

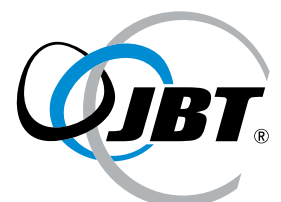
The art of filling glass and plastic bottles.



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JBT level and weigh filling technology

A walk down the grocery store aisle will illustrate the overwhelming number of packaged foods in glass and plastic bottles to choose from these days: dairy products, dairy-alternative drinks, juices, wines, spirits, edible oils, sauces and condiments. Even with the already wide variety of flavors and concepts within each product category, consumers and retailers seem to want even more. Today's market demands are creating challenges in production schedules as well as applying pressure for quality and food safety standards like never before. Ensuring the quality and food safety of your bottled products before they reach the retail shelf or the consumer is now more important than ever.





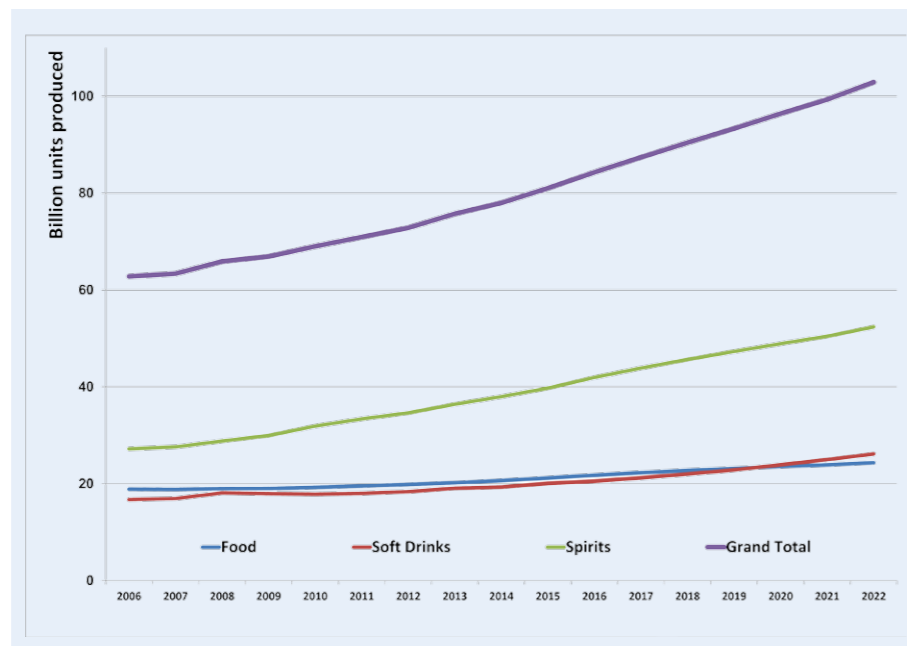
What about glass bottles?

Glass is the trusted and proven packaging for health, taste and the environment. Glass is 100% recyclable and can be recycled endlessly with nearly no loss in quality or purity. 80% of the glass that is recovered is made into new glass products. Glass is **nonporous and impermeable**, so there are no exchanges between glass packaging and products to affect the flavor of food and beverages. No nasty aftertaste - ever. Finally, glass has practically **zero rate of chemical interaction**, ensuring that the product inside the glass bottle keeps its strength, aroma, and flavor.

Many consumer surveys show that glass is considered the perfect packaging material to cater to the needs of today's

consumers. Trends towards a growing demand for high quality, pure and natural products, such as organic and bio food and drinks, provide opportunities for glass. More than three-quarters of European consumers see glass as the most environmentally friendly packaging material – 50% higher than in 2008 – according to a Europe-wide surveyed commissioned by the European Container Glass Federation (FEVE) in 2017.

No wonder that global volumes of food and beverages packaged in glass bottles has increased by 25% from 2006 to 2017. And processors expect even more growth in the future + 3% CAGR for soft drinks and spirits.



Source: Global Data



What about plastic bottles?

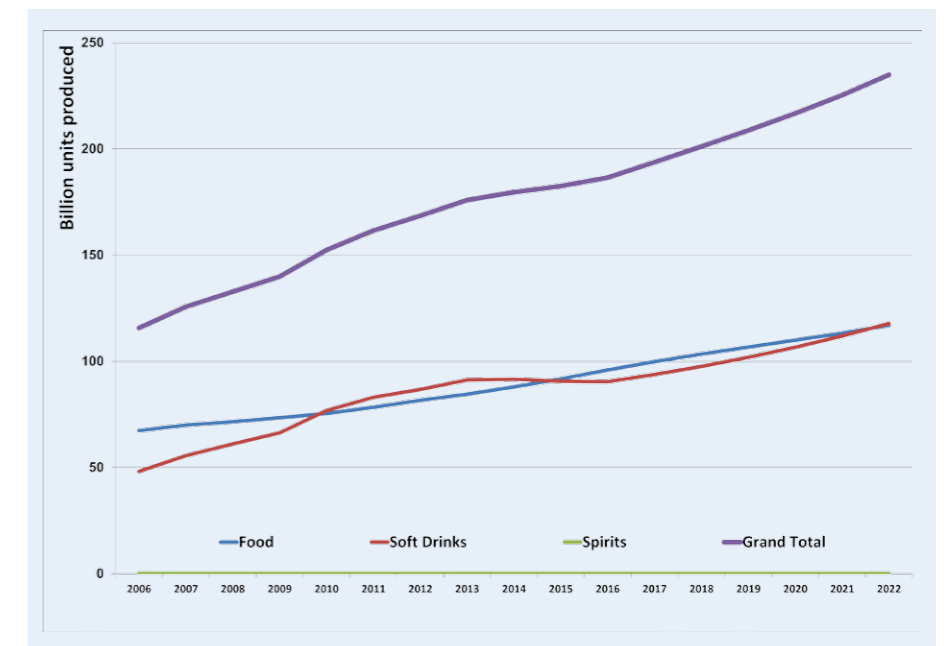
Changing lifestyles and the subsequent dependence of consumers on processed, packaged, and pre-cooked food is increasing the sales of plastic packaging in all its formats; this is visibly giving way to plastic bottles owing to its convenient format, superior barrier properties and high-quality print-ability. Plastic bottle packaging is a major contributor to the plastic packaging market, across the world.

The growing emphasis on the carbon footprint of packaging supply and end-of-life management will prove a compelling competitive advantage for plastic packaging. In particular, PET will present an increasingly persuasive case in terms of sustainability, technical performance, and aesthetics. PET is generally recognized globally as a non-toxic, safe,

lightweight, strong, flexible, microwave resistant and 100% recyclable raw material. It also provides an excellent barrier against carbon dioxide (CO₂) and oxygen (O₂).

Currently, packaged water represents the largest end-use market for PET bottles, accounting for more than one-third of the total global consumption. Packaged water is followed by carbonated soft drinks (CSD), food bottles and jars, non-food bottles and jars, fruit juice and beer. Regionally, the Asia-Pacific region represents the largest PET bottle market and accounts for around 32% of total global PET bottle sales. The Asia-Pacific region is followed by North America and Europe.

Global food volume packed in plastic bottles (PET, HDPE, PP) is estimated to grow at 4% CAGR through 2022.



Source: Global Data



Your choice of filling technology

Filling machines are the core of your filling line and the only packaging machines in direct contact with your product. They will play a major role in managing your product quality, food safety, shelf life, yield and throughput. In this whitepaper we will focus on ambient, non-aseptic filling of food and beverages in glass and plastic bottles.

There are four factors driving filling technology decisions for FMCG manufacturers: faster line/production speed, filling accuracy, increasing labor costs and increased quality standards.

1. FASTER LINE SPEED:

Unlike most of the food and beverage bottling lines installed in the last decade, the standard speed of today's bottling line averages up to 500 bottles per minute. This makes manual inspection impossible and could dramatically increase the potential number of defects equating to multiple retailers receiving a considerable amount defective products.

2. FILLING ACCURACY:

Having properly filled containers is one of the key elements to ensure product quality and control give-away. At best, under-filled bottles result in consumer complaints and, at worst, may land a company in court. However, overfilling is costly and wasteful. This means your filler must be accurate and consistently maintain that accuracy over the years.

3. INCREASING LABOR COST:

Labor rates have increased globally in the past years. Furthermore, global manufacturers are finding it more difficult to find, train and keep a quality labor staff.

4. INCREASED QUALITY STANDARDS:

With every product quality recall (recall rates have increased at the same level as increased production rates) local consumers grow more aware of quality and food safety issues. Many consumers throughout the world are willing to purchase more reputable brands for their perceived quality. Almost all manufacturers are now implementing inspection programs as a standard practice to help protect their valuable brand image and reputation for quality.

When beginning your liquid filling equipment search, it is important you consider the different aspects of your product (or application) and the demands of your project. There are five characteristics that will help in determining the type of filling machine you will need: 1) the liquid's nature or characteristics; 2) fill volume(s); 3) fill temperature; 4) container dimensions and specifications; and, 5) production rate.



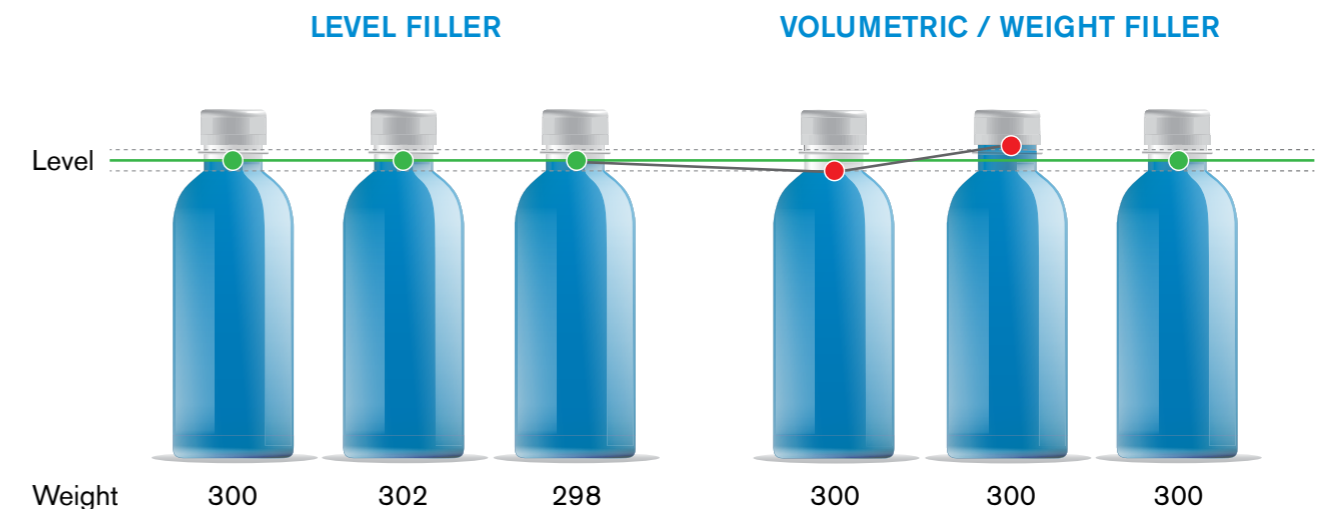
Volumetric, level or weight filling?

Glass bottles do have some small variations in volume. The reality is that internal volumes often vary. If these were filled volumetrically, it would give the perception of different fill volume given the varying headspace, even though the volumes are actually the same. The volume/weight inside the bottle is correct, but because of the small volumetric difference between the bottles it appears to be short. This can create a bad impression with the customer. With a level filling machine all of the bottles will "appear" to have the same volume because the fill level will be the same, but in reality there will be slight differences in fill volume, no short fills, but some slight overfills.

So this is the decision you have to make beforehand: volumetric, weight or level filling? For some liquid products the answer will be level filling since it is cheaper and faster than volumetric filling, plus bottles will be evenly filled.

However, volumetric or weight filling is the best solution if the product has to have an exact dosage or if the product is very expensive per weight and the little bit of give-away could cost you dearly, especially in a high production environment. On the other hand, you may choose weight filling in the case your product requires non-contact filling to ensure higher product hygiene.

JBT offers complete solutions for rotary volumetric, level and weight filling. This JBT White Paper specifically discusses the options and solutions for non-aseptic rotary level and weight filling for packaged consumer products in glass and plastic bottles.





JBT Level Filler

JBT level fillers rely on the internal volume of the container to fill the product a certain distance from the top of the neck. This distance will remain constant regardless of the container's internal volume with a level tolerance of +/- 1 mm. This internal volume can vary significantly, especially for blown glass bottles. If filled volumetrically, the level of product will vary creating an appearance of over and under fill. This is especially true when bottles with a narrow neck are displayed side-by-side on store shelves.

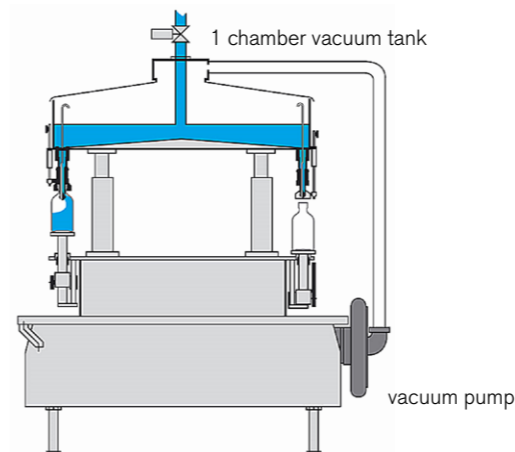
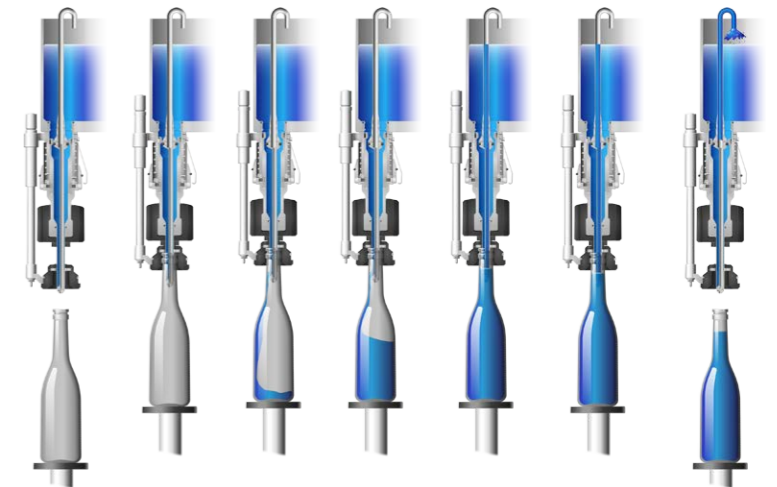
The JBT level filler is an 'overflow' filler. A two-port nozzle enters the bottle and creates a seal against the neck. The product flows into the bottle through one port and air vents through the second port. When full, the product overflows through the second port. The fill level is controlled by how far into the bottle the second port extends.

Depending on the viscosity of the product, the level filler can be delivered in low-vacuum or high-vacuum versions for **100% drip-free filling with a level tolerance of +/- 1 mm** in bottles from as little as 20 cc.



Low-vacuum level filler

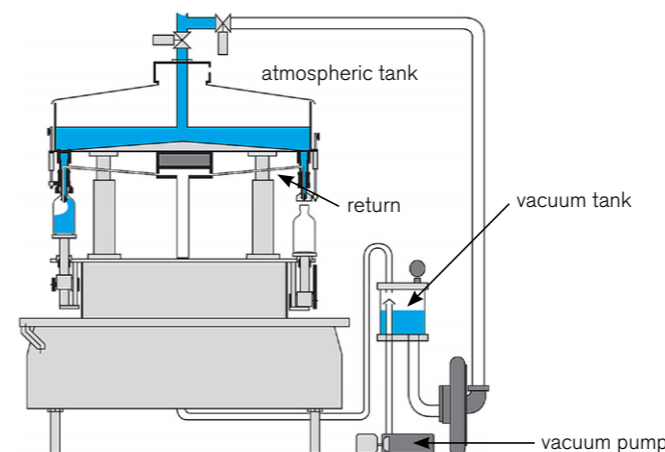
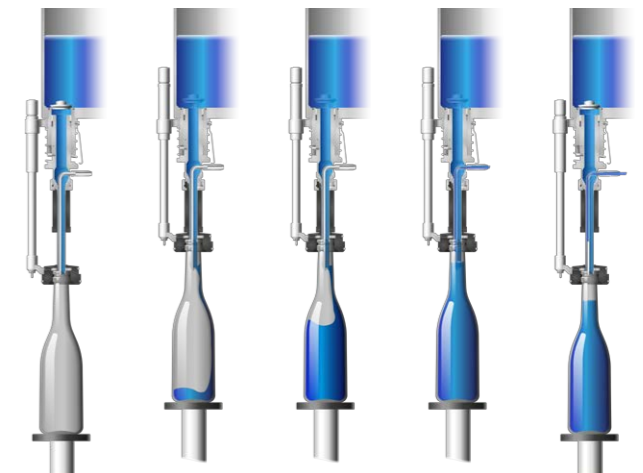
Product flow into the bottle is assisted by a low vacuum of 50 mbar. This makes it suitable for 100% drip-free filling of low-viscosity products.



1. Loading the bottle
2. Lifting the bottle towards the valve
3. Opening the valve
4. Filling the bottle. Product flows into the bottle vacuum-assisted by gravity
5. The required level is reached and filling is stopped
6. The air tube is filled (stable situation)
7. Lowering the bottle and the air tube with excess product is emptied into the tank

High-vacuum level filler

The product flow into the bottle is assisted by high-vacuum ranging from 40 mbar to 400 mbar. This makes it suitable for 100% drip-free filling of medium and high-viscosity products. The design includes two vacuum chambers.



1. Loading the bottle
2. Vacuum in bottle, start filling
3. Product flows into bottle due to gravity and vacuum forces
4. Filling cycle ends, excess product is returned
5. Lowering the bottle. The air tube empties into the return tank.

Dairy & Dairy Alternatives



JBT's rotary level filler is widely used for filling fresh and shelf-stable dairy products. Dairy products must be filled and sealed with great care. To this end JBT supplies the appropriate level of hygienic design to ensure the cleanest possible filling process.

Juices



A JBT level filler for juice in bottles provides the best solution for premium quality juice with an extended shelf life. The product can be filled hot or cold, and even contain fibers and soft particles.

Sauces & Condiments



A JBT level filler with a high-vacuum system for sauces in glass bottles provides the best solution for when headspace needs to be consistent, independent of the glass quality. The product can be filled hot or cold, and even contain small particles.

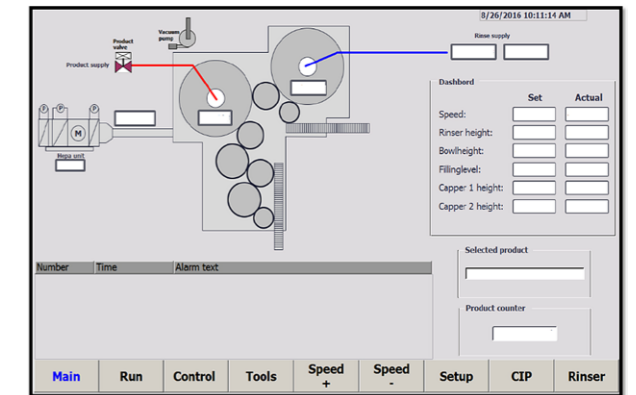
Wine & Spirits



Most spirits are filled in glass bottles. JBT vacuum fillers are renowned to ensure a virtually identical filling level on the supermarket shelves. An advanced vacuum control and bent air tubes minimize alcohol loss and avoids atomizing. The returned product is directed straight into the product bowl instead of spraying against the bowl cover.

All JBT level fillers can be combined with a bottle preheating/rinsing unit and a capper/sealer to form a mono-block machine with a reduced footprint and higher handling efficiency. JBT's durable design of level fillers features automatic and accurate filling level adjustment and quick release change parts, meaning that change-overs are completed with minimum downtime of 10 to 25 minutes (depending on the machine configuration). The new design of the filling valves enables faster filling, quick change-over without tools, and improved cleanability. Moreover, the filler is engineered to be exceptionally friendly to maintain by providing easy access to all long life wear parts. All level fillers are equipped with a centralized lubrication system. As a result, we can count on a large global installed base of level fillers that are still proving their accuracy after more than 40 years of intensive, daily processing. Even though filling machines are trending towards more automation, equipment must be easy for operators to use. JBT has paid special attention to this by designing an intuitive human machine interface (HMI) with panels that are easy to use and read.

The HMI allows automatic adjustment of the complete machine and provides a full overview of the machine status and warnings on the screen. The HMI can be connected to a network with remote support abilities.



With one push of a button CIP (Clean-In-Place)/SIP (Sterilize-In-Place) is activated without need for dummy bottles.

Need a filling solution for dairy-based beverages in single serve, wide-mouth bottles?

JBT offers a high-hygienic and high-capacity filling solution with the Unifiller. This volumetric filler has unique, seal-less, self-draining fill stations allowing Clean-In-Place without fill station disassembly. The unique valve design – with a short product path – allows fast switching of the valve, resulting in high fill accuracy with minimum product give-away and a consistent headspace for trouble-free in-container sterilization. With up to 81 filling stations, it can run wide-mouth glass and plastic bottles at a line speed of up to 900 bottles per minute.

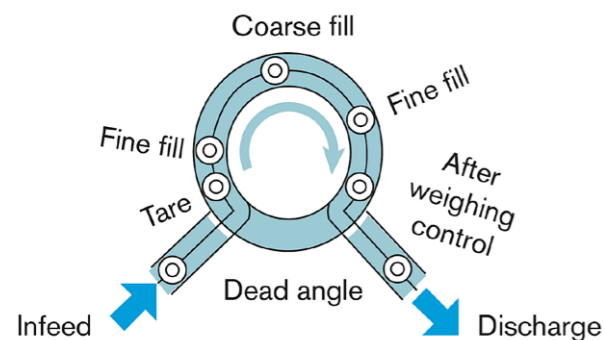
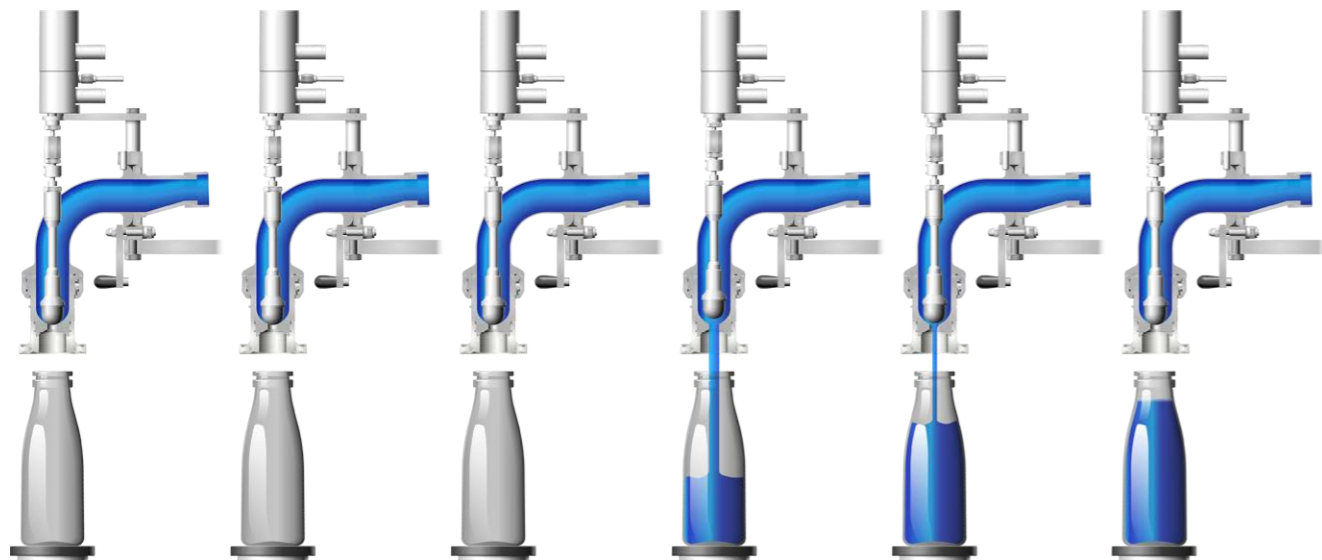




JBT Weight Filler

The JBT rotary weight filler fills liquid foods and beverages into glass and plastic bottles at high nominal throughputs. Its electronic weight filling system ensures high-precision filling with **minimum give-away (maximum 0.5 g with a standard deviation of only 1g in 1l)**.

To this end, each filling station is equipped with a highly sensitive weight sensor, which checks the weight 1,000 times per second and transfers the results to the central control system. It accurately fills - with a hygienic no-contact fill - low and high viscosity products into glass and plastic bottles as small as 100 ml.



1. Loading the bottle
2. Weighing the bottle for approval (taring)
3. Zeroing the load cell plus bottle
4. Prefill the bottle and fill at full speed
5. Fine-filling to the shutoff point
6. Checking the end weight



Hygienic design on demand



The JBT weight filler can be delivered in three configurations to meet your hygienic product requirements:

PRECIFILL™

Designed to fill a broad range of products not requiring an extra clean treatment in a hygienic, contactless way. It fills bottles of 100ml up to 5,000ml at a line speed of 80 bmp up to 550 bpm with minimal product give-away.

PRECIFILL™ HIGH HYGIENIC

This derivation of the PreciFill features a stainless steel roof and a HEPA filter to provide the filling section with a constant supply of sterile air (Class 100 HEPA filtered). Overpressure in the filler with sterile filtered air is vital to ensure harmful bacteria are filtered out of the air inside the

filler. Air is first filtered via a HEPA filter and pumped at a light pressure inside the filter enclosure. The overpressure ensures that no contaminated air is let in to the filling machine during normal production.

The Precifill High Hygienic is equipped with internal CIP-provisions, a self-draining bottom plate, bed flush and external cleaning devices. This machine fills bottles of 100ml up to 5,000ml at line speeds from 80 bmp up to 550 bpm with minimum product give-away.

PRECIFILL™ ULTRA CLEAN

The Ultra Clean filler is designed following sound aseptic principles in their smallest details. This design, especially suitable for Extended Shelf Life (ESL) products, features an extra small filling zone (to minimize the risk of contamination), completely sealed doors, self-draining surfaces and mechanical components located outside the filling area. The sterile air system has additional features that maintain a constant down flow around the filling area to prevent unfiltered ambient air from entering. It complies with EHEDG, EN1672, PMO, 3A and all relevant FDA-CFR regulations. The Precifill Ultra Clean is equipped with internal and external CIP provisions. Small doors are mounted on the machine for service intervention; larger doors are provided for access to change parts while maintaining overpressure during intervention.

This machine fills bottles of 250ml up to 5,000ml at line speeds from 20,000 l/h up to 40,000 l/h with minimum product give-away.



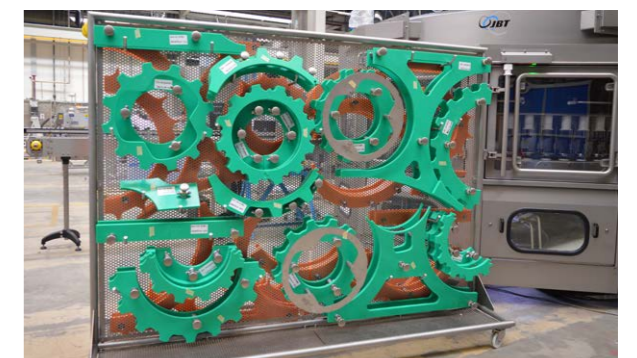
The Ultra Clean Precifill™ features an automatic side door for easy access to the infeed and capper unit



Detail from CIP system



Mechanically and electrically locked side doors for easy access to the filling area of a Ultra Clean Precifill™



Two complete change-over sets on a trolley

JBT Weight Filler Product range



JBT weight fillers can handle a broad range of products and bottle shapes. This results from a well-designed bottle gripper and custom-made filling valves. The bottle neck gripper ensures exact bottle positioning on the weight scale, generating an axial force on the bottle via a neck gripper and eliminates the need for a body gripper. It also allows for quick bottle change-over since only the gripper has to be changed and no other parts in the carousel. Moreover, the gripper has been designed following high hygienic standards, with no springs and an open structure for easy CIP.

Filling valves are designed for each specific application considering dripping, foam formation, presence of product particles, etc. But as they have a modular design, nozzles and outlets can easily be changed to meet future product developments.

All JBT weight fillers can be combined with a neck trimmer unit, a capper/sealer and a reject system to form a mono-block machine with a reduced footprint and higher handling efficiency.

Machine efficiency is ensured by the well-designed graphical HMI with touchscreen panel. All machine

adjustments can be made automatically from the HMI. The full CIP cleaning program, for example, is operated automatically with one push of a button from the HMI and without need of manual interference or dummy bottles. Moreover, the HMI allows remote control and network connection.



Dairy

Our Precifill™ is widely used for filling fresh and long-life dairy products. Especially for ESL (Extended Shelf Life) products, filling and sealing must be done with great care. To this end we supply the Ultra Clean Dairyfill with all the features needed to ensure the cleanest possible filling process.



Edible oil

There is a clear move to lightweight PET bottles in packing vegetable oils. Our weight fillers are often chosen to be the heart of the line. Filling by weight means that the exact desired weight or volume is packed, thereby eliminating product give-away.



Sauces

The fill-by-weight principle is suitable for filling viscous products like sauces, ketchup, mustard, mayonnaise and like products in squeezable bottles, glass jars and glass bottles.



Juice

Our Ultra Clean Precifill™ provides the best solution for premium quality juice with an extended shelf life. The product can be cold filled, even when containing fibers or soft particles.



For more than 110 years, versatility, precision and durability have been the hallmarks of JBT filling systems. All over the world, a broad variety of liquid foods and beverages are precisely filled into bottles and jars, day in and day out.

Stringent present-day requirements concerning hygiene, CIP, ergonomics, operator safety and fast change-over procedures have been implemented to perfect the JBT fillers as the ultimate state-of-the-art concepts for weight, level and volumetric filling.

JBT is your partner for efficient liquid filling. JBT not only supplies stand-alone filling machines, but also provides all-in-one solutions for complete filling lines.

Discover our offering on www.jbtc.com/foodtech or mail us at hello@jbtc.com.



WE ARE YOUR SINGLE SOURCE FOR PROFITABLE PROCESSING & PACKAGING SOLUTIONS

JBT is a leading provider of integrated food processing & packaging solutions. From single machines to complete processing & packaging lines, we enhance value and capture quality, nutrition and taste in food products. With a local presence on six continents, JBT can quickly provide our customers and partners in the food processing industry with the know-how, service, and support needed to succeed in today's competitive marketplace.

JBT LIQUID FOODS

FRESH PRODUCE TECHNOLOGIES | FRUIT AND VEGETABLE PROCESSING | SECONDARY PROCESSING | ASEPTIC SYSTEMS | FILLING AND CLOSING
IN-CONTAINER STERILIZING | HIGH-PRESSURE PROCESSING | POWDER PROCESSING | TUNA PROCESSING

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We're with you, right down the line.™

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