

Variety of closures points to Capping by module

CAPPING MACHINES CAN BE CALLED ON TO APPLY SCREW CAPS, PLUGS, PUMPS, ROPP CAPS, DEODORANT BALLS OR OVERCAPS ON A VARIETY OF DIFFERENT STYLES AND SIZES OF CONTAINER. SO A MODULAR APPROACH IS THE ANSWER, WRITES MARTIN KEAY.

There is a tendency when considering machinery to think of all machines in a particular industry such as packaging being completely distinct from groups of machines in other industries such as textiles or metal working.

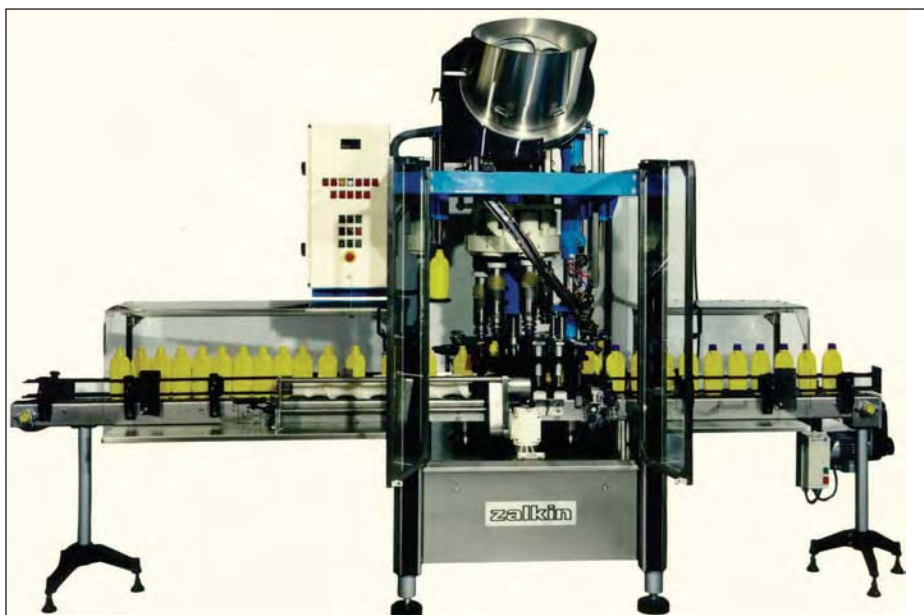
To a great extent this is true, although much less than it used to be now that so many machines are based on industrial robots. However in some cases the equipment used in one industry is remarkably similar to equipment used in what might have been considered a completely different sector.

Capping machinery is one such example. While we think of a capper as being a piece of machinery that you would only find in the bottling industry, machines that are surprisingly similar are widespread in many other industries, used for assembling toys, parts for cars and even munitions.

The essential areas of similarity are conveyors to supply large components to the machine, bowl feeders to unscramble and correctly orientate the small components required for the assembly, an indexing mechanism or carousel where a series of operations can be carried out, and a variety of tools to pick up the components and attach them, so producing the final, assembled product.

With automatic assembly machines it is obvious that each machine has to be customised to suit the components and the article being assembled, but the same is also true of capping machines, which can be called on to apply screw caps, plugs, ROPP closures, pumps, deodorant balls or overcaps on a wide variety of different styles and sizes of container.

Consequently capper manufacturers, like automatic assembly machine makers, work with a series of standard mechanisms, sub-assemblies or modules, which they either link together to produce a standalone capping machine or supply in sub-assembly form to



Wide range: Zalkin cappers offer outputs from 10 to 1200 containers a minute

another manufacturer to be integrated into a filling and capping monobloc.

Given the variety of closures that capping machines can be called upon to apply to a container, the term capper or capping machine seems rather inadequate, but provided we can come to terms with the idea that a capper may actually be inserting a push-fit plug or pump let's stick with the term capping machine.

Use of servo motors

As in other fields of packaging equipment, the single most obvious development in capping machinery in recent years has been the increased use of servo motors and other programmable drives. These are particularly suitable for use in modularised sub-assemblies and allow capper manufacturers to move away from complex mechanical mechanisms that can only apply a limited range of closures.

But electronic drive systems are not suitable for all applications and in particular cannot be

used in DSEAR zone 1 areas where a potentially explosive cloud of gas or vapour can be expected infrequently, but during normal operation; for example in a room where an alcohol based aftershave or perfume is being filled. In this situation, ATEX group II category 2G equipment is required and this will typically mean that an electronic drive motor will have to be replaced by an air motor and pneumatic controls.

The heart of every capping machine is the capping head and here the use of servo motors has allowed capper manufacturers to improve the performance of capping machines significantly with precise control of cap placing, precise control of cap torque and the elimination of cross threaded caps.

For example, Zalkin, represented in the UK by Krones, builds a range of machines for a wide variety of industries with outputs ranging from 10 to 1200 a minute. Machines are supplied for handling various sizes of closures, from small plugs and pharmaceutical phial

CAPPING

overcaps, to beverage caps of all varieties, to large diameter coffee jar screw caps, orientated aerosol overcaps and various closures for dangerous chemical applications.

Capping heads are available to suit almost all varieties of push-on, push-in, roll-on, tuck-under, twist-off, pilfer-proof, non-refillable, child-resistant and screw caps of plastic or metal. Indeed Zalkin machines can be equipped for automatic changeovers between different cap types, which can include auto-changeover of cap chutes, cap dispensers, cap guides and cap sorters.

Screw capping heads now have quick release jaw units or chucks available, with some heads using a quick release design to reduce changeover times still further. Torque changes are now readily adjusted either by the appropriate scale marked on the outside of the head via a moveable collar, or by simply selecting the cap type on a touch-screen, which can provide all the settings needed for each cap type.

Adjustment now easier

The introduction of servo control has also made it much easier for machines to be adjusted to suit a variety of container sizes.

For example, French manufacturer PKB offers an innovative system for positive crimping of capillary pumps, controlled entirely by a servo drive. This makes it possible to carry out positive crimping on bottles with variable neck heights and also for snap-on pumps to be handled just as well.

Capping machines can be divided into four groups, suitable for progressively increasing outputs: bench mounted machines, fixed head in-line machines, fixed head indexing machines and rotating head machines.

Bench mounted cappers are the ideal start up machine where outputs are low and the budget is limited. On these machines the closures are placed on the container by hand and the containers are moved towards and away from the capping head manually. However, many bench mounted machines are designed so that they can be automated at a later date when outputs or budgets increase.

For instance, the Zalkin model TM3 can be supplied as a bench mounted machine with two hand controls to initiate the capping cycle, or with a conveyor and starwheel to automate the feeding of containers, and in the final step with a cap sorter allowing the whole operation to be carried out automatically.

The simplest form of automatic capping



Swedish capper: The EC40 is among Fillpak cappers now available in the UK from SP Filling Systems

machine is an in-line fixed head machine where containers are conveyed to and taken away from the capper on a conveyor. On these machines the closure may be applied automatically, manually or using another machine.

A current example is from Universal Filling Machine Co, which has recently installed the first of its new Mini-Block combination liquid filling and cap tightening machines at Biotrin, Dublin. This company specialises in diagnosis/theranostics, providing a range of tests for the clinician and research scientist to detect new and emerging viruses, and tests for biomarkers to assess tissue damage.

Biotrin was looking for a filling and capping solution that was simple to operate, had a small footprint and would be able to handle a range of six bottle and cap sizes with a wide range of torque settings.

Production rates doubled

Following installation of the Universal Mini-Block, production rates at Biotrin have more than doubled while allowing the company to automate filling of some products that were previously manually packed. According to Universal, changeover times have been virtually eliminated due to the puck handling system, which means there are only a few simple adjustments to change from one cap/bottle combination to another.

Automatic in-line capping equipment from Swedish manufacturer Fillpak is now available in the UK from SP Filling Systems. Currently, says SP, the two most popular models are the EC40, able to close up to 50 bottles a minute with either screw or press-on caps and the

EC80 offering higher speed up to 80 bottles a minute on a similar range of bottles and closures. For trigger spray applications, the TG50 is also available, offering in-line tightening at speeds up to 50 bottles a minute.

All models in the Fillpak range can be to an ATEX group II category 2 specification.

The next level of automation is again a fixed head machine, but where the containers are moved under the head or a series of heads using an indexing table or starwheel.

Modular approach needed

However, as Cap Coder points out, a modular approach is usually needed to cope with the wide variety of capping applications, often using special purpose machinery that extends beyond simply dealing with several different products on the same machine.

Current special purpose requirements met by the company include turning a product upside down after filling and capping, manufacturing in plastic to cater for aggressive acids, adding agitator balls before filling and handling superglue which, says Cap Coder chairman Lou Bates is "quite entertaining".

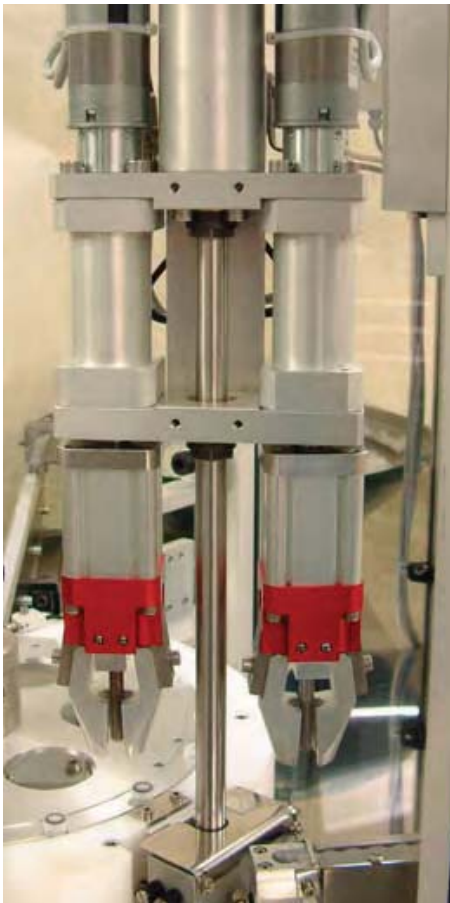
The principal module in a capping machine is of course the torque head, which needs to be able to pick up any cap and screw it onto the container. Cap Coder's CC720 head, for example, has three cap-gripping jaws, using change part pads to ensure the correct grip.

The jaws are powered to close and to open, allowing lower operating pressure and minimum resistance to rotation, giving better torque control.

The brushless DC drive motor allows inde-



Saving space: Containers and capping heads follow an oval path on the SF Vision machine



Swing torque head: Cap Coder system gives faster capping for bigger bottles

pendent control of torque and spin – although for Zone 1 applications pneumatic motors are employed.

Torque heads are configured for single or multiple operation with rise-and-fall to tighten caps, or in the swing beam format using two heads, where one head picks up a cap while the other is tightening another on the container.

The next most important module is the star-wheel indexing drive, which has to meet the necessary precision required for the plugging and capping operation.

The AC servo drive used by Cap Coder can be programmed to cater for four pockets when handling 5-litre jerrycans, or 30 pockets when handling, say, a 50ml container. Speeds can be ramped up and down for smooth operation on index, and a jamb reaction device ensures safety and no damage. Again, for Zone 1 applications a pneumatic drive is available.

Single spindle servo machine

One of the latest machines from Albro-Dico-Gravfil is the Dico 100S single spindle servo driven capper, which can be supplied with an optional colour vision system that allows the pick and place mechanism, able to 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 also checks 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 Roger May.

CAPPING

The 100S is also equipped with an indexing table on which speed profile is controlled to prevent slopping when fill levels are high, an Allen Bradley PLC and an internal fault diagnostics system. Machines can be supplied to handle containers up to 10 litres.

However, for applications where a fixed head capper is too slow, a capper that incorporates a series of heads that move with the container is required.

Typically rotating head cappers will have a series of heads arranged on a circular carousel, although SF Vision, represented by Optima Packaging Machinery, has now developed a multihead capper on which the heads and containers follow an oval or racetrack path rather than a circle.

This design has the advantage that it reduces the width of the capping machine significantly when compared to the conventional design, making it easier to fit into a congested bottling plant.

Krones points out that the Zalkin rotary range allows any output to be met by machines via the use of multiple heads, with various cap sorters and cap transfer systems to meet the cap sorting and output required. The machines can

be single turret, with the possibility of mounting two different head types in alternate positions to reduce changeovers, or two or three turrets for multiple closure application, for example plug, caps and overcaps, or collars, balls and overcaps for deodorants.

Finally, IMA has recently introduced the F800 series of high speed pharmaceutical fillers and cappers able to reach speeds of 450 bottles a minute with up to 24 filling heads and

ten closing heads. Dosing volume is up to 1 litre.

Closing turrets can be equipped with various types of heads for all types of closures, such as screw caps, push-on caps, aluminium ROPP caps, droppers, reducers, pumps and dip tubes. Each capping head can also be fitted with individual motors to allow orientation of push-on caps and torque control during the tightening operation with monitoring of the force applied to each single bottle. ■

For further information:

Albro-Dico-Gravfil
T: 01233 629161
E: ashfordsales@gei-int.com

Cap Coder
T: 01865 891466
E: capping@capcoder.co.uk

IMA UK
T: 01189 772323
E: hotdesk@imauk.co.uk

Krones UK
T: 01942 845000
E: sales@krones.co.uk

Optima Packaging Machinery
T: 01962 883728
E: Peter.Kierans@optima-gb.com

PKB
T: +33 2 3237 9632
E: g.potter@pkb.fr

SP Filling Systems
T: 01597 824918
E: colin@sp-filling.co.uk

Universal Filling Machine Co
T: 01233 643666
E: mail@universalfilling.com

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