Roadmap to Optimise Closed Loop Recycling of Glass Packaging

close the glass loop

June 2024

The objective of Close the Glass Loop is to reach 90% collection for recycling of glass packaging in the EU by 2030, and to ensure that the recovered material is of good quality and fed back into the manufacturing of new glass packaging containers.

From the moment a glass container leaves a manufacturing plant, to the moment it comes back for recycling by re-melt, and all the steps in between, every part of the value chain plays a key role to ensure that glass expresses its unique attribute of infinite recyclability without loss of its material properties.

Likewise, every decision taken at every point of the chain will have an impact on all the other parts. In that context, the goal of this Roadmap is to set a pathway for Close the Glass Loop to further support the **continued optimisation of the closed loop glass recycling process**.

In the context of closed-loop glass recycling, sorting glass coming from collection to get furnace-ready cullet as well as remelting furnace-ready cullet into new glass containers are both part of the virtuous recycling chain of glass.

In this document:

- **we provide information on glass packaging and the closed loop glass recycling process,**
- **we outline the key challenges to maximise the uptake of recycled content in the manufacturing of new glass containers,**
- **we propose actions and pathways to address these challenges.**

Contents

Glass packaging for the circular economy

Glass, a fit-for-purpose material

Safe and inert, glass was one of the first materials to be used as a packaging. Packaging glass is manufactured with virgin raw materials (sand (SiO_2), limestone ($CaCO_3$) and soda ash (Na_2CO_3)), as well as secondary raw materials (recycled glass).

As a permanent material, glass is an ideal material for the circular economy. It is 100% recyclable and can be re-melted infinitely with no loss of quality and no functional limitation for food contact applications where it is predominantly used.

In 2021, more than 83.3 billion bottles and jars were produced in manufacturing plants in more than 20 European countries, making Europe one of the largest centres for glass container production in the world.

Glass containers have been developed to provide a wide array of shapes, sizes and colours that are well suited to package a variety of products.

Each market segment uses a diversity of shapes and sizes for their glass packaging, as well as colours, which is an important characteristic of glass containers.

The vast majority of glass containers are constructed from flint (present in all market segments), amber (present especially in beer and pharmaceutical products) or green glass (present especially in beer and wines).

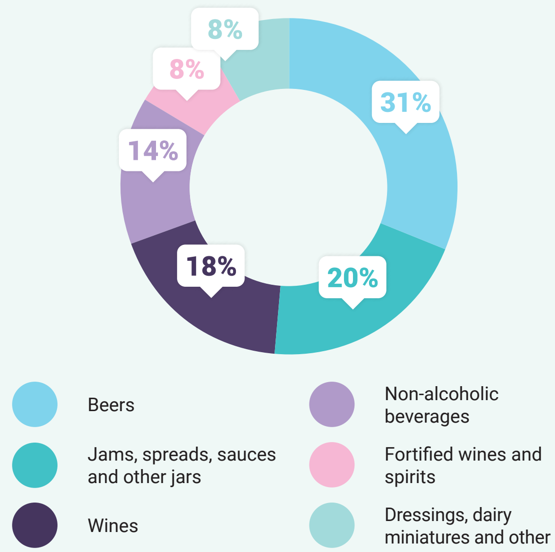
Other colours may be used (blue, purple…) but their occurrence is almost negligible compared to flint, amber and green glass. It is important to note that all coloured glass pieces can always be re-melted in a glass furnace to produce new glass containers.

In addition to aesthetics and brand identity, glass colour can also be functional to preserve the product. Products that are affected by light, such as pharmaceuticals and beer, are usually packaged in amber containers because amber glass transmits the least amount of UV radiation; whereas foods are usually packaged in flint containers to enable an unobstructed view of the contents.

83.3

billion glass bottles and jars produced in Europe in 2021

Breakdown of glass packaging sales by market segment (excluding the perfumery, cosmetics and pharmaceutical sectors)[1]



1 Source: FEVE

Cullet

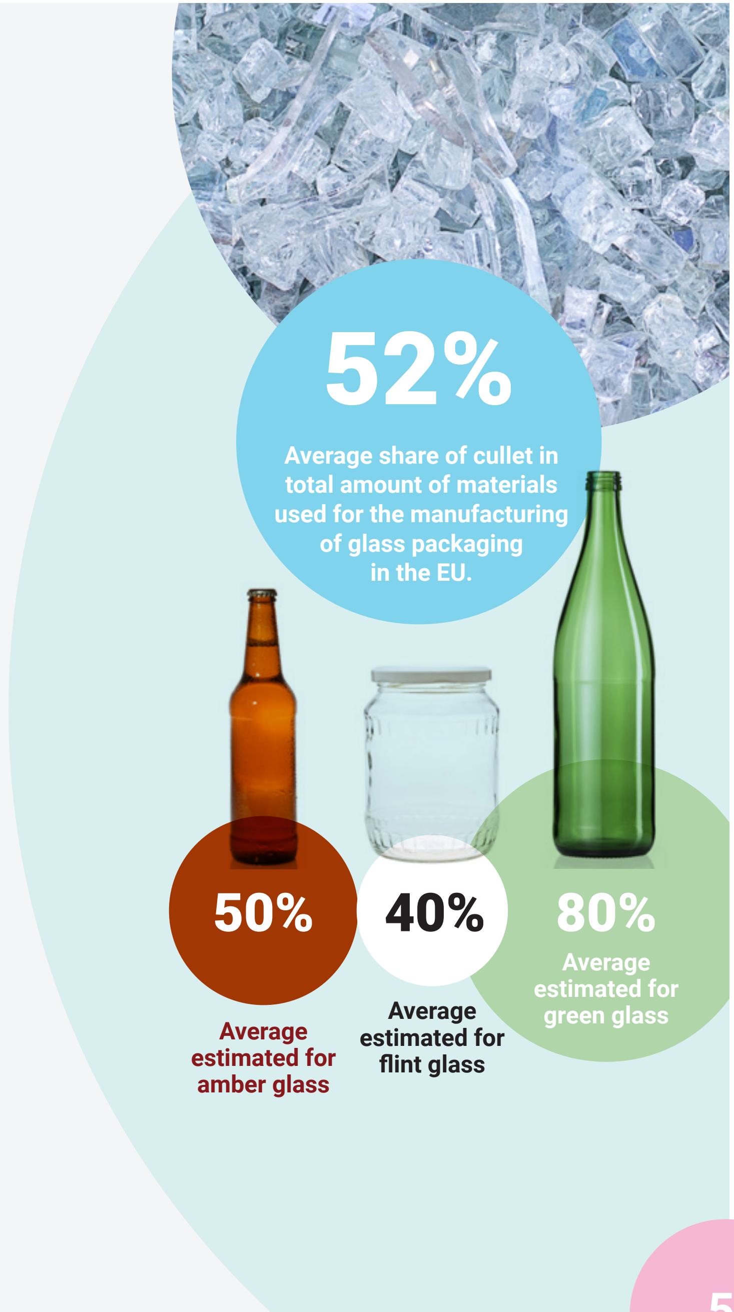
Glass that is recovered and used to replace raw materials in glassmaking is known as “cullet”. Technically, because of its material properties, glass packaging could be produced with up to 100% cullet.

With the gradual increase of glass collection for recycling in the European Union, made possible by the implementation of separate collection for household packaging and the development of collection, sorting and recycling infrastructure, there has been an increasing amount of cullet available for re-melt in glass manufacturing processes for glass containers.

As a result, cullet has become the most important raw material that is used to produce new glass packaging solutions, replacing sand, limestone and soda ash.

On average, cullet represents 52%[2] of the total amount of materials used for the manufacturing of glass packaging in the European Union.

In practice, the uptake of recycled content in different colours of glass varies across colours (the average was estimated to be 80% for green glass, 50% for amber glass and 40% for flint glass in 2012 and these figures will have improved considerably since). These differences between colours can be explained by the limited availability of cullet and by market requirements on the colour of the container (e.g. for flint glass there is a very high expectation on total transparency).



2 FEVE 2012 Life Cycle Assessment

End-of-waste: from glass waste to glass cullet

Unlike other waste streams, glass has a special status under European legislation as it benefits from an "End-of-Waste" regulation.[3] Under this regulation, glass that has been separately collected and processed under an official and externally controlled quality system, can be labelled as a material and no longer a waste provided it is sent for recycling by re-melt. This material is generally referred to as "Furnace-Ready Cullet" and can circulate freely in the internal European market. In Annex I of the regulation there are some minimum criteria on the material, establishing certain thresholds for the presence of contaminants. In practice, glass manufacturers have set their own acceptance criteria, which are usually even stricter than those of the regulation. Additionally, these criteria have become more and more stringent with the evolution of sorting technology.

3 European regulation EU N°1179/2012 of 10 December 2012

Closed loop recycling and recycling

Recycling is defined by the European legislation as "any recovery operation by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes."[4]

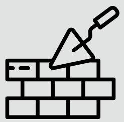
In the case of glass packaging, three routes are possible: [5]

Closed loop glass recycling

Whereby glass packaging is reprocessed for the use in a new glass packaging.

Open loop glass recycling

Whereby glass packaging is reprocessed for the use in a glass manufacturing process other than container glass (i.e. especially in glass foam and glass wool).



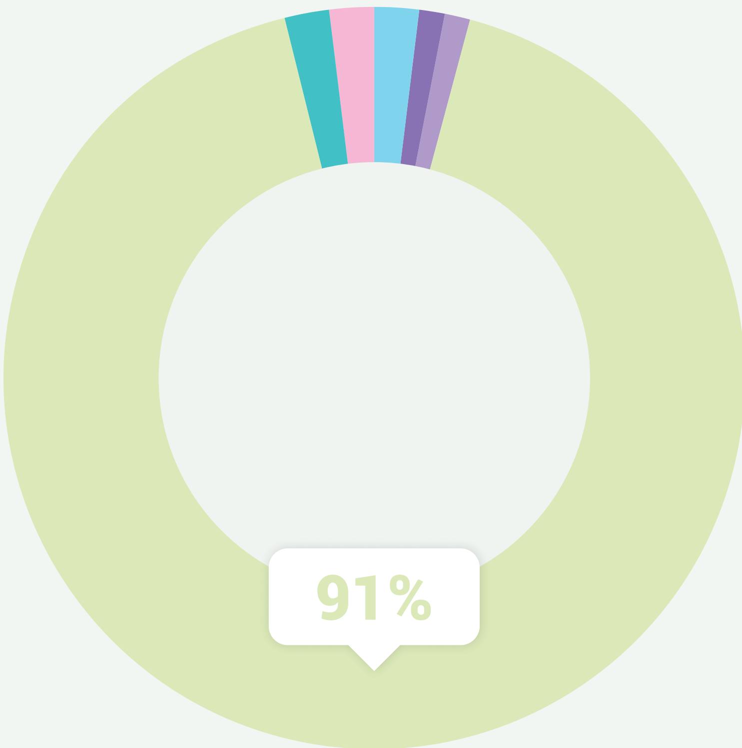
Open loop recycling

Whereby glass packaging is reprocessed for the use in a process that does not require re-melt (i.e. brick-making, construction materials, filtration media, abrasive materials, glass sand substitute).

4 European Waste Framework Directive (2008/98/EC)

5 Performance of packaging glass recycling in Europe report

According to the Close the Glass Loop study on the Performance of Packaging Glass Recycling in Europe in 2019,[6] the closed loop glass recycling process represents 91% of the total tonnage of glass packaging recycled in 2019.



	Tonnes	Share	
Glass packaging manufacturing	6,289,652	91%	Closed loop glass recycling
Glass foam manufacturing	166,000	2%	Open loop glass recycling
Glass wool manufacturing	134,200	2%	Open loop glass recycling
Brick-making	110,100	2%	Open loop recycling
Backfilling	65,000	1%	Open loop recycling
Construction materials	59,844	1%	Open loop recycling
Filtration media	24,200	<1%	Open loop recycling
Special Glass manufacturing	18,703	<1%	Open loop glass recycling
Abrasive materials	7,346	<1%	Open loop recycling
Glass sand substitute	200	<1%	Open loop recycling

There are 3 categories for glass recycling:

- **Closed loop glass recycling**
- **Open loop glass recycling**
- **Open loop recycling**

6 Performance of packaging glass recycling in Europe report

The benefits of closed loop glass recycling

In the manufacturing of packaging glass, around 20% of the CO_2 emissions come from virgin raw materials (process emissions from decomposition of carbonates in the virgin raw materials). These emissions can be reduced if virgin resources are replaced with cullet.

20%

of CO_2 emissions come from virgin raw materials

Each time 1 tonne of cullet is introduced into a glass furnace:

It avoids the extraction of ~1.2 tonnes of virgin raw materials.

-1.2t

It reduces the CO_2 emissions by 580 kg on a Life Cycle basis[7] (cradle to cradle). On average, a 10% increase of cullet in the furnace decreases CO_2 emissions by 5% on gate to gate basis.

-580kg

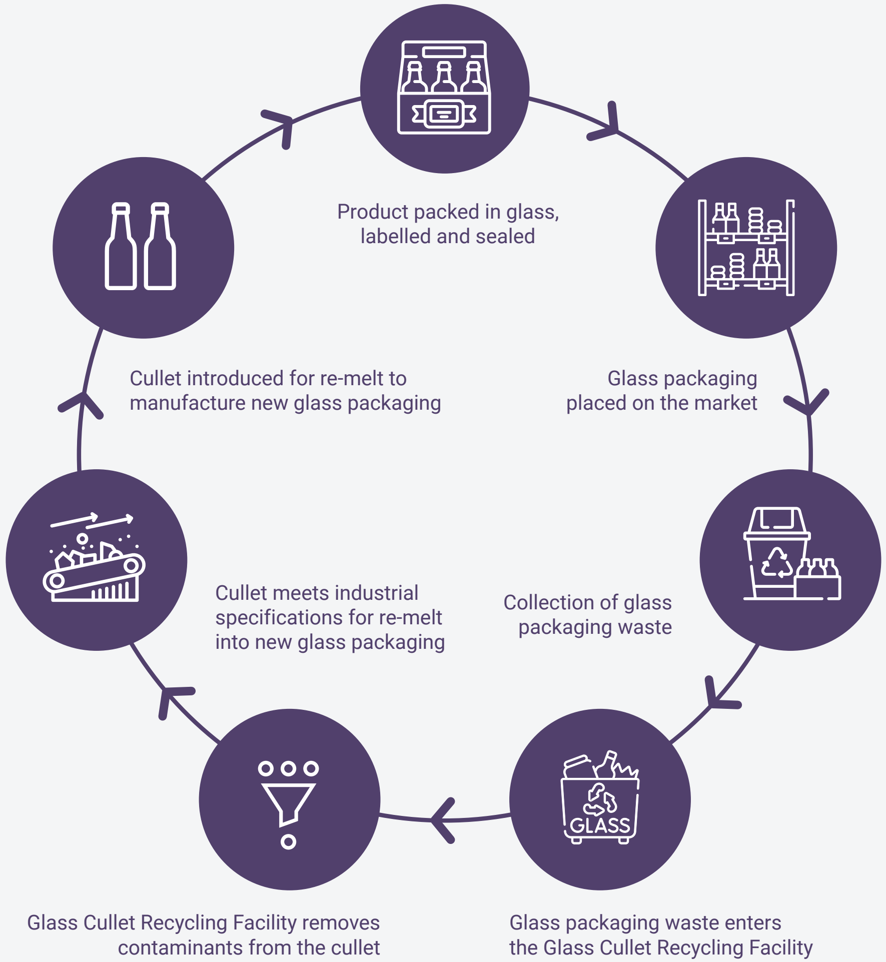
It reduces the energy consumption of the furnace: as a rule-of-thumb for large furnaces, every 10% increase of cullet will reduce the energy consumption of the furnace by ~2.5% on gate to gate basis but this can vary depending on furnace size.[8]

-2.5%

7 Based on FEVE 2012 LCA study

8 See page 314 of Glass BREF

The closed loop glass recycling process



The value chain

After a glass bottle is manufactured, it goes to a filling line where it is filled, closed or sealed, and labelled. The product packed in glass is then distributed to the market, where it is consumed and discarded. If it is collected for recycling, the glass packaging waste is sent to a Glass Cullet Recycling Facility where it is sorted and prepared for recycling by re-melt in a glass packaging furnace, for the production of a new glass containers.

Each part of the value chain has a role to play to maintain the material in a closed loop. In particular, we can highlight 4 key pillars:

Product design | **Collection** | **Sorting** | **Re-melting recycled glass**

Product design

The product design phase is essential to ensure that:

- Closures, labels and other components can be easily sorted and separated from the glass packaging during the glass recycling process;
- Complementary materials to glass packaging that may be collected together with the glass (e.g. closures, labels…) should have recycling systems available, even if this does not influence the overall closed loop glass recycling process;
- The glass itself must be fully identifiable and detectable as glass during every phase of the sorting process.

Collection

The collection method is essential to:

- Separate glass at source from other materials such as paper, metals, plastics… Separate collection of glass, which may include separating glass by colour, is key to ensure a high quality of cullet. Although separate collection has now become the norm almost everywhere in the EU, some countries are still collecting glass with other waste, which is generally less optimal to ensure adequate cullet quality;
- Reduce the presence of contaminants (stones, ceramics, plastics…) in the glass packaging waste collected, so that more glass can be maintained in the subsequent sorting process;
- Avoid unnecessary handling which results in repeated breaking and produces tiny glass pieces (i.e. fines) that are then more difficult to sort and recycle.

Sorting

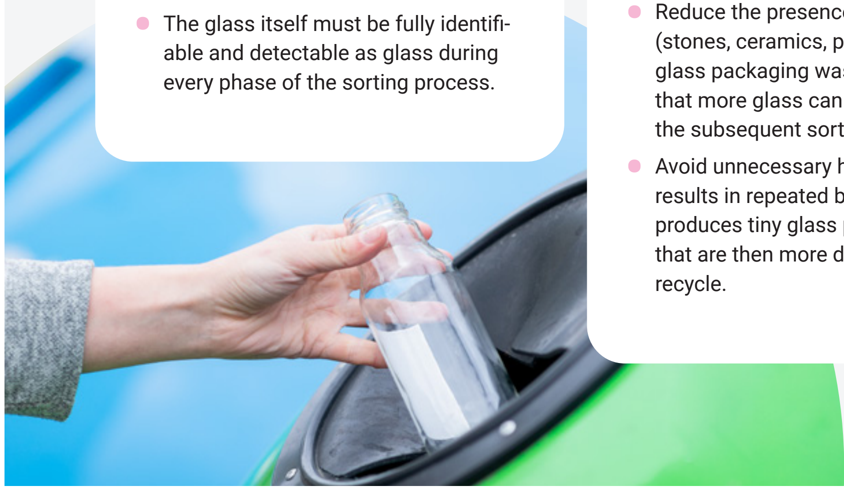
The sorting process within a Glass Cullet Recycling Facility is essential to:

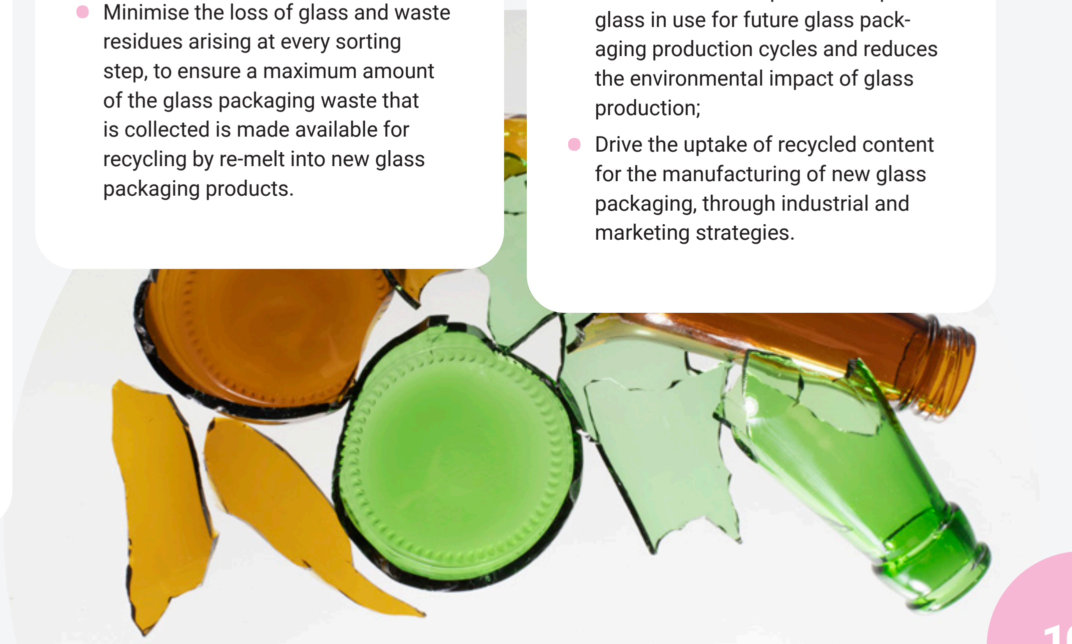
- Remove the contaminants from the glass packaging waste to meet industrial specifications for recycling by re-melt into glass furnaces;
- Sort glass according to colours;
- Minimise the loss of glass and waste residues arising at every sorting step, to ensure a maximum amount of the glass packaging waste that is collected is made available for recycling by re-melt into new glass packaging products.

Re-melting recycled glass

The recycling by re-melt process within a Glass Packaging Manufacturing furnace is essential to:

- Guarantee the effective recycling of cullet into a new glass packaging, which is the best option to keep glass in use for future glass packaging production cycles and reduces the environmental impact of glass production;
- Drive the uptake of recycled content for the manufacturing of new glass packaging, through industrial and marketing strategies.





The process within a Glass Cullet Recycling Facility

The process within a Glass Cullet Recycling Facility is the intermediary step in the closed loop between collection and recycling by re-melt. According to the Close the Glass Loop study on the Performance of Packaging Glass Recycling in Europe in 2019,[9] 92% of all waste materials entering Glass Cullet Recycling Facilities come from municipal waste sources, 6% from post-consumer glass other than municipal waste and 2% from pre-consumer glass.

Glass Cullet Recycling Facilities employ various pre-treatment techniques and sorting machinery, equipped with high tech devices, capable of detecting glass and removing all other contaminants. They are designed to optimise the output from post-consumer waste collection and management systems, which are exposed to varying degrees of contamination due to lack of separate collection infrastructure, lack of sufficient information or signage, poor consumer behaviour or negligence in logistics and management.

Despite being highly exposed to the challenges of post-consumer waste management, we estimate that 92% of all waste materials entering the Glass Cullet Recycling Facilities are effectively recycled in Europe. Furthermore, 91% of those materials effectively recycled were recycled in a closed loop glass recycling process, 5% were recycled in a glass manufacturing process other than glass packaging, and 4% were recycled in an open loop recycling application.[10]

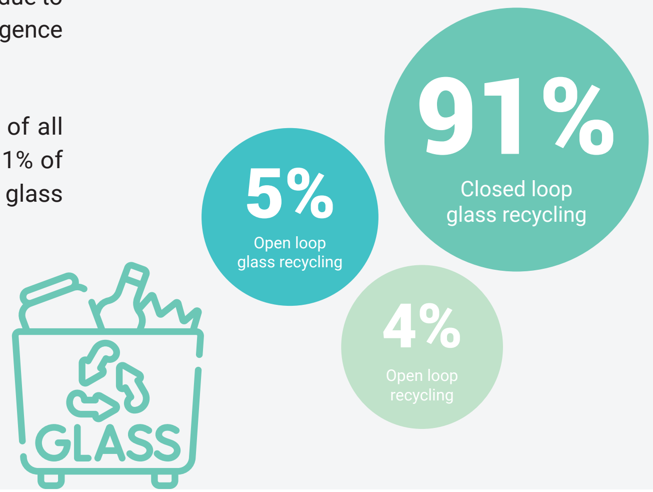
9 Performance of packaging glass recycling in Europe report

10 Performance of packaging glass recycling in Europe report

Inputs to Glass Cullet Recycling Facilities

- **92%** — **Post-consumer glass from municipal waste** (accounting towards EU glass recycling rate)
- **6%** — **Post-consumer glass other than municipal waste** (accounting towards EU glass recycling rate)
- **2%** — **Pre-consumer glass** (not accounting towards EU glass recycling rate)

Recycling outputs of Glass Cullet Recycling Facilities



Although the order may differ according to the different installations and machinery in place, **the process is based on several key steps highlighted below.**

STEP 1
Preparation of the material

- Arrival and storage of the waste
- Pre-sorting of non-glass fractions
- Crushing
- Drying and cleaning

STEP 2
Intensive and repeated sorting processes

- Pneumatic sorting of the light fraction
- Mechanical sorting of metals
- Mechanical sorting based on optical photoelectric sensor properties

STEP 3
Further processing

STEP 4
Quality control

STEP 1

Preparation of the material

Arrival and storage of the waste

The collected glass waste arrives at the Glass Cullet Recycling Facility where it is first controlled, stored and exposed to external atmospheric conditions. Thanks to the combined effects of moisture (mostly present as drink residues in the collected material, rain, snow) and light (particularly UV sunlight), the glass waste undergoes a natural, partial separation process, i.e. organic fractions such as labels, paint and sleeves can already become detached from the glass.

Pre-sorting of non-glass fractions

After this natural process, the waste is taken by a front loader to a hopper and then on to a first conveyor on which manual sorting could be performed to remove large non-glass items which are often found in the waste stream, such as CSP (Ceramic, Stones, Porcelain), and more rarely bags, shoes, clothes, toys, WEEE (waste of electric, electronic equipment)… This contamination of the glass waste can occur through lack of sufficient information and signage, poor consumer behaviour or negligence and poor collection logistics.

Crushing

After the preliminary sorting phase, the fraction above 50 mm of the glass waste is crushed in such a way that the majority of the glass is broken into smaller glass pieces with a size range between 3 and 50 mm. The main objective of this step is to produce a homogeneous material, with glass pieces of a limited range of sizes, which allows for ease of conveying through the installation and for optical sorting. The challenge, however, is to crush the material without creating a fine fraction whereby the glass pieces are so small (below 3 mm) that they may no longer be detected.

This is mostly achieved by using mechanical roll type crushers instead of rotating mills.

Drying and cleaning

This step helps to create a homogeneous material composition further purifies the glass fraction from:

- Any remaining food residues (beverages, jam, vegetables, sausage…),
- Moisture (inherent and because of the outside storage) avoiding the gluing of several glass pieces,
- Small organic fragments decorating the packaging, such as paper or plastic pieces of labels and sleeves, varnish, ink, coatings, which have not been removed in the natural process.

The drying and cleaning phase is usually performed by dryers that work on a temperature between 180 and 200°C, combining temperature and mechanical erosion in a heated rotating drum or flat bed, equipped with a cyclone and an air filter.

STEP 2
Intensive and repeated sorting processes

Once the material has been prepared, the glass pieces are spread in a single layer over the entire width of the conveyor and are submitted to several sorting steps during a controlled fall, with a positive or negative sorting where contaminants are gradually removed:

Pneumatic sorting of the light fraction

Light fractions remaining after the pre-sorting and drying are sorted thanks to a vacuum system that sucks off the light fractions such as pieces of paper and plastic labels, sleeves, corks, aluminium foils and closures, neck covers (in aluminium, tin or plastic, …), plastic closures.

Mechanical sorting of metals

The separation of metals is done by 2 systems, based on the electric and magnetic properties of the metal:

- ferrous/magnetic metals are removed via magnets;
- non-magnetic metals are removed by an eddy-current device

Such equipment are frequently used several times along the treatment process in particular at the entry of the process.

Mechanical sorting based on optical photoelectric sensor properties

The optical sorting system is calibrated to perform the following separations:

- Removing the remaining contaminants at different steps:
  - Ceramic, Stones and Porcelain
  - Lead-containing glass: classic crystal glass or accidentally introduced CRT glass from screens
  - Heat resistant glass
  - Borosilicate glass (used in and by laboratories)
- Separating glass by colour (green, amber, flint glass…. and other colours depending on the request)

During this sorting phase, the broken down pieces of material fall one-by-one in the machine and are lit by a calibrated light ray (nowadays generally LED technology). On the other side, cameras are detecting the received light, analysing it and determining whether or not the light is transmitted through the material:

- In case of non-transmission, the material is considered as non-glass, and a signal is given by the camera to a nozzle placed lower. This nozzle generates a jet of compressed air, deviating that piece of non-glass material from its vertical fall onto another conveyor.
- If the light is transmitted, no action is taken by the machine, the piece of glass falls vertically on the receiving conveyor below.
- For the colour sorting, a potential signal is given in function of the measured/modified wavelength.

The development of increased sensitivity in electronic systems and cameras allows the detection of ever smaller pieces of glass and non-glass fractions and has greatly enhanced the efficiency of optical sorting.

Repeat

To ensure the removal of contaminants the material can either be returned by conveyor to the same sorting machine for a second pass or carry on to an identical machine which can be placed in the next stage of the process.

STEP 3
Further processing

As the efficiency of the sorting machines decreases together with the size of the glass pieces, further processing is required after the sorting phase to optimise the overall output of the process. In particular, one technique that has been developed is grinding the rejections from the optical sorting process, which include glass and non-glass materials, into glass sand. This glass sand is composed of glass and non-glass particles below 1 mm that melt like glass in the furnace, without producing inclusions in the glass container. Glass sand can therefore be considered as a complementary secondary raw material to cullet, with its own technical specification to match glass furnace requirements.

STEP 4
Quality control

As well as the recorded data on sampling and quality control they receive from Glass Cullet Recycling Facilities, glass producers generally perform their own quality control on site and on each batch, before organizing its transport to their furnace. A conformity check is additionally performed on each delivery at the gate of the furnace.

Maintaining glass in the closed loop: the main challenges

Removing contaminants from post-consumer waste management

The main challenge for closed loop glass recycling is its massive reliance on post-consumer waste management, which is one of the most volatile waste streams dealing with variations in consumer engagement, as well as different rules and regulations applying for different municipalities where the glass is collected.

There is no single model for the collection of glass packaging waste in the European Union. Collection methods vary from street containers (also called "bottle banks") to kerbside collection (also called "door-to-door"), from mono-material to comingled with other materials, from colour-separated to mixed colours, or from municipal take-back systems to deposit-return schemes. The characteristics of the collection method will largely influence the total amount of glass packaging waste collected for recycling and the levels of purity with regard the quality of the collected glass packaging waste.

In that context, standards are difficult to enforce and the quality of the incoming material can vary for every delivery. As a result, the presence of contaminants in the collected material is a major issue for closed loop glass recycling.

There are two types of contaminants:

- **Expected contaminants** are all those materials that are functional to the glass packaging itself and have been placed in the separate collection with glass. The main expected materials are: organics (closures, labels, food residues…), metal closures and foils, and ceramic closures in markets where bottles have ceramic closures.
- **Unexpected contaminants** are materials and products that should never have been placed in the separate collection for glass. For unexpected materials, the list is wide and varied. Over time, Glass Cullet Recycling Facilities have learnt to cope with varying degrees of unexpected contamination.

In addition to the presence of contaminants, collection methods and transport logistics can have a detrimental effect on the quality of the incoming material. In some case, to save space and time, glass collection services use compaction trucks that crush the material. However, when crushing happens in an uncontrolled environment, the material is crushed into pieces that are so small they are impossible to separate, generating major losses in the process.

The table after highlights why contaminants are such a problem for closed loop glass recycling, during the recycling phase both by sorting and by re-melting.

Contaminants	Challenges for closed loop glass recycling	
PHASE IN THE CLOSED LOOP RECYCLING PROCESS	**SORTING**	**REMELTING IN A CONTAINER GLASS FURNACE**
Organics	• Organics can cause damage to the sorting equipment and may represent a fire hazard through the production of combustible dust with dryers – whereas glass dust is non-combustible. • Organic contaminants represent a cost as they are either sent to landfill or energy recovery.	• Plastic pieces can remain intermingled with cullet that is fed into a melting furnace. • Creates bubbles and foam, introducing gas bubbles into the melt that is removed by adding a fining agent such as sodium sulphate. Vaporizing plastic and using fining agents produces air emissions. • Too many organics may alter colour stability.
Metals	• Metal parts can be difficult to eject due to their shape • Metal parts can be difficult to eject when combined with ceramic swing-top closures. • Safety could be jeopardized by certain non-magnetic closure system (see example)	• It is crucial to remove all traces of metals as these materials are totally banned from the production of new packaging: metals have different melting points to glass, are not miscible with glass and damage the refractories of the glass furnaces. • Metal particles generate inclusions in new glass packaging, causing a weak/breaking point during the cooling process of the packaging production, during the transport of empty packaging, during their filling, or during storage and use. This is a particular problem for carbonated beverages. • Steel can cause colour variation to the glass.
Ceramics, Stones, Porcelain	• Thin porcelain has too much light transmission and gets confused with glass • Some parts can be difficult to eject due to their shape • These fractions get broken down into small pieces and become part of the fine fraction, which is not always accepted by glass makers.	• Ceramics, Stones and Porcelain contaminants have higher melting point than glass • They cause unacceptable defects and inclusions in the final glass packaging products • Can create damage to the scissors cutting the molten glass and create worker safety issues
Lead-containing glass	• These fractions get broken down into small pieces that are difficult to sort and become part of the fine fraction, which is not always accepted by glass makers.	• Lead-containing glass is a contaminant for the production of glass packaging containers.
Glass with special composition	• These fractions get broken down into small pieces that are difficult to sort and become part of the fine fraction, which is not always accepted by glass makers.	• Glass packaging is made of soda-lime glass. Other glass compositions (e.g. borosilicate glass) have higher melting point than glass, can cause unacceptable defects in the final glass packaging products

Reducing glass losses in the sorting phase

At every step of the sorting process, removing contaminants means there is a risk of a small amount of glass being lost to the system. The challenge is to work towards reducing these glass losses to ensure more glass material goes to the closed loop recycling process.

There are four main phases where steps can be taken to support the reduction of glass losses:

Collection

By ensuring separation at source is performed to avoid the presence of unexpected contaminants in the collected material

Sorting

By constantly improving the precision and accuracy of sorting techniques and equipment.

Processing

By developing techniques to optimise the use of glass within the rejected fractions by the optical sorting systems (glass sand).

Product design, by

- Ensuring that non-glass materials attached to the glass packaging are easily separated and sorted from the glass.
- Ensuring that non-glass materials attached to the glass packaging do not obstruct the transparency of the glass, so that the optical sorting systems recognise the material as glass.
- Ensuring that the glass itself must be identifiable as glass by the optical sorting systems.

Meeting rigorous industrial specifications

At the end of the sorting process, glass cullet must meet rigorous industrial specifications in order to be recycled in a closed loop glass recycling process. These specifications are key to protect the glass packaging furnaces from damage by contaminants, as well as the new glass containers from defects or defaults that would be unacceptable to the markets they are serving.

The challenge therefore is double: removing all contaminants to ensure a maximum quality of cullet, while reducing losses that are, to some extent, inherent to any sorting process.

Actions & pathways towards optimising closed loop glass recycling

Adopting principles for good collection practices

The link between collection and sorting is critical to the closed loop glass recycling process. The least amount of contaminants in the incoming material, and the least the material is crushed before entering the Glass Cullet Recycling Facility, the lower the risk of further sorting losses.

Action #1

Close the Glass Loop proposes to develop “Principles for good glass packaging collection practices”.

These principles will be based on:

- **A study on the impact of collection methods on cullet quality.** This study should help to demonstrate variations in quality according to different collection methods, including on-site testing and sampling.
- **Guidelines on the proper handling of glass** between the collection point and the entrance into the Glass Cullet Recycling Facility to avoid unnecessary handling and crushing.
- **An assessment of the use of quality standards on collection.** Some countries have implemented standards on collection with limit thresholds on the presence of contaminants in the incoming glass material. Although these standards may not always be enforced or enforceable, Close the Glass Loop will support a dialogue between municipalities and the operators of Glass Cullet Recycling Facilities to consider setting appropriate standards.

Cullet Innovation Action Plan

The link between both recycling phases of sorting and re-melting in a container glass furnace is the other key connection in the closed loop glass recycling process.

Action #2

Close the Glass Loop proposes to establish a Cullet Innovation Action Plan that will include:

- Supporting the continuous improvement of sorting techniques and equipment to reduce glass losses and improve cullet quality;
- Upscaling processing techniques to optimise the use of rejected fractions from the optical sorting process in container glass furnaces;
- Developing industrial strategies to maximise the uptake of recycled content in decarbonised furnaces that use new technologies and energy sources;
- Building partnerships with other material industries to foster the uptake of post-sorting non-glass materials into recycling applications, to divert recovered materials away from landfill and disposal;
- Driving market requirements towards the use of recycled glass over virgin raw materials.

Developing guidelines for brands and fillers on product design

Although the biggest challenges to the closed loop glass recycling process come from the interaction with post-consumer waste management systems, there are some steps that can be taken at product design level to help optimise the process as a whole.

Close the Glass Loop proposes to develop guidelines for brands and fillers to help inform product design decisions that can support closed loop glass recycling. These will be supported by case studies and good practices where changes in product designs have brought about net improvements on the closed loop glass recycling process. Such guidelines should preferably be harmonised across the European Union to avoid the duplication of documents and initiatives, but they should be based on existing design for recycling guidelines developed on national level.

In particular, these guidelines would include an exhaustive list of materials used in connection with glass packaging, their different functions (e.g. closures, labels, decorations, sleeves, coatings, illuminators etc…) and recommendations:

- to ensure that these materials can be easily sorted and separated from the glass for each of their functions.
- to ensure that these materials do not obstruct the glass once it goes through the optical sorting system.
- to use materials that have an effective recycling system available to ensure that the least possible amount of waste materials go to landfill or incineration.
- In addition, these guidelines should consider the particular aspects related to the glass itself, to ensure that all glass that is placed on the market is identifiable and detectable by the optical sorting systems.

In the sorting process, the materials go through an optical sorting system that identifies transparent materials as glass and rejects materials that are not transparent. Up to now, the sorting technology does not easily differentiate between highly opaque glass on the one hand, and ceramics, stones and porcelain on the other, which are undesirable contaminants for closed loop glass recycling that can cause serious damage to furnaces and create defects in new glass containers. In practice, however, it is still unclear what would be an acceptable level of transparency for the sorting systems, as their ability to detect glass also depends on many other factors within the sorting process itself (e.g. the size of the piece of glass, its position during the fall through the optical sorting system) and other design factors such as the thickness or shape of the glass. The issue of glass opacity, however, must not be confused with glass colours, as all glass colours can be detected in both recycling phases of sorting and re-melting in a container glass furnace.

Close the Glass Loop proposes to carry out further research on this issue, with a view to establishing, if necessary, a recommended transparency threshold for glass containers.

Action
#3

close the glass loop

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Close the Glass Loop is the European action platform for glass packaging collection & recycling. It brings together 14 European associations representing the whole value chain (product sectors, glass manufacturers, glass recyclers, extended producer responsibility organisations, municipalities and the hospitality sector), as well as 13 national platforms around the common goal of achieving 90% glass packaging collection for recycling by 2030 in the European Union.