

Although sold by volume Filling by weight gains credence for liquids

DISPENSING LIQUIDS BY WEIGHT, RATHER THAN CONTROLLING THE TEMPERATURE AND FILLING BY VOLUME, COULD SOMETIMES BE PREFERRED, WRITES MARTIN KEAY.

It seems rather obvious that if you sell a product by volume you measure it by volume, and if the product is sold by weight you measure it by weight. However there is an increasing realisation that this may be a rather too simplistic view of things and that while all liquids are sold by volume it may be preferable in some cases to dispense them by weight.

One of the latest industries to start to question the obvious filling method are the petrol retailers. We are all thoroughly familiar with the volumetric petrol pump and would not be surprised to know that something very similar is used at the oil refinery to fill up the petrol tankers. However, what most of us are not aware of is that a load of 5000 litres of petrol can shrink to as little as 4750 litres by the time it is dispensed into our cars.

The problem is of course temperature. Like many other liquids, petrol expands and contracts significantly as it is heated and cooled. The bulk of this cooling takes place in the tank under the petrol forecourt and, while it is cooling, the petrol retailer is losing money, giving a new meaning to the expression shrinking assets.

But it is not just the petrol retailer who loses out with this variable volume, because of course the fuel value of the petrol is reducing as it gets hotter. So should we be buying petrol by the kilogram rather than the litre?

Well, petrol retailers certainly think that there should be a move to selling by weight and if you consider that the fuels of the future – LPG and hydrogen – are sold by weight rather than volume, this idea may not be so far fetched.

But what has all of this to do with liquid filling machines? Variable volume is in no way confined to petrol. Lubricating oil and liquid detergents behave in the same way. So for products like these, filling by weight is a cost effective alternative to controlling the temper-



Fill by weight: Ocme Libra net weight filling machine and capper

ature of the liquid and then filling by volume.

Weigh fillers are by no means a new idea, but in the past they have been considered as only suitable for large volume fills, because of the variability of the container weight and the weight of liquid in flight when the filler nozzle cuts off the flow. However, the latest generation of weigh fillers is able to fill 50ml accurately, by tare weighing every container and automatically compensating for variations in in-flight material.

Weight constantly checked

For example, the latest nett weigh filling machines from Ocme are able to fill to an accuracy of $\pm 0.5g$ on a 1 litre fill – depending on the application. During the filling cycle the machine is constantly checking the weight of the filled container, making any corrections necessary, and automatically rejects any that fall outside the target weight.

The fillers are available with eight to 64 filling heads, and can give speeds up to 600 containers a minute for a wide range of liquids within industries such as household products, food, dairy, personal care and beverages. Size range is 50ml to 20 litre pails.

Ocme's filling valve mechanism is designed to be outside the product tank, so making the tank and filling valve ultra clean while the filling valve itself is programmable, automatically setting itself to the optimum for the application.

Acma GD's liquid division, which includes the Corniani and Ocea companies, has now supplied its rotary net weight filler to major companies around the world, handling a full spectrum of products, from milk to paint, fabric conditioner to body lotion and lube oil to bleach. Machine speeds have ranged from 30 to 650 containers a minute.

Most recent installations include five complete lines to handle milk in Russia – from blow

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moulder through to palletiser – operating at speeds in excess of 300bpm; filling and lidding paint containers in the UK on rotary machines; and orientating, filling and capping an angle necked product at speeds in excess of 350bpm, again in the UK.

In a further installation shampoo and conditioner are being handled at speeds in excess of 600 containers a minute.

In all cases the process involves tare weighing the empty glass, metal or plastic container, filling a pre-set weight and taking account of product in flight so that the valve can be closed at the point where the pre-set weight has been measured, less the in-flight material, giving a true net weight in the container.

At any given time, during the fill cycle, the filler knows what it has received, or what it should have received. If it is short on the anticipated weight, then that particular head will be closed. For example, it could be that the container is leaking. So closing the valve saves waste.

Acma points out that the design of the filler is based on an easy maintenance requirement with all components accessible and easily removed and replaced. Even the more complex items such as the load cell arrangement can be removed and replaced in seconds, the company says.

In addition, the design of the tank is such that it drains entirely into the filling valves, leaving almost no residual product in the tank. A CIP system can also be built in.

Easy to clean

Indeed, another advantage shared by weigh fillers and flowmeter fillers, which if you think about it are a kind of weigh filler, is that they are very easy to clean since they only need one simple valve to control the flow of the liquid.

Propack, UK agent for Ronchi, continues to work with the Italian manufacturer on the development of its flexible filling line philosophy based around the Exacta RX-8 flowmeter filling system, which comes as a standalone machine or as a monobloc with servo capping system.

Although relatively small, Propack says the RX8 is capable of outputs up to 120 a minute on 300ml fills and combines the advantages of flowmeter technology with the fast set-up of a rotary machine.

Flowmeter filling heads have no moving parts and can be cleaned as easily as a plain pipe. Flushing is said to take the minimum of time and produces very little effluent, while setting



Flowmeter filler Berchi has launched its Unitronic machine for still drinks such as water and juices

the machine up for a new container is “virtually instant”. Once set up, no further adjustment is required to reach full running efficiency.

Recent UK installations include a puck line for a major personal care company which features unscrambling and puck loading. It handles a range of products from oils and lotions to shower gels with both push-on and screw caps which are monitored by a vision system for orientation. The compact nature of the line leaves space for a range of manual capping options which enables it to be used as a fully-automated operation running at 120 units a minute or for short runs and special products.

A number of the functions are programmable, from filling level to capper operation and all settings can be stored as a recipe for easy recall. Change parts are locked pneumatically and released at the touch of a button.

The machine checks each filling operation is started and completed in the time available, that fill level is within set tolerances and that a cap is fitted, fully applied and to the correct torque level for screw closures.

German manufacturer Breiitner has developed a twin lane flowmeter machine, the Twin IDL/MDL, capable of producing up to 250 bottles a minute to combine the flexibility of linear fillers with the output of rotary lines. UK agent Engelmann & Buckham says the machine offers an ideal balance between cost, flexibility and output.

The machine is fed by a single conveyor which then splits into two, transporting the bottles to

both sides of the filling machine. Here the filling takes place, with up to 12 nozzles on either side of the machine. On one track the bottles are filled while on the other they are being conveyed, then vice versa. The two lines merge again onto a single conveyor after the filling operation is complete.

Flexibility from two tracks

The Breiitner machine offers significant advantages, utilising all the flexibility of a linear filler says Engelmann & Buckham. A wide range of bottle sizes – from 20 ml to 25 litres – can be accommodated without change parts and short runs can be filled on one track while the second track is being set up for the next product.

The machine is equipped for CIP/SIP and can

Flowmeter filler

Buckinghamshire based family-run business Tims Dairy, Chalfont St Peter, has improved the quality of its CIP routines and increased the filling speed for its organic Biyo yoghurts with a new flowmeter filler from Masterfil.

As a result, shelf life for these non-preserved products has increased substantially.

Realising that the risk of contamination, and the potential health risks, on its non preserved organic products was high, the company knew its existing two head piston filler was not right for the job and needed to improve the security of cleaning systems.



Fast change pot filler: FastFill 80 from Packaging Automation



Gentle handling: Raque piston fillers offer a 135deg product path

fill a wide range of products and containers.

Significant UK installations for Brei- tner Twin IDL/MDL fillers include Gerber Foods Soft Drinks, which uses its Brei- tner machine to fill a wide range of PET bottles with fruit juices, and also Ipswich and Norwich Co-op which fills milk into a variety of hdp- e bottles.

Meanwhile, Berchi has launched its new Uni- tronic flowmeter machine, principally for han- dling still drinks such as water and juices.

The machine is said to offer a high level of hygiene as standard, since there is no contact between the filling valve and the bottle, but is also available as an ultra-clean model. This involves additional equipment in the form of bottle sterilising/rinsing, air change control, and a specially configured capper.

Krones has launched its VODM-L-PET sys- tem for filling beer aseptically in PET bottles using inductive flowmeters which, the company points out, is an ideal method for dimensionally accurate containers such as plastic bottles.

Good air displacement

The use of a long-tube filling system for gentle, below surface filling, coupled with a ring bowl gas flush of the bottle before it is pressed on, is said to produce good displacement of the air from below. Pressurisation can then be per- formed using CO₂ from a clean gas channel, enabling excellent oxygen values to be obtained, says Krones. Dispensing with spring internals at the valve adds to hygiene.

However, volumetric piston filling still

remains one of the most popular and accurate methods of liquid filling and the introduction of servo motor technology to power both the pis- ton and the rise and fall mechanisms on dis- pensing valves has increased the versatility of this technique, which is equally effective with thin liquids, thick pastes and liquids containing particulates.

For example, Winyard Engineering has developed the RS12 servo-driven rotary filler machine over the last two years to meet the needs of the food industry. The machine will fill and lid a range of packaging with both hot and chilled liquids and viscous semi-solid products, such as soups, sauces, potato salads, coleslaw and dips.

The RS12 is the next generation machine

enhances CIP and shelf life for natural yoghurt

"Our main criterion was ease and security of CIP. Added to that we wanted to increase the speed of the line," explains Tims Dairy director Peter Timotheou.

The filler developed by Masterfil is fed by a pressure vessel that is cleaned by a spray ball and, with six-heads at the moment, can fill the 250ml bottles at a speed of 60 a minute. How- ever, extra heads can be added in the future to double this figure.

The Masterfil software control programme on the machine is used to set the volume, fill and nozzle rise speeds, with the ability to save up to



Greater shelf life: Biyo yoghurt is now filled on a Masterfil flowmeter machine

100 product profiles. The filler's CIP/SIP sys- tem is integrated with the dairy system, offer- ing a choice of joint cleaning and sterilisation with the benefits of convenience and shortened downtime, or separate cleaning and sterilisa- tion options, which allow flexibility.

"The Masterfil machine has exceeded expectations," says Peter Timotheou. "Ease of changeover has improved, hygiene stan- dards are very high and the shelf life of our non preserved products has increased to 28 days which is exceptional."

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from the original gearbox driven unit and meets demand for greater product control to eliminate 'slopping' and subsequent packaging contamination. Servo motor drive gives increased indexing speed but allows the dwell time to remain the same, thus allowing sufficient time for pot dispensing and lid application.

There are six stations comprising pot dispense, first fill, second fill/film application, lid placement, lid consolidation and pot eject.

Handling food gently

Raque Food Systems' piston fillers incorporate a 135deg product path that allows these self-priming machines to handle all food products gently, from thin fluids to chunky pastes and aerated products. Apart from eliminating tortuous product pathways, which can often damage or restrict the product, this design allows the filler to handle delicate liquids with particulates up to 40mm without deformation or loss of filler speed.



The standard dispensing valve is a piston style, positive cut-off, non-drip valve in sizes from 0.5 to 3in diameter. Specially designed valves include cone valves, rectangular valves, rosette valves and spreader valves that are interchangeable with the standard valve.

With small to medium volume filling the issues can often be as much about container handling as they are about the method of filling.

This is one reason, for example, why Cap Coder has designed its new CC560 capping machine to handle a wide range of products.

"The basics of the machine are that the only certain foolproof way of getting any unspecified cap onto a container is to pick it up and screw it on," says the company. "Any other method, such as neck transfer, or pick-and-place will not deal with all the variety of caps and containers, so caps are presented to a CC720 torque head for pick-up and are then screwed home."

Many of the machines built by Cap Coder incorporate a filling station, be it volumetric, peristaltic or flowmeter, into what is essentially a product handling machine.

But the method of filling does of course depend on the application.

For example Jos Nusbaumer, based near Strasbourg, is a family firm which has been making traditional fruit liqueurs and eaux-de-vie since 1947. There are 75 products in the company's range, and it needed a new machine



Peristaltic filler: Adelphi Cerberus handles liqueurs for Jos Nusbaumer

to fill the liqueurs into 30ml miniature bot-

tles with ROPP caps and into 200ml flasks. Adelphi Manufacturing supplied its Cerberus monobloc filling machine fitted with two peristaltic pumps, which cope with the foaming liquids and enable fast changeover between products with no cross-contamination. The system has been designed to avoid any drips, which would affect labelling, and provides an output up to 1800 bottles an hour.

"We needed to replace an old filling machine that took 40-45 minutes to clean between production runs," explains Mrs Wilim, general manager of Jos Nusbaumer.

"With the new Adelphi Cerberus we can now change over in seconds, so our production is much more efficient. We can fill just what we need, when we need it, and output of the 200ml flasks has nearly doubled."

Three options for filling

The Adelphi Cerberus is designed for automatic filling, stoppering and closing of containers from 1ml to 250ml. Three options for the filling system are available: peristaltic pump, volumetric displacement pump and vacuum. Many types of closure can be handled, including screw-caps, push-on caps, security caps, ROPP caps, plugs, stoppers, clinching seals for pump-sprays or vials, and plastic pipettes. Half-stoppering can also be done for lyophilisation.

Fast changeover is also a feature of the new

FastFill 80 rotary filler-sealer for preformed pots, developed by Packaging Automation to help convenience food manufacturers switch quickly from one product to the next.

For example, changeover for pot diameter has been reduced 20-30 per cent compared with previous machines. The cups are now carried through the filling and sealing operations supported on a rotary table of four lightweight 90deg segment tools that simply clip in and out of place. A CIP system can also be fitted.

Particulates up to 25mm

The machine is able to accommodate pots and trays up to 130mm diameter and 140mm deep, with a maximum dose of 1 litre. Particulates up to 25mm can be included and there is a rotary valve to provide efficient cut-off. Filling can also be under feedback control from a checkweigher – to take account of changes in product density – and MAP facilities are available. Speed is up to 60 pots a minute.

As standard, the machine can be equipped to apply pre-cut lids of foil and polyester or use reel-fed film while the container magazine can be loaded with pots or trays without stopping production. A pendant mounted touchscreen control panel is fitted – giving visibility from anywhere around the machine – and allows a variety of management information to be generated and displayed, or downloaded to a network.

Meanwhile, KP Aerofill and Dawson, two

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leading UK companies within the IWKA group, have combined their 150 year liquid filling and handling experience to form a joint liquid filling organisation supported by sister businesses, IWK Verpackungstechnik and KUKA Robots. The result is Servopak filling and closing systems said to be capable of CIP changeover without skilled operators or change parts in under 5 minutes.

Rather than employ fixed displacement pistons, the Servopak uses peristaltic and gear pumps with easy-clean nozzles to handle all liquids including solvents, cosmetics, food and pharmaceuticals.

Banks of filling systems, positioned over a conventional conveyor, can be employed to achieve constant production while parallel systems are locked in a closed loop CIP circuit without operator involvement. When cleaned, the pumps can be automatically primed and set from a menu – still in the CIP position – ready for instant changeover.

IMA has introduced the Flexifill in-line machine which, for flexibility, can be either electronically or mechanically driven, intermittent and continuous motion. Specifically designed for low to medium outputs – from 120 to 250 bottles a minute with a dosing volume up to 500ml – the machine will be shown for the first time at the Total Processing and Packaging exhibition.

Servo motor option

Equipped with eight filling units, the Flexifill can be fitted with a variety of filling systems depending on the type of product to be handled and on the container type. Servo-driven motors can also be specified for adjusting the stroke of the nozzle carrier head and for adjusting dosing volume. CIP-SIP systems are available.

Propack Automation has recently been appointed agent in the British Isles for Italian manufacturer Comas, which specialises in medium speed liquid filling and capping machinery for doses of 0.02ml to 1 litre, with systems to handle small containers said to be a particular speciality.

In the pharmaceutical industry machines have been supplied for handling syrup, eye drop products, lens cleaner, vials, test tubes and pre-filled syringes while in the perfumery, cosmetics and personal care industries machines are handling creams, lotions, shampoos, conditioners, shower gel, foam bath, foundations, perfumes, eau de toilette, nail varnishes, mascaras, and hair colourant. Applications in the chemicals

industry include ink cartridges, household and car cleaning products, solvents, and paints.

The King Technofill Premier filler now available from Swiftpack Automation is a modular in-line liquid filling system for a variety of applications within the pharmaceutical industry and is claimed to offer up to 20 per cent higher productivity than conventional liquid fillers.

Nozzle bar lift mechanism

It has a newly designed nozzle bar lift mechanism with a programmable motorised drive, to allow variable speed and stepped diving action according to product and bottle characteristics.

Combined with a variable conveyor speed, this reduces fill times, even for foaming products and ones that require filling into the neck of the bottle.

The Technofill also has positive shut off valves on each filling nozzle, which prevent stringing or dripping and so permit higher speeds.

Despite the attraction of accurate filling techniques such as volumetric piston, weigh filling and flowmeters, level filling still remains an important technique for clear bottles.

Filmatic Packaging Systems, represented in the British Isles by Grunwald UK, has recently commissioned a clean level-filling line for



Clean level filler: Filmatic has supplied a clean machine for handling Lipton Ice Tea

Unilever Bestfoods Robertsons in Johannesburg, for handling Lipton Ice Tea. Although specifically designed to meet the stringent hygiene requirements laid down for iced tea – an ambient product with a nine-month shelf life – the line is, in fact, capable of filling an assortment of still beverages.

The Filmatic rinser-filler-capper combination is designed to rinse, fill and cap PET bottles of various sizes, although only changeparts for 1.5 litre and 500ml bottles were included initially in the installation.

To achieve a hygienic filling environment, bottles are sanitised in the rinser and the entire machine is kept under a downflow of sterile air, with caps sanitised via an ozone water solution in a cap sterilising conveyor.

Planet Flowline has become sole distributor for Italian manufacturer Sympak which makes a range of complete filling lines and individual machines to handle both PET and glass bottles for the beverage and dairy industry. Speeds go from 3000 to 60,000bph.

In particular, Sympak has developed a filling valve that allows the company's Magic hot-fill machines to handle extremely lightweight PET bottles, due to a maximum sealing pressure of only 4.5kg.

Sympak says it can guarantee a constant temperature of 85deg within the valve due to a special transfer valve that allows the product to be diverted back to a holding system within the process equipment. ■

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