



British Glass

Recycled content in glass packaging

Part of the Glass-pack portfolio:
A series of no-nonsense guides for people
working with glass packaging.

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Recycled content in glass packaging

Both public opinion and regulatory pressures are driving demand for higher recycled content in packaging. This guide will explain the factors that affect the level of recycled content possible so that this can be maximised when and where appropriate.

There are several important advantages of using cullet (glass ready to be remelted) to make new glass containers, including:

- **reducing reliance on virgin raw materials**
- **reducing carbon emissions** – every tonne of glass that goes back to re-melt saves around 185kg of carbon dioxide (compared to using virgin raw materials).
- **reducing energy used** – substituting 1 tonne of cullet for raw materials saves 322 kWh. It takes less energy to melt cullet than virgin raw materials – even though both have to reach the same temperature; this is because the chemical reactions to convert the raw materials to a glass have already occurred and subsequent remelting of cullet only requires the energy to reheat to a molten state (<https://www.britglass.org.uk/knowledge-base/resources-and-publications/balance-between-furnace-operating-parameters-and-recycled>).
- **increasing the life of the furnace** – as there are less chemical reactions with a mix of raw materials and cullet, so there is less chemical attack on the furnace structure.
- **making glass forming easier to manage** – due to the reduced energy usage there is greater furnace flexibility and higher temperatures are easier to reach with a greater cullet percentage.

Cullet definition – waste glass that's been processed, ready for recycling



CO₂ is released from the raw materials such as limestone as they are melted; however for cullet this process was completed the first time the glass was made – when it is remelted there is no further CO₂ to be given off.

Definition of recycled content

British Glass and the UK container manufacturers agreed a method for calculating the recycled content of glass containers, in conjunction with WRAP (Waste and Resources Action Programme), in 2008; the method is aligned with ISO 14021 Environmental labels and declarations – self declared environmental claims (Type II environmental labelling). The materials which can be counted towards recycled content under this method are:

- **glass packaging waste from bottles and jars from recycling collections (UK and imports)**
- **waste plate (flint) glass from glazing and automotive**
- **calumite (a waste material from iron production used in glass production)**

While glass from internal process losses (eg test runs, rejects) will be returned to the furnace whenever possible, it is not included in the recycled content figure which British Glass and its members report (unless requested and clearly labelled as such). This is to ensure that recycled content:

- **represents genuine use of a waste product/circular economy**
- **correlates with a reduction in the use of virgin raw materials**
- **is not artificially inflated by variations in the manufacturing process**

Due to daily fluctuations in availability of suitable cullet it is not possible to provide individual product recycled glass content. The UK national recycled glass content figures are calculated over a calendar year.

3

Brand owners can maximise recycled content in their glass packaging by...

...exploring whether colour/clarity requirements can be adjusted

...not stipulating minimum levels of recycled content – giving a manufacturer the flexibility to maximise recycled content when good quality cullet is available may be more effective overall

...ensuring their bottles and jars are as easy as possible to reprocess for re-melt – see our guide to maximising recyclability of glass packaging

...encouraging consumers to recycle – on pack recycling labelling and hosting bottle banks are practical ways brands and retailers can help to drive up the amount of glass coming back for re-melt.

Case Study

Lidl/Leeds bottle bank - positive results #RecyclingHero

In Leeds, household glass is collected at glass banks, not kerbside. This captures glass with lower contamination than mixed material collections, but there is a trade-off in convenience and awareness.

That's where retailers can make a practical and positive contribution to increasing recycling, and help consumers do what's right for the planet.

In partnership with Lidl and Leeds City Council, British Glass embarked on an awareness campaign after placing glass bring banks at Lidl's Halton store.

The total glass captured from all banks within one mile of the store in March 2018 was up six tonnes on the same period in the previous two years – showing the new banks have captured additional glass, not just diverted it.



4

What's the optimum recycled content? It's a question of cullet quality

When cullet quality is high, the advantages of using it outweigh any disadvantages. As cullet quality falls, the cost and effort of processing the waste glass increases. Where the balance is to be struck depends on the quality of the cullet available at the time.

High quality cullet has minimal contamination from non-container glass (eg ovenware, tableware), non-glass material (eg ceramic, pyro ceramic) or glass of a different colour.

High Quality = increased benefits

- Reduced CO2
- Energy savings
- Reduced extraction of virgin materials
- Improved glass forming
- Increased furnace life

Low quality = increased risk

- Critical defects from inclusions from contaminants within the cullet
- Reduced colour consistency of the product
- Process waste - production rejects increase
- Substandard products that are not fit for purpose

Making glass from virgin raw materials only

From an environmental perspective, it's better when recycled content can be used. But sometimes the product specification means that no waste glass can be included. This is usually for premium (super-clear/super-flint) glass of the highest clarity standards.

Even when this is the case, glass is still made from abundant and mostly local raw materials.

The main ingredient of glass is silica sand (which is silicon dioxide) at around 60% of the raw material mix. After loss of CO₂ from the other raw materials, silicon dioxide accounts for around 72% of the final glass. Silica sand is mined widely and is generally responsibly and ethically sourced close to glass factories. (It's worth noting that the sand from river beds and beaches isn't right for making glass – and reports of these being plundered for sand are not connected to glass manufacture.)

The other ingredients of glass are dolomite and limestone which occur abundantly in nature and soda ash which can either be found naturally or synthetically manufactured (we use all available cullet and add these raw materials as necessary).

How much recycled content is it possible to use?

Theoretically bottles and jars could be made from 100% cullet. They can be just as strong as those made from raw materials. Glass manufacturers will use as much cullet as they can while still achieving the quality required by a customer at an acceptable cost. But in reality there are a number of factors that make 100% recycled content unfeasible.

Colour/composition control

Most customers want perfect colour consistency within and between production runs, which means careful control of the glass composition. Depending on the container colour being produced – this has implications for cullet use.

Clear and green glass

Colour sorting technology for glass has improved significantly in recent years, but some colour contamination in cullet from post-consumer waste is inevitable. To achieve clear glass colour contamination must be kept to a very low level; there is greater tolerance on green glass. In either case – precise control of colour may mean using more virgin raw material depending on the quality of cullet available at any given time.

Making amber glass requires particularly fine control of the composition – the amber colour comes from a chemical reaction of the trace iron oxide within the glass composition and organic contamination from plastic or food can impact on the colour.

Defects from inclusions

Non-container glass (ovenware), ceramic (pottery) and pyro-ceramics (glass-ceramics) are particularly difficult to remove from post-consumer waste glass; if pieces get into a furnace they will not melt and cause inclusions in finished products – which can cause containers to fail at any point in the onward supply chain. It is rare that bottles or jars with inclusions reach the customer as sophisticated inspections within the factory will reject these items and quarantine them for further inspection. While they rarely impact the customer, these process losses impact on productivity and will be excluded from recycled content if they are remelted.

How much recycled content is it possible to use? continued

Expression of food contact materials (FCM) regulations

Unlike other materials, glass can be remelted over and over again with no loss of quality and remains safe for food contact use. Glass with recycled content will be just as non-toxic, impermeable and inert as glass made from 100% raw materials. There is however a legal consideration around heavy metal content in glass packaging; the main metals of concern are lead and cadmium.

Modern cullet processing equipment can identify lead glass and remove most of it. However, if lead glass does get into the cullet for remelt, over time, as glass is recycled again and again, lead levels can accumulate.

This is not a health concern; the chemical structure of glass locks lead in so only insignificant levels can pass into a container's contents.

Availability/price fluctuations of cullet

Cullet is a supply and demand market. It is not always possible for glass manufacturers to get cullet of the necessary quality and sell containers at a competitive price. The supply and price of cullet is influenced by factors including:

- Differences between the glass produced and used within the UK: the UK produces and exports a lot of filled spirits bottles such as whisky in clear glass but consumes a lot of imported wine and beer mainly in green glass. The result of this import and export of filled products is that there is a high quantity of green cullet compared to a low level of flint – this influences price due to supply and demand.
- Collection and recovery methods: while mixed material collections are convenient, the process losses when glass is collected with metals and plastics can be very high. This is because plastics and metals are removed from the co-mingled recylcates first. Everything that is left is 'MRF glass' – this contains high levels of non-target materials (including non-recyclable and organic waste). The greater the levels of non-target material, the greater the cost of cleaning and processing glass to produce furnace-ready cullet.



Produced in association with British Glass members and Glass Technology Services Ltd (GTS)



URM UK Ltd – the UK's largest purchaser and recycler of waste glass. It operates world-class cullet treatment plants in Knottingley, Tilbury, Doncaster and South Kirkby and provides fast and efficient collection services through bottle banks, kerbside and trade collections.



Viridor – which operates two dedicated glass recycling facilities in addition to direct contracts between the glass facilities and glass producers and other waste management companies. Viridor is an experienced reprocessor of recycled glass cullet and is proud to be one of only a handful of UK companies that is certificated as an 'End of Waste' (EoW) glass re-processor.



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For an environmental assessment of container glass, e.g. CO2 footprint, life cycle assessment (LCA), recycled content is NOT the correct indicator. The recycling rate is the valid indicator, which for glass packaging in the UK is a recycling rate of 68%.

We recommend organisations do not use recycled content data for any assessment of environmental performance, or other environmental evaluation. Recycled content data should be used only for internal reference and material stewardship.

NB. The environmental assessment process is complex and ISO guidelines for the assessment of plastic packaging are different to those for glass.