

BOTTLING REPORT

DOWN-THE-LINE REVIEW OF THE LATEST EQUIPMENT FOR BOTTLING FROM PPMA MEMBERS.

THE MARKETPLACE

Mixed signals on UK demand for bottling machinery

Forecasts of UK demand for bottling equipment – covering alcoholic and non-alcoholic, carbonated and non-carbonated beverages, as well as dairy products – appear to be carrying mixed signals.

On the one hand, the bigger international suppliers such as KHS are predicting healthy growth rates in global consumption. Up to 2009, the company says, world-wide consumption of beverages in general will increase by 4.3 per cent year-on-year. Non-alcoholic products will outperform this average, KHS forecasts, with bottled water, 'wellness' and functional drinks doing particularly well.

The German-based equipment supplier goes one step further, saying that its own studies indicate annual growth in demand for beverage filling and packing equipment of 5.2 per cent by 2010. But examining this figure in more detail, it is clear that demand will continue to be highest in developing markets from Eastern Europe and the Middle East to Africa and Asia.

In Western Europe, on the other hand, consolidation among beverage brands is expected to intensify. In the UK, this will be a particular feature of the soft drinks sector where the highest consumption growth is also anticipated.

Beer and alcohol brands have been following a similar pattern of consolidation. And the largest dairies will make it hard for some of their privately-owned competitors to fight their corner with high-growth categories such as flavoured milk and yogurt drinks.

Undeterred, equipment companies are working hard at developing machinery ranges which

meet the needs of these and other higher-value segments of the market. These include ultra-clean and aseptic lines, those for innovative dairy drinks and those which are targeting the strong UK market for juice in cartons with more flexible bottle shapes and sizes.

PROCESSING

Specialist in filling looks upstream for integration

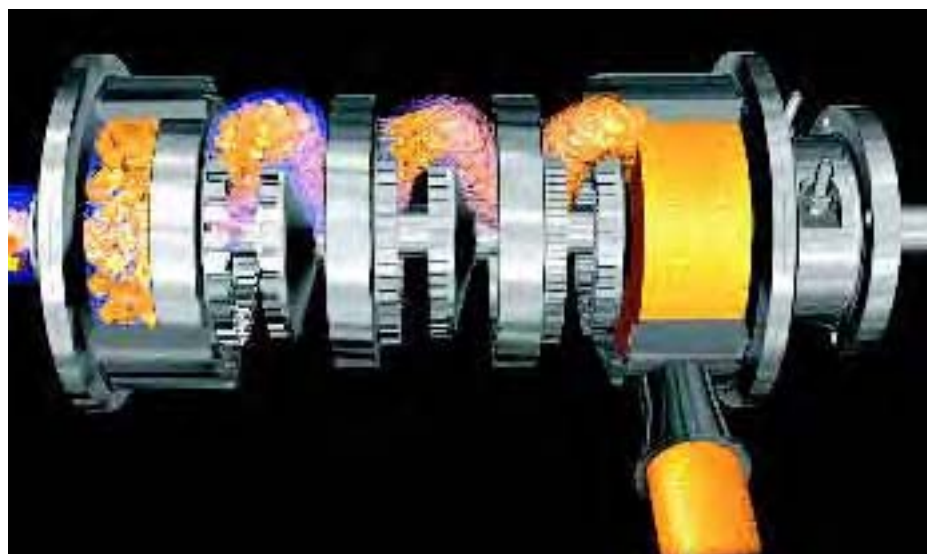
Although traditionally known as a filling machinery specialist, Krones is currently strengthening its credentials as a provider of upstream process equipment. As Krones UK technical manager Andrew Wilson points out "key components" of its VarioFlash and VarioAsept flash pasteurisation systems are now produced by Krones in Neutraubling, and this trend for bringing process equipment in-house is set to continue.

While VarioFlash is designed for classical

flash pasteurisation of beer, carbonated soft drinks, juices, milk and dairy products, VarioAsept is intended for aseptic preparation of sensitive products. For highly viscous and fibre-containing liquids, as well as milk-based beverages, Krones offers shell-and-tube heat exchangers. Mr Wilson estimates that some 20 examples of Krones flash pasteurisers have already been installed.

As might be expected from a turnkey supplier of this size, Krones is emphasising the integration achieved between the flash-pasteurising, filling and post-fill sections of the line. Its use of Zenon touchscreen technology provides operators with a uniform interface, and allows them to access all settings (given the correct authorisation) and view the status of different sections of the line from a single screen.

Where post-fill tunnel pasteurisation is required, Krones subsidiary Sander Hansen has new equipment which overcomes some of the problems commonly associated with belt longevity. The Sharc (safe hygienic active regenerative control) pasteuriser uses the polypropylene and stainless steel Marathon belt which, says Andrew Wilson, is given a ten-year warranty. "The belts used in tunnel pasteurisers



Processing juice concentrate: Three stage Ytron-Z homogeniser achieves minimum viscosity and avoids fibres



Eliminating the front table: Krones F1 filler breaks new ground in a number of areas

have traditionally been expensive and had short lives," he points out.

While Engelmann & Buckham principal Gerstenberg Schröder is best-known as a supplier of process equipment for yellow fats, its Consistator unit is now used more widely in the food and drink industries, and can process fruit concentrates, purees and smoothies.

The Consistator is a scraped surface heat-exchanger for low-to-medium pressure applications where heating, cooling or crystallisation of the product is required. Models can be specified either for small capacity batch production or for continuous production, in a vertical or horizontal configuration.

For homogenising, Ytron-Quadro has developed a new system in conjunction with German fruit juice brand Eckes Granini. The process, called Ytronising, is used for producing fruit juice concentrate.

Conventionally, concentrate is processed in a high-pressure homogeniser at around 100 bar. As the company explains, the aim is to optimise the sensory properties of the juice, reducing the tendency for settling-out in the final juice by cutting particle size to a defined level.

But as Ytron-Quadro (UK) managing director Dudley Bradley explains: "This conventional process is expensive, with high capital investment costs and energy consumption. In addition, there is the cost of routine maintenance and costly wear parts." He also argues that high-pressure homogenisation adds a metallic taste to the final juice.

Instead, the company proposes passing the concentrate through its Ytron-Z unit. This houses up to three sets of rotor/stators with extremely high radial tolerances. Because it operates on an in-line principle, Ytron-Quadro argues, this applies defined and reproducible

shear forces to the product in a single pass.

The system is said to be suitable for juices, premixes and concentrates from 12degBrix up to 60deg Brix. Advantages are said to include the avoidance of fibres, which can block filling valves, the ability to achieve a minimum viscosity, again eliminating filling problems, and a substantial reduction in energy and maintenance costs.

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RINSING AND FILLING

Breaking new ground in carbonated filler design

Perhaps the biggest single launch by Krones at Drinktec 2005 last September was the F1 volumetric filler for carbonated soft drinks, which breaks new ground in a number of areas. First, it does away with the front table, using individual neck-handling starwheels to transport PET bottles from the rinser and on to the capper. Each starwheel has its own servo drive.

Second, the F1 keeps the bottle stationary during filling, instead moving the filling nozzle

down to the neck which says Krones, increases output. This has been made possible by the development of a swirl insert in the valve, directing the beverage towards the inside wall of the bottle, and avoiding any need for a filling or vent tube.

This is not the only innovation with filling valves on the F1. Whereas previous fillers have tended to house all electronics in a dedicated 'tower' in the centre of the machine, the F1 decentralises these controls to each valve. This includes the pneumatic controls, three-way valves and the supporting electronics for the inductive flowmeters. By locating them above the filling head in this way, Krones says it has increased response time and accuracy. "As far as Krones is concerned, this is the way things will be in the future," says Krones UK technical manager Andrew Wilson.

Self-contained starwheels

The decentralisation theme is also picked up in the distribution of servo drives. By integrating the servo motors in the column of each starwheel, Krones has ensured that they function as self-contained, synchronised units.

While Krones lays the stress on the F1's modular build, fellow-German supplier KHS emphasises the way in which its latest high-speed system for handling carbonated soft drinks functions as a complete rinsing, filling and capping bloc.

There are similarities between the F1 and KHS's servo-driven Innofill DRV-VF block. Both do away with the front table, for example, and substitute the flexibility of neck-handling for the PET bottles. But in other regards, it is the differences which stand out. While the Krones system lowers the filling valve to meet the bottle neck, KHS stays with its own variant on bottle-lifting technology.

However, the filling process itself is simplified, says KHS, with only two pneumatically-activated membrane cylinders required for the entire volumetric filling process. These cylinders lift the bottle and ensure that the mouth of the container forms a seal with the filling valve. The same basic system, which was shown for the first time at Drinktec, can be used for non-carbonated soft drinks, says the company.

KHS twins the filler with the single-channel Innoclean FR-EM mechanical rinser as standard in the bloc, but points out that two-channel and computer-controlled alternatives are available if required.

The same starwheel concept is developed in



Flowmeter filler: In-line Breitner IDL 2065 filler for still beverages

the KHS capper. Here, while the lower section of the star is used to hold each bottle by the neck ring, the upper part acts as a cap conveyor. A pick-up disk transfers the plastic closures directly to the capping head.

The space-saving theme, which is central to many of these filler/monobloc developments, is picked up in a new buffering technology from Krones. Synchronising different operations and allowing for stoppages or slowdowns in critical line bottlenecks remain major challenges for anyone wanting to integrate functions and reduce the footprint of a line. So Krones has introduced the Acculink mechanical buffer as a possible solution.

While an air conveyor requires changeover between different bottle shapes and sizes, the Acculink needs no adjustment, says Krones. It can also be used on aseptic lines and sterilised more readily than air conveyors.

Krones uses the term 'Smart Line' for operations using the Acculink, and these were originally intended for PET lines running at speeds up to 60,000bph. However, in principle the same concept can be applied to different speed ranges, says the company.

Acculink uses just two servo drives, Krones points out, as opposed to 15 or 20 for an equivalent air conveyor. With its 10sq metre footprint, it is said to provide a two-minute buffering option at different critical points in a high-speed line.

Perhaps learning some lessons from the PET sector, Ave UK has installed a line at Princes

Soft Drinks using neck handling on hdpe bottles. The bottles, which are filled with pasteurised juices, incorporate a neck profile which allows them to be securely handled this way. By making this design adjustment, the overall light bottle weight can be maintained without risking compression on a pedestal lift, Ave UK managing director Steve Bradley explains. The line runs at around 11,000bph on 2-litre bottles.

Ultra-clean conditions

A second concern for Princes was the filling line's ability to provide ultra-clean conditions which would give the juices a 30-day shelf life. Ave carried out tests to ensure that the 40-head bottle rinser would actually sterilise the hdpe jugs, which incorporate the potential contaminant trap of a handle. By inverting the bottle and using a sterilising solution on a continual rinsing principle, Ave says it has made a significant contribution to achieving that shelf life.

The sterilising agent continues to act while the bottles are on the conveyor between the rinser and the monobloc, Mr Bradley explains. Only just before the filling station are the bottles rinsed with sterile water – with the option of subsequent drying with sterile air. A HEPA filter and laminar air flow ensure ultra-clean air inside the 40-head rotary gravity filler and 12-head capper.

Meanwhile, Ave has also provided its own solution for small-to-medium size fillers wanting to run carbonated and non-carbonated beverages on the same line. Its latest electronic

flowmeter filler is currently on order for a South African company wanting to use it for its own cola while running at ambient temperatures. In the past, says Steve Bradley, foaming beverages posed a significant challenge on electronic fillers of this sort, and meant that machine speeds had to be reduced by up to a quarter. The alternative was to invest in a chiller.

The latest patented system from Ave means that the individual head 'sniffs' continuously – at around 100 sniffs a second – during the filling cycle, ensuring there is no build-up of pressure, so allowing line speeds to be reduced by only 10 or even 5 per cent. Filling temperatures can be up to 20deg C.

An earlier version of the same system was installed at Sangs in Scotland. Here, still and carbonated soft drinks, as well as water, are filled into PET bottles of between 250ml and 2 litres at speeds up to 20,000bph. The 50-head rinser and 50-head filler are followed by a 20-head capper.

With a previous PET line, Sangs had experienced problems with the pre-fill handling of bottles, experiencing a high reject rate on the thin-wall containers. The filler was understandably keen to avoid the same problem on the Ave line, which uses a high-level depalletiser to feed bottles to the filling station, while avoiding the need for an additional operator manually feeding bottles onto the line.

For filling still beverages at line speeds up to around 15,000bph on half-litre bottles, Engelmann & Buckham has the Breitner range of in-line fillers. While rotary versions are available, says managing director Michael Henderson, demand in the UK among beverage fillers seems to be for the in-line variety.

The version of the linear machine most commonly specified for beverages is the IDL induction flowmeter model, says Mr Henderson. For a line in this output range, size changeover is said to be relatively easy, with no change parts required. The line has CIP capability.

Juices and smoothies

Over the last few years, Breitner installations have been made at Gerber Foods for juices and Orchard House Foods for smoothies, says E&B. Bottle sizes between 200ml and 1.5 litres can be handled.

For filling those smaller bottles favoured for the newer yogurt drinks, E&B supplies Hamba machines. These have already been successfully installed with some of the big names such as



Multi-lane: Hamba Flexline can include up to 14 lanes for speeds up to 50,000bph on 500ml containers

Danone and Müller and most are specified in ultra-clean versions, which gives the drinks adequate shelflife in the chill-chain. But, explains Michael Henderson, Campina in the Netherlands requested a fully aseptic model for its UHT ambient product.

A multi-lane version of the Hamba filler was launched at last year's Interpack. The Flexline can handle larger bottles and, on an exceptionally wide model with 14 lanes, could fill around 50,000 half-litre bottles an hour, although a more typical installation would be eight lanes wide, says Mr Henderson.

The intermittent-motion machine uses volumetric filling, with hydrogen peroxide as a sterilant throughout. Servo drives allow changeovers to be carried out from the control panel, and in the latest version of the machine, service equipment has also been re-engineered.

Among the more specialist suppliers of fillers is Italian machine builder Sympak Bottling & Canning, represented in the UK by Planet Flowline. Within the Sympak range, machines are available for filling PET and glass, catering for line speeds between 3000 and 60,000bph.

Machines include the Master RS, Volmaster RS, Magic RC, Magic Ultra-Clean and Magic Hot Fill, capable of filling a range of products, from carbonated soft drinks and water to beer, wine, still juices and yogurt drinks. According to Planet Flowline, Sympak's Separated Air



Rinser-filler-capper: Sympak Master RS 40-head rinser-filler with twin 8-head cappers

Return system ensures that product is kept to the highest quality. The Variable Starwheel system is said to allow fast adjustments between 50 and 100mm, with no need for changeparts.

Wines and spirits

Though not then incorporated into a fully-fledged filler at Drinktec, Krones showed a new method for filling wine without using the traditional systems of fill-level correction. According to Krones UK technical manager Andrew Wil-

son, the servo-driven vent tube automatically adjusts to the filling height without the need for changeparts.

Stork Amsterdam International continues to supply the wines and spirits sector worldwide with options for standalone fillers, filler-capper monoblocs and rinser-filler-cappers. Part of Stork's success, says the company, has been its CIP unit which can be integrated into a new machine or retrofitted for thorough cleaning of the filling valve, inside and out, and of the central trough.

Aseptic filling

In aseptic filling, the trend among the largest suppliers is to offer both wet sterilisation processes based on peracetic acid and dry processes based on hydrogen peroxide, according to customer preferences. KHS showed both types of system at Drinktec. As the company says, some customers will prefer its Alfill dry technology because of the cost savings, while others will want the reassurance of a traditional bottle and closure rinsing method.

The mini-isolators used on the KHS Alfill lines house Class 100 clean room conditions. Reducing the size of the sterile area has reached the point where the only isolated areas are the PET bottle guide elements in the steriliser, the valve bells in the filler and the capping heads. Output spans the range 3000 to 50,000bph.

Like KHS, Krones is presenting customers with a choice between dry and wet aseptic systems. Says Andrew Wilson: "We launched our hydrogen peroxide technology at Drinktec, and believe that there will be applications where this can be beneficial. We wanted both available, although we think that PAA (paracetic acid) will dominate." Krones notes that PAA remains particularly advantageous where lightweight, heat-sensitive plastics are being filled.

Mr Wilson points out that the Krones hydrogen peroxide system is a true "dry" technique,

with the use of pre-heated bottles meaning that there is no condensation, and so no need to rinse with sterile water. Only sterile air is used.

Four flavours on one filler

Addressing the particular aseptic needs of the dairy industry, Kronos has launched a new version of its Rainbow filler for handling four different milk or yogurt-based variants of the same drink, simultaneously on the same carousel. While previous models have used inductive flowmeters, the latest version is based on a weigh cell, to ensure that any gas in the product does not affect filling results.

The four different products arrive from dedicated product tanks, pressurised with sterile gas. One variant will be fed to the first, fifth and ninth filling head, another to the second, sixth and tenth, and so on. To ensure that the right label goes on each bottle at the end of this fully aseptic process, a laser-based batch identification process is used, with an inspection camera used for final quality control.

For these types of added-value milk-based drinks, it seems there is no shortage of equipment available on the market. What is missing, according to Tony Dignam, managing director of Stork Amsterdam International, is aseptic contract filling capacity.

Aseptic contract filling

Existing brand owners, currently using single-layer hdpe and a sterilising process, want to move to a multi-layer variant which gives greater flexibility in pack shape and size, he says. Then there are those wanting to push brands already familiar from confectionery and ice cream. Again, they are eager to use aseptic filling – but in neither case are the companies ready or willing to install these high-cost lines themselves.

In this case, Stork itself has taken the initiative and installed an aseptic line in its technical centre in Amsterdam. Mr Dignam points out that the bigger names in the filling equipment industry such as Tetra Pak’s Sidel have focused on PET. He says: “I think we’re the only company that can blow-mould three-layer hdpe bottles, and then process and fill fruit juice or milk drinks aseptically.”

Stork’s isolator technology on its recently-introduced Asep-Tec machine means the footprint on this part of the machine is reduced. The machine is linear, but can be supplied in multi-lane versions able to fill between 12,000 and 18,000 bottles an hour. “If you have a rotary

filler, you’re dispersing the air completely, and you simply don’t want that with an aseptic line,” Tony Dignam argues. The Stork machine uses a combination of flowmeter technology and its own Dolphin filling nozzles.

When it comes to ultra-clean filling, as opposed to the fully-aseptic alternative, Stork already has lines up and running in the UK. Starcross Foods, now owned by Dairy Crest, is filling Coca Cola’s relaunched Minute Maid soft drinks in 1-litre PET bottles. For this, Stork installed a complete line including a bottle unscrambler, PAA sterilisation, sterilised water rinsing and rotary filling under ultra-clean conditions at speeds of 12,000bph. Caps are uv-sterilised, and the line also includes a labelling station.

Ultra-clean weigh filling

The Starcross soft drinks line uses non-contact weigh filling. But for milk, too, this is the established technology among the larger super-dairies, according to Mr Dignam. Stork has over 35 ultra-clean weigh-filling machines installed across the UK with the likes of Robert Wiseman, Dairy Crest and Arla Foods. Speeds tend to be around the 18,000bph mark on 4-pint jugs.

Tony Dignam explains that, while the smaller dairies will opt for cheaper level-fill alternatives, the larger operators understand that they can recoup the higher capital cost of weigh-fill purely by eliminating product giveaway with the more accurate technology.

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CAPPING AND CLOSING

Standalone cappers for in-line operations

While the trend has been for increasing use of filling and capping monoblocs on higher-speed lines, Breitner is among those equipment manufacturers supplying only standalone cappers. The company has launched a new range of servo-driven cappers – the VRS range – capable of running in line with its IDL in-line filler for still beverages.

Quick product changeovers are a particular benefit of the VRS, says UK representative Engelmann & Buckham, making it especially useful for lines changing between, say, standard screw-on caps and sports caps.

Bespoke capping machines

On slower speed lines, Cap Coder suggests that, in certain circumstances, bottling line managers should consider designing their own bespoke capping machine. Rubber-lined gripping jaws can be selected to suit the chosen cap. These are mounted on a rotating shaft driven by a servo motor which controls both torque and speed. A pneumatic motor can be used as an alternative if required. The system can be made fully-automatic, first picking each cap from a transfer device before placing and screwing it on.

In this type of fully-automatic configuration, says Cap Coder, the three-position rise-and-fall mechanism will allow each capping head to apply 30 caps a minute. The simpler two-position cap tightening operation can achieve speeds of 50 caps a minute, says the company. As an alternative, Cap Coder offers a twin rotary-head unit, comprising two torque heads supported at 180deg on a centrally-pivoting beam. In this case, the heads rise and fall together, but while one head is tightening a cap, the other is picking up the next closure from the transfer mechanism.

Fords Packaging Systems and Relco spent four years developing rotary machines for foil sealing using induction technology. Several have now been installed for major brands, particularly for small pots of drinking yogurt. The principle is similar to that used in conventional induction sealing machines, such as those



Swing torque head: Cap Coder system gives faster capping



Rotary induction sealing: Fords Packaging and Relco have co-operated to build high-speed rotary induction sealing systems

already supplied by Relco for sealing foil-lined plastic caps in dairies. Rather than using conducted heat, the induction head generates an electromagnetic field which converts to heat in the foil. But this is the first time that the technology has been combined with Fords' direct foil cutting and placement system.

Capping press for forming

The Fords machine has a capping press to form the foil into a profiled cap, with or without a pull-tab, which is then sent down a chute where it is applied to the bottle. An infeed star-wheel takes the bottle into the sealing turret, where the induction heads are lowered into contact for a pre-set heating time.

Systems are now operating commercially in the USA, France, Germany and Thailand, running at speeds of around 600 containers a minute, says Relco.

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LABELLING AND CODING

Steered beam laser moves into high speed territory

Linx Printing Technologies has added a new high-performance laser system to its range of coding equipment. According to Linx, the 500SL laser coder provides letter-quality script in high-speed production environments, making it ideal for high-speed label coding on beer and beverage lines. Up to 90,000 labels can be coded an hour, says Linx, taking this steered beam laser into territory previously reserved for dot matrix and mask laser systems. The peak power of 100W means that almost all packaging media can be coded.

At the 2005 PPMA Show, The Needham Group showed the Macsa range of CO₂ lasers. The F-1000 series is specifically designed to apply high-quality, permanent codes to difficult substrates, particularly in cold-fill conditions, while Needham claims that its Crystal Font offers better code readability on PET than any other laser system currently available. For even better dot visibility, it has developed a specific wavelength version of the font, which generates minor structural alterations and significant colour change.

The F-1000 series offers Ethernet connectivity for easy factory integration, a choice of lenses for different code sizes and high-speed