



Zotefoams Group chief executive David Stirling aspires for ReZorce to be rollout-ready globally



Above and below: Extrusion of ReZorce material at the Zotefoams facility in the Netherlands



New kid on the block

The traditional beverage carton was launched in the 1950s and its design remains fundamentally the same today.

The large majority of these beverage cartons use different layers of materials (paperboard, polymers and sometimes aluminium) to keep liquids fresh, making recycling tough given the limited number of facilities that can separate the materials.

Because they are difficult to recycle, they often end up in landfill or are incinerated, and with around 250 billion beverage cartons used worldwide each year, this is clearly a big problem. And it is precisely the issue that cellular materials technology supplier Zotefoams is targeting with the launch of its ReZorce packaging.

Unveiled to the world's media at a recent event in Amsterdam, the Netherlands, ReZorce offers the potential for circularity in a market where this has not previously been possible, suggested keynote speaker Paul Polman, the former chief executive of Unilever and a campaigner on sustainability.

"The simplicity of the material and design is key to the development of a circular

Could a mono-material carton be about to shake up the beverage industry? **Dominique Huret** attended a media event in the Netherlands to find out

economy," explained Polman. "In addition, the compatibility of ReZorce with standard household recycling streams is key to ensuring the product is recycled. We have to be cautious about the word 'recyclable', seen on so many types of packaging – some of which are, in reality, very difficult to recycle. This is a deeply empty word: the exact term must be 'recycled'."

In explaining ReZorce's journey from concept to commercialisation, Neil Court-Johnston, president of Zotefoams' business unit MuCell Extrusion – the producer of the microcellular foaming technology behind the product – said his company's general expertise is in barrier materials, but it chose to focus on beverage cartons because there was little evidence of anyone else trying to deliver circularity in this particular market.

"With 250bn beverage cartons used each year worldwide, the problem should be addressed," he argued. "The annual Ellen

MacArthur Foundation report pinpoints the challenges of fast-moving consumer goods manufacturers in meeting their waste and carbon reduction targets. This can partly be attributed to the complex nature of some types of packaging. However, for beverage cartons, we believe ReZorce is a solution."

Based on the MuCell technology, 95 per cent of ReZorce material is a mix of foamed HDPE, mineral masterbatches, and ethylene vinyl alcohol copolymer. The remaining 5 per cent of the volume is atmospheric gas, to enable the creation of microbubbles. Sandwiching foamed layers containing microbubbles with solid layers optimises barrier performance and provides the rigidity needed, while allowing for folding. The substrate is available in sheet and roll with different layer structures to suit a range of applications.

"The HDPE material outperforms current liquid beverage carton technology,



The ReZorce carton can incorporate 100 per cent recycled content, explains Neil Court-Johnston



ReZorce HDPE material for extrusion

Assessing the lifecycle

In 2022, Zotefoams commissioned Intertek to conduct an independent lifecycle analysis (LCA) comparing three types of ReZorce incorporating various levels of rHDPE with traditional multi-material liquid paperboard (LPB).

Intertek assessed 19 life-cycle impacts for each material, the primary three being global warming potential (the relative measure of how much heat a greenhouse gas traps in the atmosphere), water resource (describing human activity involving water resources as well as the total amount of water used during a process), and cumulative energy demand (the total primary energy input for the generation of a product).

The study evaluated LBP's and Zotefoams 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

End-of-life scenario

Scenario	LPB	ReZorce
A	100% Incinerated	100% Recycled
B	100% Incinerated	100% Incinerated
C	100% Recycled	100% Recycled
D	Only fibre recycled	100% Recycled

– incineration, recycling or a mixture of the two – is the most important factor in determining the critical global-warming-potential lifecycle impact.

Intertek needed to construct four scenarios to accommodate the possible end-of-life options for the comparison. Each scenario involved certain assumptions based on the 'fit' between the compositions of ReZorce and LPB and current recycling technologies.

Scenario A (see table) assumed that because the ReZorce container is made predominantly from mono-material PE, it can be recycled where household plastics 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 according to Intertek, as only the fibre in the LPB container is recycled, with the rest incinerated.

The results of the LCA show that it takes five times less energy to produce, fill and transport a ReZorce carton when compared with conventional LPB cartons. ReZorce requires 11 times less water to produce and – provided it's recycled – has a 50 per cent lower global warming potential overall.

achieving sustainable clarity without compromising look, feel or performance – solving the food and beverage packaging industry's biggest sustainable challenge: multi-material cartons," said Court-Johnston.

"ReZorce can incorporate up to 100 per cent recycled content if food-grade recycled polymer is available, as well as being recyclable via post-consumer waste collection. Compatible with surface printing processes, the high-barrier solution is designed

to keep oxygen and water out, and to feel and fold like paperboard. And, last but not least, it meets current and impending legislation, driving towards a more circular economy."

Indeed, seeing cartons made of liquid packaging board coming through the recycling system is extremely disruptive to the process, explained Chris Hanlon, commercial director at UK-based waste management firm Biffa Polymers.

“Manufacturers and brand owners recognise that current technology cannot meet impending sustainability targets and we are already collaborating with likeminded partners”

Neil Court-Johnston, Zotefoams Group

It adds a level of contamination that we have to take out,” he said. “So, rather than being beneficial to the recycle stream, it adds a layer of complication to our equipment and to our sorting process.”

Zotefoams is working with Refresco and Südpack on a joint-development project for ReZorce – Refresco being the world’s largest independent beverage bottler, serving major retailers and brand owners across Europe, North America and Australia. It intends to conduct in-market trials with the mono-material packaging.

ReZorce cartons are being produced at one of Refresco’s facilities in Europe, using a machine designed for traditional composite beverage cartons, modified with a proprietary change parts kit.

The partnership with polymer extrusion specialist Südpack was announced at the media event, and Dirk Hardow, chief executive of the Functional Films & Compounds business unit, was on hand to explain his company’s role in the project. “An additional essential asset for ReZorce is that this functional film is manufactured on existing sheet extrusion

processes, and produced and filled on standard machines,” he said. “We at Südpack will provide a potential capacity of up to 100 million ReZorce cartons annually.

“We have a pioneer company mindset, so we are proud to contribute to the production of a packaging concept that will fulfil the requirements of the EU Packaging and Packaging Waste Directive in terms of recyclability and recycled content.”

Zotefoams is also collaborating on the HolyGrail project, led by AIM – the European Brands Association and the Alliance to End Plastic Waste. HolyGrail 2.0 is focused on developing chemical tracers and digital watermarks to track plastics waste and improve the sorting of post-consumer packaging as well as boost recycling rates.

“Manufacturers and brand owners recognise that current technology cannot meet impending sustainability targets and we are already collaborating with likeminded partners,” continued Court-Johnston. “Beverage cartons are just the beginning.”

For the moment, Zotefoams’ asking price for the substrate matches the latest



Südpack’s Dirk Hardow (left) announced a partnership with Zotefoams during the media event, while Biffa Polymers’ Chris Hanlon detailed how disruptive to recycling traditional liquid packaging board is

generation of beverage cartons but, unsurprisingly, not the most commonly used multi-material structures used by well-established competitors.

“Our goal is parity, but we are not there yet, as we need economy of scale,” admitted Zotefoams Group chief executive David Stirling. “We hope that ReZorce will be progressing towards becoming a fully commercialised product that is scalable with existing infrastructure. I am aspiring ReZorce to be rollout-ready across the world. This could be my contribution to a cleaner planet.”

More information from Zotefoams Group, 675 Mitcham Road, Croydon, Greater London, CR9 3AL, UK. Tel: 44 208 664 1600.

Email: info@zotefoams.com.

Web: zotefoams.com

EP

