BEYOND PLASTIC MED

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REUSE

Some theoretical and practical insights

BeMed Business Club
Technical Sheet
July 2022

FONDATION PRINCE ALBERT II DE MONACO · Fondation tara océan explore and share · SURFRIDER FOUNDATION · UICN · MAVA FONDATION POUR LA NATURE

This technical sheet was written based on the interventions of Corinne Fugier-Garrel (L'Occitane en Provence) and Valérie Guillard (University of Montpellier, UMR IATE) at the BeMed Business Club at the end of 2021, and also consists of some additional research.

[Contents]

Reuse, definition and its place in the waste hierarchy

Conventional reuse

Any operation by which substances, materials or products considered as waste are reused for the same purpose for which they were originally intended.[1]

E.g. a bottle is returned to the producer to be washed and refilled.

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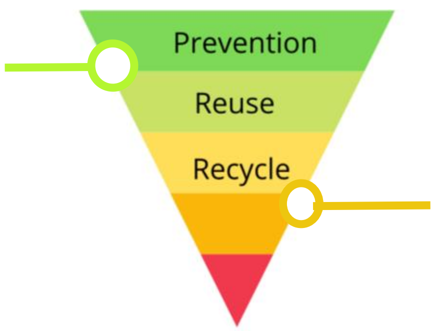


Creative Reuse

Any operation by which substances, materials or products that have become waste are used again.

E.g. A bottle is thrown away at a recycling center, where it is reused to become a vase.

Although in everyday language the term reuse is used interchangeably, it refer to two very different realities in the French environmental code. In English, the distinction between these two words is not commonly used and they are both expressed by the same term "reuse".

Stability of the material during the use cycles

Presentation of the issue

Resistant to use, washing and transport cycles

The reused container must remain stable over time, i.e. it must not degrade, lose its protective properties or its strength, despite repeated contact with food or cosmetics, successive washing and transport cycles. Thus, tests must be carried out to verify the stability of the chosen material throughout its cycles of use.

What about reusable plastics?

The **issue of material stability** during its reuse cycles is an important barrier to its use. Unlike stainless steel or glass, plastic is not an inert material: its properties alter during its cycles of use.

The question arises because of the **migration of neoformed compounds**, molecules formed during the cycle of use of the container and can potentially be toxic to humans. These molecules initially absent from the material can form according to the constraints which are applied to it and the food with which it comes in contact with. In addition, the **hygiene of the container surfaces** must be studied over time, such as the formation of microcracks due to wear and tear and the associated microbiological risks.

Numerous tests are necessary to ensure the safety of containers for food consumption (see a few examples on page 4). However, **the lack of norms and standards** to guide them can slow down the development of this type of solution.

In fact, there are no standards regarding the technical properties that need to be respected for the reuse of a plastic container in a professional or domestic context.

As an experiment, it is possible to transpose the NF EN 12875-1 standard on the mechanical resistance of utensils put in the dishwasher (compliant with the standards until the 125th washing cycle).

Ensure a container is suitable for reuse

Some examples of criterias to test

The **visual aspect** gives an indication of the stability of the material. Consumers pay special attention to this.

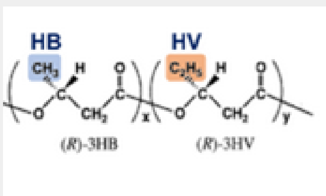
The **mechanical properties** (e.g. impact resistance) must remain stable during the washing in order to allow a good machinability of the containers.

Migration testing verifies that transfers between the container and the contents remain within regulatory norms to ensure the consumer's food safety.

Application example: the case of PHBV and its biocomposites

	Visual aspect	Mechanical property	Migration test
PHBV* pure	No evolution	Overall decrease up to 5 cycles then stabilizes at a satisfactory level up to 125 cycles	Increases and exceeds the limit after 50 cycles
Biocomposites**	Bleaching, wrinkles on the material, broken corners	Very fast degradation	Cellulosic fibers: satisfactory up to 5 cycles Lignocellulosic fibers: migration limit exceeded immediately due to migration of tannins to the content.

Conclusion: Pure PHBV can be reused up to 50 times while biocomposites can only withstand 3 cycles.

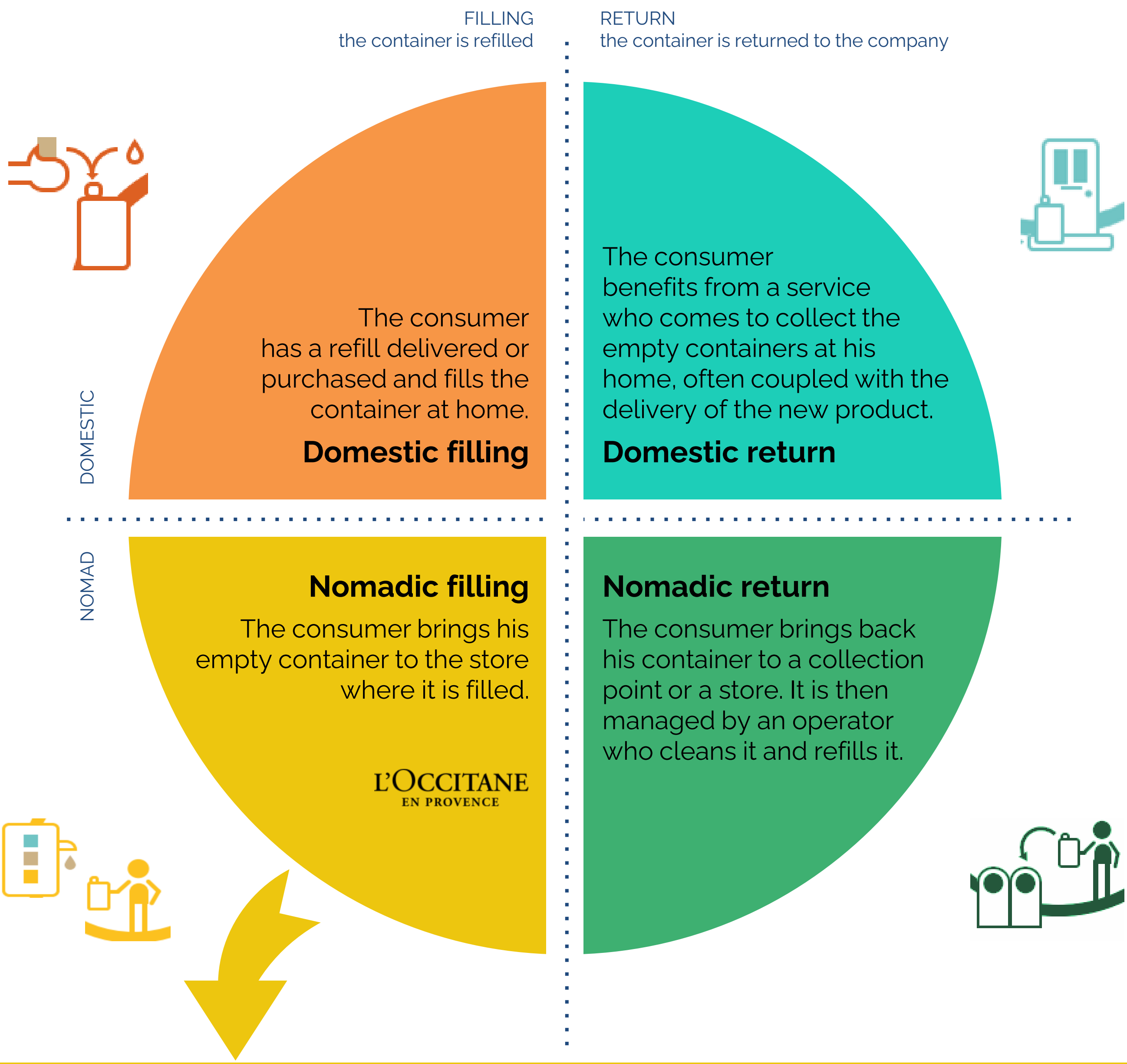


***PHBV** (poly(3-hydroxybutyrate-co-3-hydroxyvalerate) belongs to the polyhydroxyalkanoate (PHA) family. It is a biosourced plastic resin and biodegradable in natural conditions (soil, home compost). It is synthesized by bacteria from organic matter (e.g. sugars, agri and food residues...), then a purification step allows to recover the polymers to form pellets which can then be thermoformed or extruded.

****Biocomposites** are materials based on plastic resins with reinforcements of natural origin, in this case agricultural residues (e.g. cellulosic and lignocellulosic fibres).

Issues on distribution models

Reuse can take many forms, depending on how the reused packaging is distributed and collected. The Ellen McArthur Foundation[2] classifies these models according to a) whether the packaging is refilled or returned to the producer and b) where the operation takes place. This classification excludes B2B (business to business) reuse models.



Nomadic filling solution: the example of reuse fountains by L'Occitane en Provence

L'Occitane en Provence has developed refill fountains in order to offer a range of products in bulk. Customers can keep their bottles and come back to the store to refill them. Five products constituting a complete routine are offered in this format. After a pilot phase, the machines are currently being deployed in volunteer stores.

This system reduces plastic consumption by 94% from the first use.

Key lessons from the L'Occitane en Provence pilot

Testing on a small scale allows you to make mistakes and to adapt the project as well as possible before deploying it. You should not hesitate to make it evolve or rethink your process in order to improve!

After the results of a pilot project, L'Occitane en Provence changed its partner and technology in order to take into account the feedback from the field. For example, the dispensing fountains have been simplified and a sterilizer has been developed.

Collaborating with innovative partners allows us to find customized solutions and to respond to the needs and constraints.

L'Occitane en Provence has surrounded itself with Jean Bouteille, a start-up specialized in liquid bulk, and Claranor, an expert in the decontamination of bottles and flasks.

Anticipate the evolution of the project over time according to its development.

L'Occitane en Provence's fountains are designed to accommodate more products in the future.

Taking a step forward: setting up a new distribution model based on reuse, what are the success factors?

Human factors

Sales **team training** helps to engage staff and better assist customers.

In-store tests and studies show that **customers** are receptive and ready to change their consumption habits in order to limit their environmental impact.

Economic factors

A **favorable *pricing*** policy that encourages customers to consume without packaging via a lower price on the bulk product range for example.

When launching a project, accepting to do tests, with a **distant return on investment** is part of the game. The final objective is that the *business model* holds, but there is a learning curve during which the project is not necessarily profitable.

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Technical and material factors

Low tech allows to limit maintenance problems; and to promote the appropriation of the innovation by the sales teams and the customers.

The issue of **hygiene** is key in the reuse subjects in order to avoid any contamination and to promote the acceptability by the customers.

A **versatile**, **aesthetically pleasing** and **robust** container to simplify the customer experience.

Perspectives, or the importance of comparative analysis

The benefits of reuse

Reuse has advantages in several areas, under certain conditions (see next section).

Business advantages

Cost reduction
including packaging and transportation costs by providing refills for reusable containers in compact form (solid or concentrated).

Strengthen brand loyalty and customer retention with the implementation of a deposit and reward system for reusable containers.

Adapting to individual consumer needs
with models that allow the user to mix and match flavors, customize the packaging or choose the desired quantity.

Improve the user experience
by improving the aesthetics, feel or functionality of the reusable packaging (which can be more premium as its initial production costs are divided by a greater number of uses).

Optimize operations
by achieving economies of scale on transport and logistics by pooling reusable containers across brands, sectors or larger networks.

Gathering information
on users and system preferences by incorporating digital technologies such as RFID tags, sensors and GPS tracking in the reusable packaging.

Environmental benefits

Example: the case of plastic containers

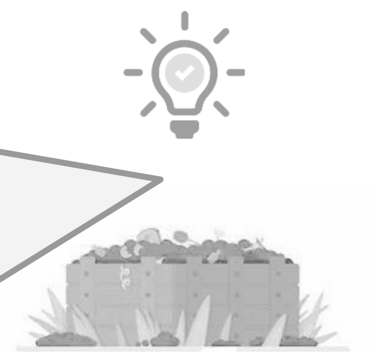
Reusable plastic containers may have some advantages in « reuse » situations:

- Lighter, these containers represent a weight saving option compared to materials such as glass or metal, particularly from the point of view of handling and transport, but also an improvement in the customer experience.
- The possibilities for customizing the packaging are also more varied for the marketer.

On the other hand, and beyond the question of the stability of the material during the reuse cycles mentioned above, the question of the end-of-life impacts of reusable plastic containers arises. Poorly modeled by life cycle analyses (LCA) today (no consideration of the risks of long-term toxicity of plastic), this last aspect is difficult to quantify. Moreover, the reuse of these materials is not an infinite loop, nor is their recycling, as we see with PET (see the data sheet on recycling).

Recycling, reuse and biodegradability are not necessarily antagonistic, and can on the contrary be complementary. Within the framework of plastic reuse, it can be interesting to have biodegradable materials. Indeed, the plastic deteriorates during the cycles of reuse, and is not recycled indefinitely: to make it reintegrate the cycle of carbon at the end of life by the biodegradation is a means of reducing this pollution.

NB. it is necessary to distinguish the theoretical or laboratory biodegradability from the practical biodegradability, which requires that physical, chemical and biological conditions are met.
For more details, see the bioplastics fact sheet.



The conditions to be studied for reuse to have environmental benefits

Reuse **is not a miracle solution** and only represents an environmental benefit compared to disposable packaging under certain conditions. A LCA is often necessary to determine whether the benefit exists and on which aspects. In addition to the number of use cycles of a packaging, here are some criteria that can affect this environmental balance[3] .

	Why/How does this criterion impact the environmental benefit?	Questions to ask yourself
Production of the packaging	Depending on the material chosen, this is often the phase of the life cycle that generates the most negative environmental impacts (e.g. 70% to 80% for a glass bottle[4]). Its environmental assessment is key when defining the reference state against which the model with reuse will be compared.	What is the material of the packaging and its environmental impact? What is the economic and environmental cost of manufacturing the material? What energy sources are used to produce it? What is the capacity of the packaging? What secondary and tertiary packaging is used in the reuse loop?
Transport	In a reuse loop, the packaging is transported many times (e.g., from producer to distributor, then to consumer, then possibly to the collection point and washing facility and back to the producer). For this reason, many reuse loops focus on local networks to limit the potential negative impacts of transport.	What is the distance the package travels on a duty cycle? What is the maximum acceptable mileage for a one duty cycle? What mode of transportation is used? What is the truck fill rate? What is the weight of the packaging? What are the collection methods for empty packaging? Is the collection massified?
Washing	The washing/cleaning of containers is essential from a hygiene point of view and is a determining factor for customer acceptability. This step consumes water and can potentially use polluting products.	What are the conditions for washing the bottles? What are the environmental performances of the machines used in terms of water consumption, energy, use of chemicals? How is the wastewater from the washing center treated?
Losses & Loop Scaling	Losses, are inevitable in a reuse loop, if packaging is not returned, is thrown away, broken or lost. If they are significant, it is necessary to introduce virgin containers. To optimize the operation of a reuse loop and maximize the environmental benefits, these losses must be reduced and sufficient volumes must be available.	What are the collection rates for empty packaging? What are the breakage rates? How much new packaging must be re-injected in each cycle? What are the end-of-life impacts?

The glass bottle case: some key figures

In the context of a local reuse loop for glass bottles, the reused glass generates many positive impacts. However, it is crucial to emphasize that the reuse of glass bottles **only makes sense within a given geographical area and the number of use cycles**!

Recycling Reuse

The study conducted by the firm Deroche[5] in 2009 indicates that the reuse of glass bottles over at least 20 cycles and along a circuit of 260 km round trip allows, compared to recycling :

76% less primary energy consumption

79% less greenhouse gas emissions

33% less water consumption

A more recent study in 2020[6] indicates that within a 200km radius, reusing glass bottles over two cycles has less negative environmental impacts than using single-use glass bottles.

The checklist to evaluate the feasibility and relevance of reuse

If you want to set up a reuse loop, make sure you ask yourself the right questions in order to assess its relevance and feasibility:

- ❑ Is there already a standardised reusable packaging for the concerned product? Will these standards evolve in the coming years?
- ❑ What are the hygiene standards for my product/packaging? How easy is it to follow them in a reuse loop?
- ❑ Can the container cause problems during washing (risk of breakage, water-soluble labels, caps, existing industrial washing solution)?
- ❑ Is the logistic scheme realistic? on the right scale? with the right partners? How is the collection of empty packaging organized?
- ❑ What additional demands will be placed on the staff? Do they have enough time available to deal with it? How will they be trained?
- ❑ If a monetary deposit is applied to the packaging, What is the amount? How and by whom is the deposit/return handled? What is the cost of the chosen solution?

Annexes

Contact

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Sources

1.Environment Code art. L541-1-1

2.Reuse, Ellen McArthur Foundation, 2019

3.ADEME report, Life cycle assessment (LCA) of reuse or reutilization (B to C) systems for household glass packaging, 2018

4.LCA, Distro, September 2021

5.Environmental assessment of the "75 cl Alsace" returnable glass bottle marketed in Eastern France compared to a single-use glass bottle, by the Desroches firm, April 2009

6.Reusing glass bottles in Italy: A life cycle assessment evaluation, Milan, Italy, 2020

This document is based on the interventions of Corinne Fugier-Garrel (L'Occitane en Provence) and Valérie Guillard (University of Montpellier) at the BeMed Business Club. This document has been synthesized by ©ConsultantSeas.