



# Liquid Packaging Board (LPB)

Circular Packaging



**53%**  
less energy



**51%**  
less water



**55%**  
lower gwp

**“The overall conclusion is that the LCA provides evidence that ReZorce® beverage container has lower environmental impact (in terms of the measures produced by LCA) than the conventional liquid packaging board container.”**

Gary Parker, Sustainability Director, Intertek



Circular Packaging

VS

Liquid  
Packaging  
Board (LPB)

## Introduction

**ReZorce® is a new range of recyclable mono-material barrier packaging from advanced cellular materials specialist Zotefoams plc. Barrier packaging is used widely in the food, beverage and personal care sectors to prevent degradation of products and ensure shelf life.**

A pre-eminent form of barrier packaging currently used for beverages such as fruit juices and dairy products is the carton. Made from liquid packaging board (LPB), an estimated 250 billion cartons are used globally each year, making it one of the most successful packaging innovations of the twentieth century.



However, it is increasingly apparent that this success comes at the expense of the environment, due to the multi-material nature of LPB. Besides fibre board (typically 72.5%) it contains layers of polymers (24%) and, sometimes, aluminium (3.5%), laminated together. This makes it very difficult to recycle and means that the majority of LPB cartons end up incinerated or in landfill.

## The LCA – comparing ReZorce’s environmental impacts with LPB

Functionally and aesthetically, ReZorce cartons have been shown to perform the same as or better than traditional beverage cartons. To demonstrate ReZorce’s “circular packaging” potential Zotefoams commissioned a life cycle assessment (LCA) from Intertek, independent specialists in environmental, scientific and regulatory consulting. We asked Intertek to compare the environmental impacts of ReZorce mono-material barrier packaging incorporating 50% recycled HDPE – anticipated to be the most likely formulation based on availability of suitable recycled materials – with traditional multi-material LPB, with both materials serving as primary packaging for 1000ml of apple juice.

The primary components of each were:

**ReZorce container:** Foamed high-density polyethylene, mineral masterbatches, and ethylene-vinyl alcohol copolymer.

**LPB container:** wood fibre; polyethylene, and aluminium foil.

*Both products featured the same four-component cap and nozzle system, manufactured entirely from polyethylene.*

## Life cycle impacts

The LCA Centre assessed nineteen life cycle impacts for each material, the primary three being:

**GWP (Global Warming Potential) [kgCO<sub>2</sub>e]** is a relative measure of how much heat a greenhouse gas traps in the atmosphere. This measurement compares the amount of heat trapped by a certain mass of the gas in question to the amount of heat trapped by a similar mass of carbon dioxide.

**Water Resource (m<sup>3</sup>)** is a generic term describing human activity involving water resources as well as the total amount of water used during a process.

**CED (Cumulative Energy Demand (MJ-eq))** is the total primary energy input for the generation of a product.

## Four scenarios

The study evaluated the two materials' environmental impacts from cradle-to-grave incorporating the impacts from the raw material stage to the final end of life stage.

What happens at end-of-life — **incineration, recycling or a mixture of the two** — is the most important factor in determining the critical GWP life cycle impact, and Intertek needed to construct four scenarios to accommodate the possible end-of-life options for the comparison.

### End-of-life scenario

Scenario	LPB	ReZorce
<b>A</b>	100% Incinerated	100% Recycled
<b>B</b>	100% Incinerated	100% Incinerated
<b>C</b>	100% Recycled	100% Recycled
<b>D</b>	Only Fibre Recycled	100% Recycled

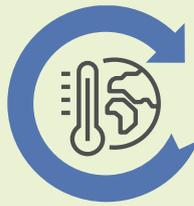
Each scenario involved certain assumptions based on the “fit” between the composition of ReZorce and LPB and current recycling technologies:

**Scenario A** assumes that **because the ReZorce® container is made predominantly from mono-material polyethylene it can be recycled** where household plastic waste is collected for recycling. The component materials of the LPB container, on the other hand, are difficult to separate and so are unlikely to be recycled.

Given the ease of recycling ReZorce, **Scenario B** is an extreme scenario but was included to provide a like-for-like comparison with LPB. Likewise, **Scenario C** was also included to provide a like-for-like comparison. **Scenario D** is the most likely end of life scenario as explained by Intertek, “In Scenario D, only the fibre in the LPB container is recycled, the rest being incinerated, which is the most probable processing of the LPB container”.

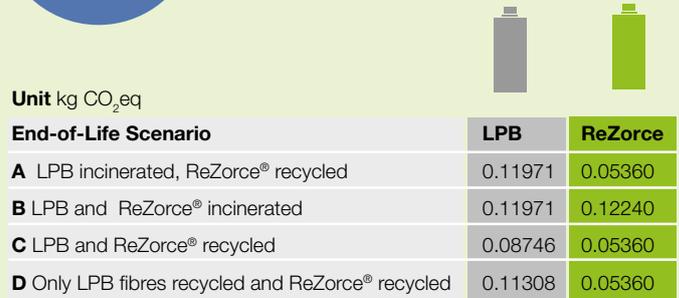
## The results

The LCA Centre set out the outcomes of the ReZorce vs LPB comparison for GWP, Water Resource impact and CED as follows:



### Global Warming Potential

Global warming potential of all containers based on the A to D End of Life Scenarios

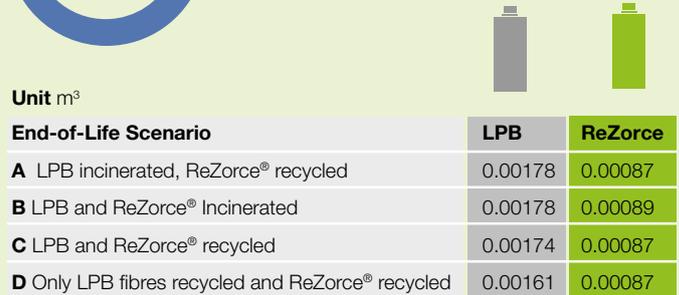


**GWP:** ReZorce was found to have a lower global warming potential except in the unlikely scenario that both packages are incinerated.



### Water resource

The H<sub>2</sub>O impact of all containers based on the A to D End of Life Scenarios



**Water Resource:** The water impact of producing ReZorce is an order of magnitude lower.



### Cumulative Energy Demand

The CED impact of all containers based on the A to D End of Life Scenarios



**CED:** The energy required to produce, fill and transport ReZorce is on average five times less.

## What do these results mean?

### For brand owners

Environmentally conscious consumers are energised by the idea of the “**circular economy**” — of “**make-use-return**” replacing the linear economy’s “**take-make-waste**”.

Currently these consumers are effectively being short-changed when they recycle some products. It’s simple to drop an empty “recyclable” container into the recycling bin, but in the case of composite (multi-layer) materials, the process that follows is anything but straightforward, resulting in low recycling rates that are at odds with both impending legislation and society’s obligations to the environment.

ReZorce® is a fully-recyclable mono-material alternative to composite packaging that fulfils all performance criteria and – as demonstrated in this report – has a lower environmental impact. Its layered structure allows recycled material to be incorporated in the core of the material. **ReZorce can be manufactured with a high proportion of recycled content, and where food-grade recycled polymer is available, a 100% recycled, circular solution is entirely possible.**

### For manufacturers

Supplied as either roll or sheet-fed material, ReZorce is compatible with existing print and carton making, filling and closing processes. Certain formulations and formats can be trialled and validated in the ReZorce Development Center in Massachusetts, USA and we are working to establish a network of selected partners for scale trials.

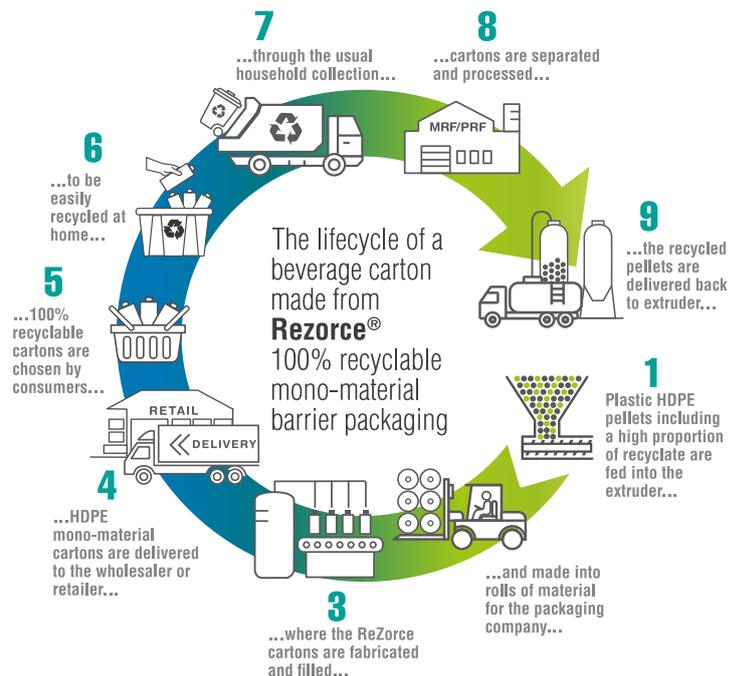
### For the waste and recycling sector

The multi-material nature of LPB poses a real end-of-life challenge, with specialist processes and facilities necessary for the separation and processing of the various materials. Different local authorities manage this in different ways – some specify LPB cartons should be placed in mixed recycling containers, some in paper and some not recycling at all.

ReZorce is the simplest solution: placed in the mixed recycling container by the consumer, it will be identified as recyclable plastic and sorted into the recyclable HDPE fraction at the mixed recycling facility.

### For all of us

‘**Reduce, Reuse, Recycle**’: these are the three core behaviours we all need to adopt to reduce our impact on the environment. Reusable containers for beverages such as dairy products and fruit juices have very limited application and are not viable in standard retail supply chains due to the need to protect the contents from atmospheric moisture and oxygen. The next best option is a recyclable container, with a low environmental impact. ReZorce is that solution and moreover, it offers the prospect of true circularity that is unattainable with LPB.



Circular Packaging

### A better, simply circular solution

Based on these findings, ReZorce provides brand owners and manufacturers with a new, enabling technology to progress the revolution towards packaging that is truly circular and has a game-changing reduced impact on climate change and pollution.



### Contact us

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See the ReZorce video at [www.rezorce.info](http://www.rezorce.info)