Returnable packaging

THE PRACTICAL CASE OF ORGANIC DAIRY PRODUCTS IN **GLASS BOTTLES AND JARS**

Reuse packaging to drastically reduce waste

According to a 2020 PMMI study on packaging sustainability, 1 out of 4 CPG manufacturers would currently be considering a purchase or equipment modification in order to meet sustainability goals.

And 1 out of 3 would think of implementing reuse, return and refill solutions, one of the 5 options available to reduce the environmental impact of packaging.

For milk and dairy products in particular, returnable glass bottles and jars appear to be a possible option. As a leading partner of the dairy and food industry worldwide, **Serac** is observing an increasing interest for glass packaging machinery and has already delivered several lines specially built to deal with the use of glass containers.

Fostered by a new regulatory framework, favorable to circular packaging, regained interest for glass packaging is spreading within Western Europe and might soon reach the leading countries in Asia, pushed by distribution leaders.

In France for example, some return and refill programs are currently being tested at regional scale to prove the feasibility of circular models (Citeo report 2019).
Glass containers, and in particular reusable ones, require special precautions and call for specific options on the filling line.

This can be done with the integrated solutions provided by **Serac**, thus keeping benefit from the flexibility, performance, and safety our brand is renowned for.

Let’s have a closer look on how we can help you seize the returnable glass opportunity.

Summary

1. Returnable glass : conditions for environmental relevance
2. Container inspection before filling: a mandatory step
3. Thorough decontamination: the benefits of liquid treatment
4. Ultimate versatility: a single line for bottles and jars
5. Filling accuracy: weight filling associated with permanent taring
6. Integrated twist-off capping: good for the planet and consumers

1 - Glass containers

Conditions for environmental relevance

Sustainable packaging is not only about waste. The global environmental impact of each particular case must be considered. Which is why no solution is the best one for every product or industry.

While glass is praised for being highly recycled and eternally recyclable, it also has its drawbacks: primarily weight and energy needed for melting.
Therefore, to be relevant the returnable glass model needs to be kept under control on at least 3 criteria:

Transportation distance

As glass is much heavier than plastic (18 times for a 1-liter bottle[1]), and as dairy products are transported in refrigerated trucks, glass containers should be dealt with as locally as possible.
Otherwise, carbon emissions due to transportation will weigh heavily on the environmental footprint.

Considering the results of a lifecycle analysis carried out by Stefanini et al[1], 250 km could be set as a maximum distance for glass to be able to compete with plastic.

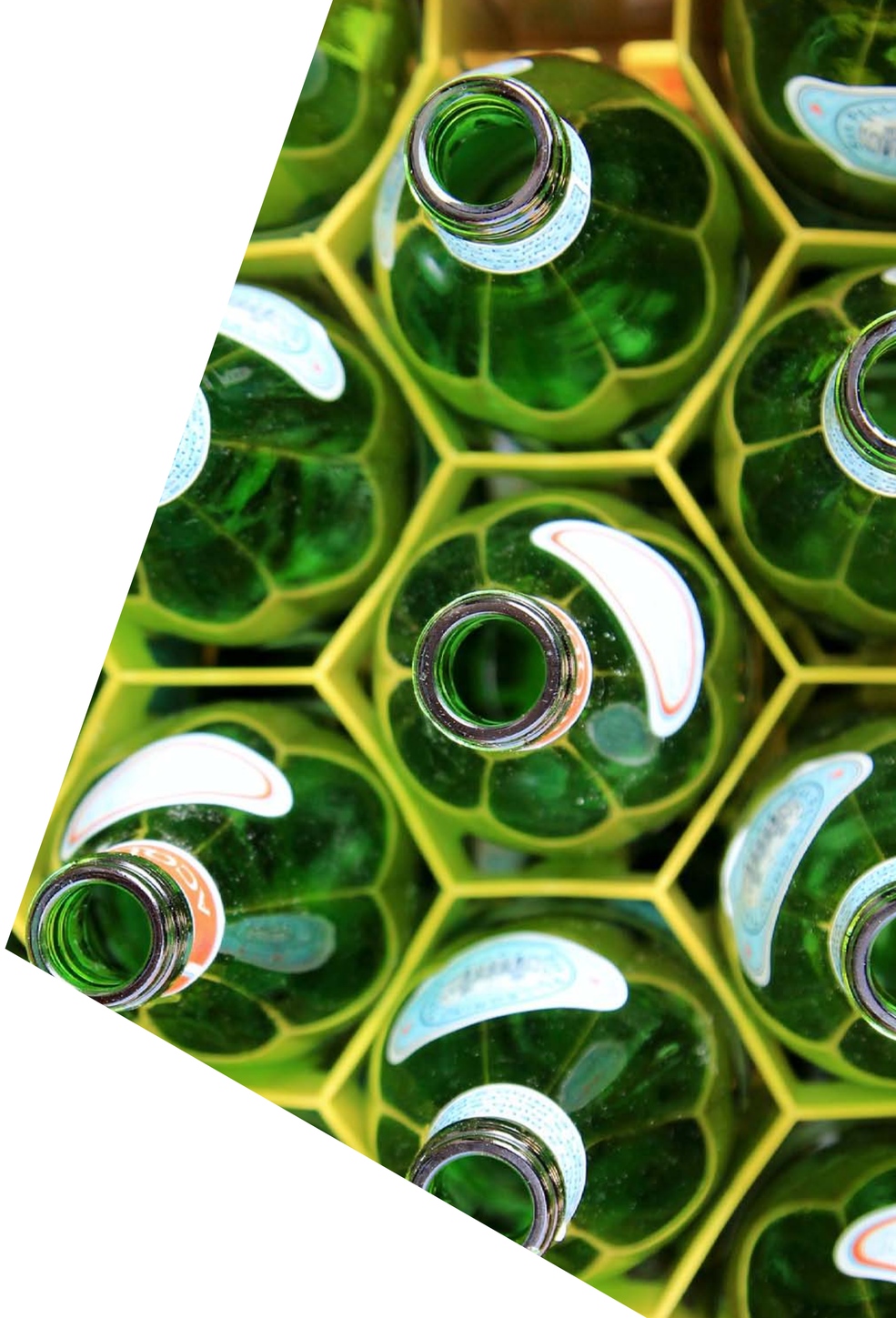
Which means that for the model to be relevant, food factories should be close to distribution centers, again close to retailers and third-party collecting actors (if required).

Number of reuse cycles

It has been demonstrated (Amienyo et al[2]) that if reused once, rather than being recycled, the environmental impact of a glass bottle drops by 40%. But also, that impact reduction shows no significant improvement after the second use and stabilizes after the eighth, due to transportation and washing impacts.

This is why Stefanini et al. built their LCA[2] based on 8 uses (7 cycles + final one). With 8 uses, the Global Warming Potential (GWP) of a returnable glass bottle of milk produced and sold locally is very close to that of a PET bottle.

Therefore, we can consider that to be relevant in the said case under study, a glass refill model shall be based on a minimum of 8 use cycles.



Percentage of containers returned

To have a significant impact on our environment, a majority of containers must enter the reuse loop. According to FEVE, the European Container Glass Federation, 76% of glass containers were recycled in Europe in 2018.

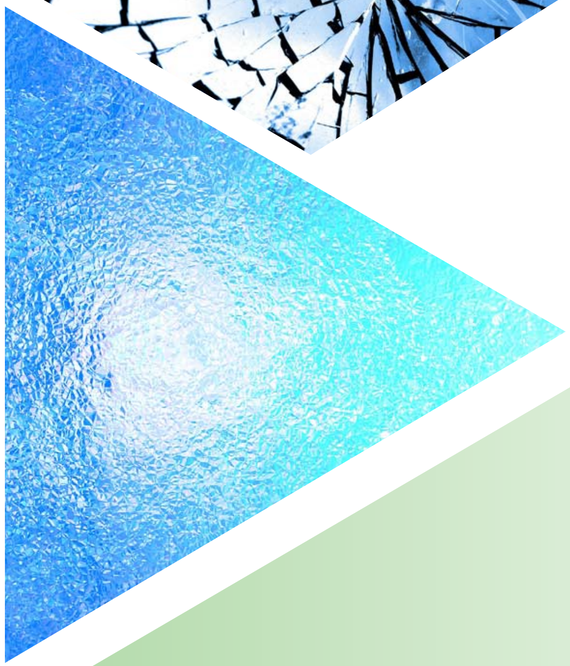
This percentage could be considered as a minimum return rate, in Europe at least. And with proper consumer incentives, the return rate might even be higher, say 80% to 90%, thus maximizing the environmental benefits.

(1). Stefanini, R., Borghesi, G., Ronzano, A. et al. Plastic or glass: a new environmental assessment with a marine litter indicator for the comparison of pasteurized milk bottles. Int J Life Cycle Assess (2020)..

(2). Amienyo D, Guiba H, Stichnothe H, Azapagic A : Life cycle environmental impacts of carbonated soft drink. Int J Life Cycle Assess (2013)

2 - A mandatory step

Container inspection upstream filling



The reuse and refill model works in closed loop with containers designed for a specific product and intended to be reused for that specific product only. In a deposit scheme, the container is the property of the product manufacturer, who grants temporary use against a fee.

Since households, retail shops and cleaning operators are involved in packaging supply, the process is not as secured as an industrial one. To make the model safe, control solutions must be implemented.
And although containers will be sorted at the point of sales and inspected at the cleaning stage, an additional check is required upstream the filling line.

The manufacturer must be 100% certain that:
- the container is the one designed to be filled on his machine,
- the container is not broken or cracked,
- the container is good-looking enough to be used again.

This requires advanced intelligent inspection systems capable of:
- inspecting thoroughly all parts of the containers (base, sidewalls, opening, thread, sealing surface),
- detecting equally faults, marks, foreign objects, stains and remaining liquids,
- differentiating reliably between tolerable signs of wear and threats to safety.

Inspection shall be carried out at high pace, with the lowest false detection rates, which requires state-of-the-art image analysis technology and high processing speed.

Serac is offering to integrate such inspection systems upstream its filling lines with a control capacity up to 30 000 containers per hour.

3 - Thorough decontamination

The benefits of liquid treatment

One of the main issues of reusing containers is to make sure they are safe for the consumers. A simple decontamination with ionized air is not recommended. A much more thorough method is necessary to ensure that the microbiological load complies with safety requirements.

Liquid and gaseous decontamination methods are both available for ultra-clean packaging in the dairy industry. Liquid decontamination can be carried out with ozonated water or peracetic acid (APA), whereas gaseous decontamination is usually done using hydrogen peroxide.

From an environmental point of view, dry methods tend to be preferred by manufacturers since they reduce the use of water (one weak point in the LCA of reusable containers).

However, in a glass refill model, liquid decontamination can be more suitable and provide other benefits :

- A liquid treatment makes it possible to wash containers just before they enter the filling line. Residual moisture in the container will not be an issue for decontamination.

- The mechanical action of the liquid ensures that potential organic and glass debris are detached from container's walls and trapped in the decontamination solution. Debris will be removed together with the liquid by placing the container upside down.

With a complete portfolio of decontamination technologies, **Serac** will adapt packaging lines to the requirements of each company and the return/refill model they are in either self-managed or third-party subcontracted collect and cleaning.

Decontamination stations are fully integrated to reduce transfer towards filling to a minimum. This further enhances food safety and helps secures longer shelf-life.

4 - Ultimate versatility

A single line for bottles and jars

Serac has a longstanding legacy of glass packaging machinery for the food industry, dairy products and sauces, characterized by wide and deep assortments.

The well-known flexibility of Serac's packaging lines is perfectly suited to new production models such as local dairies offering organic products and zero waste packaging systems. A single line will allow to deal with all recipes and glass container types. A typical example is provided by a milk cooperative in Germany, where **Serac** recently implemented a line dedicated to returnable glass.

It is an independent cooperative of dairy farmers which started processing Demeter milk in 1974 and is now the largest Demeter dairy in Germany.

The farmers produce most of their cattle's feed, let cows keep their horn, and practice circular farming. This is part of a regional value chain where ingredients are supplied and products sold from short distances.

The packaging line comprises of:

- a glass inspection system,
- an APA decontamination unit,
- a 30 stations filler,
- a 15 stations rotary twist-off capper.

The line is used to produce:
- pasteurized milk in 500 ml and 1l glass bottles,
- fruit yogurts and quark in 250g and 500g cups,
- with a respective output of 10,000 and 12,000 units per hour.

This flexibility was made possible thanks **to Serac's unique filling technology of Weight filling assisted with overpressure and dedicated dairy filling valves.**

Based on gravity, the weight filling technology is equally suitable for liquid, viscous, and grainy products (such as quark, labneh). Versatility in filling capabilities is provided by using full opening nozzles controlled through the HMI and applying a variable overpressure to compensate for the higher viscosity in some recipes.

The weight filling technology offers the additional benefit of being able to accommodate a 1 to 20 ratio in packaging size, whereas volumetric filling units, for example, can only cope with a 1 to 6 ratio. With a single **Serac** line, the milk cooperative meets all the requirements of its current market and still has the possibility to add new recipes in its portfolio to increase their market share.

5 - Filling accuracy

Weight filling associated with permanent taring

Weight filling is the only technology that controls the weight of product inside the container after flowing through the nozzles. This has long been renowned for its accuracy, and ability to deliver the exact intended quantity of product into the container, where other technologies often require a slight overfilling.

Weight filling's accuracy is independent of the variation in product temperature or viscosity.
With a standard deviation target of 1 sigma (1g/liter), product savings can completely offset the price of the filling machine in a few years of operation.

Applied to glass containers, which are far heavier than plastic ones and thus might show greater weight variations, weight filling requires a very precise monitoring of packaging weight.

This is why Serac is offering a permanent taring function.

With this function, the weight of each glass container is checked before filling. In case of deviation, the net weight monitoring allows immediate individual adjustment in the parameters of the nozzle in charge of filling that particular container.

6 - Integrated twist-off capping

Good for the planet and consumers

Twist-off caps can be recycled

Aluminum lids cannot be collected in order to be recycled. They are too light and are not detected in sorting systems. Twist-off caps, on the contrary, can be detected and recycled. They thus offer a solution for manufacturers willing to develop a fully recyclable packaging. Well adapted for glass bottles and jars, they are also a good option in a return and refill model although they are not reused yet.

Twist-off caps provides additional food safety

Twist-off capping uses steam injection to ensure perfect tightness and sterility of the cap. Steam is applied on the internal face of the cap and injected as well in the headspace of the container. Steam acts as a sterilizing agent on the cap and creates a vacuum effect when cooling down.

The twist-off capping unit is generally separated from the filling unit. **Serac** on the contrary has chosen to integrate both units in a single-block system. The conveying distance and time between filling and capping is thus reduced to a minimum, and takes place in a controlled environment. A single-block system guarantees maximum protection against bacterial recontamination and pollution.

LET'S CREATE PERFORMANCE **TOGETHER**

If you consider installing a packaging line for reusable glass bottles and/or jars, **Serac** can provide technical assistance on your project and supply turnkey integrated solutions.

Serac will support you in sustainable packaging as well as food safety issues and deliver best-in-class technologies to help make your food product an economic success.

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