

Apart from the obvious productivity benefits, KHS points out that this provides a key benefit in aseptic conditions as there is no mechanical intervention at the capper.

Vasquali says the success of its latest capping and unscrambling range has prompted a major expansion, necessitating a move to a new, purpose built factory in Sesto San Giovanni, close to Monza in Northern Italy.

Available in the UK and Ireland through Skerman Promac, the range was designed to ease cleaning between products and reduce changeover times. Vasquali says that by the use of a simplistic, but efficient and flexible design, the capper is able to employ either a simple wipe-on, or various robotic pick-and-place cap feeders, depending on either the container to be lidded or the line speed involved.

Selection of the closing section depends on the application and includes ROPP, electromagnetic or friction tightening, or simple push-on. Due to the monobloc construction, changeover to another system to suit a new container is said to be particularly simple.

The systems are fitted with cap protection sensors and the container is rejected into a separate area if the cap is not present. If a complete line is installed, then "no container, no fill and no cap" protection is also available.

Inevitably the emphasis in any discussion of "what's new" in the machinery world revolves around the latest technological developments, but as Universal Filling Machine Co points out, "there are many capping operations that can be carried out more efficiently using systems that are easier to set up and operate, than by using complex, fully automated machines".

Universal says this is especially true in industries such as contract packing "where the ability to switch from one product or container to another quickly is more vital than line-speed".

The company's basic manual unit is pneumatically driven and features interchangeable

chucks available in a range of sizes and with a variety of inserts to enable the cap size to be changed "in seconds". The unit can be hand-held or supplied with a number of types of stands and counterbalance systems to make it easier for the operator to use. Although usually operated off-line, it can be located at the end of a low-speed automated line.

The Swan-matic represents the next stage and is a semi-automatic, bench mounted unit. It features a constantly rotating shaft that also oscillates up and down and can be supplied electrically or pneumatically driven. Typical operating speeds are 20-30 containers a minute and cap sizes from 10 to 100mm can be handled.

Torque adjusted on the run

For higher speeds, Universal says its Posicap automatic cap tightener is "ideal" to operate in-line with an automatic filler. Torque can be adjusted remotely while the machine is running while speed is up to 40 containers a minute and cap sizes from 8 to100mm can be handled. The company says size changes can be carried out "very quickly without the need for expensive change parts and no starwheels, scrolls or bowl feeders to be adjusted".

Newman's 4CT cap tightener has been relaunched for the trigger spray and pump dispenser markets. The company says the guide mechanism and tightening wheel arrangement allow it to operate with almost any design of trigger pump and no change parts are required for different cap or container sizes.

An integral set of transport belts carries the container from the machine infeed through the pre-tightening and final tightening wheels to the outfeed. Adjustments are made using hand wheels and there is no requirement for a chuck, transfer wheel or timing mechanism, enabling the containers to be processed continuously or at random. Conveyor speeds up to 15 metres a minute can be accommodated.

Aerosol specialist, DH Industries/Pamasol has a full spectrum of solutions for aerosol caps including standard covers, mousse spouts, spray-through caps with actuator, lockable spray-through, caps with projections and caps with accessories.

The company's machines include the P2033 range, a single head stepped indexing system suitable for butting up to all standard slat conveyor outputs. The pneumatically driven option provides speed up to 70 cans a minute and the electric drive version up to 120 a minute.

The P2046 basic high-speed capper is suitable for cans and caps of the same diameter and runs at speeds up to 300 cans a minute. The more advanced P2095 pick-and-place rotary capper with a cam-driven, quick release chuck system is available in 6, 12,18 and 24 head versions and can handle up to 600 cans a minute. It is also available in a version for spray actuator caps which orients the outlet spout to the container decoration by means of a vision system and servo motors.

No changeparts: *Newman's cap tightener for trigger sprays and pumps adjusts to different sizes*

A variety of cap feeding and disc sorting systems are available with quick-release change part segments on the disc circumference, while the latest low-level sorter, X02046-02, uses a vacuum system to remove the caps to the feed system and runs at 350 caps a minute. ■

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Capper is installed to prevent RSI

Cap Coder says its most recent installations and orders illustrate the versatility of its capping machines across a number of industrial sectors.

In the medical and agrochemical industries, two of the company's CC1440 bench top cappers have been installed "to prevent RSI and increase production". The compact, air-operated machines use a self-aligning torque head to tighten pre-placed trigger spray caps.

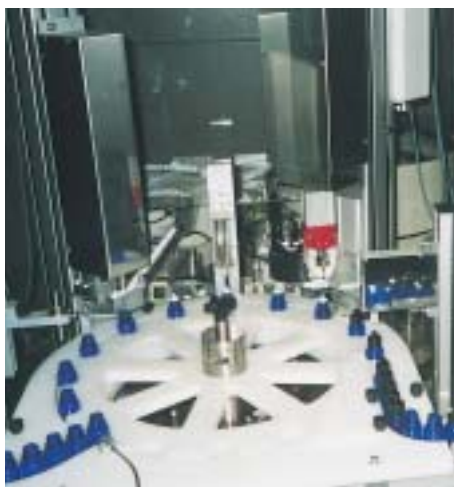
The design is said to allow fast size change for round or rectangular containers from 50ml to 5 litres. Larger containers are pushed into the capper, while smaller ones are placed on a powered infeed/outfeed base plate.

As a result of a visit to the PPMA show last year, a privately-owned major manufacturer of wood-finish products has ordered a CC550 indexing starwheel capper. The pneumatically operated machine, which will fit press-in caps, also promises fast size change for the five sizes of round tins it will handle from 50ml to 1 litre.

A CC100 ink contact coder will print batch numbers on the bases of the tins as they are capped at rates up to 25 a minute. Cap Coder says the ink drying time is comparable with inkjet, but at a fifth of the price.

Finally a manufacturer near London is set to receive a CC1160 rotary compact machine to fill, plug and cap 10ml perfumed oil bottles. Designed to handle containers from 2 to 100ml, the CC1160 is typically used in the cosmetics, healthcare and adhesive industries.

More information - enter 175



Perfume line: *Cap Coder CC1160 rotary for filling plugging and capping 2-100ml containers*