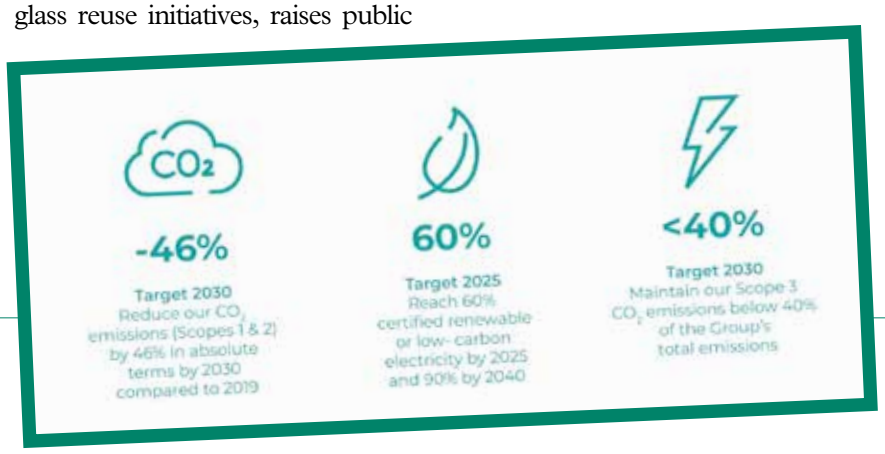
Enhancing glass packaging circularity at VERALLIA

In taking forward reuse and eco-design while pioneering decarbonisation via electric, hybrid and hydrogen-powered furnaces, VERALLIA is backed by major investments and partnerships as it continues to aim for Net Zero emissions by 2050.

The circular economy stands as a strategic development focus at Verallia, encompassing resource preservation, product innovation and the fight against climate change. For this reason, the initiatives outlined here address all stages of the production cycle - from raw material consumption to product eco-design, water usage and waste management. That approach aligns fully with the European vision of circularity, particularly as interpreted in France through the AGEC (Anti-Waste for a Circular Economy) law. Beyond regulatory obligations and environmental imperatives, the Group holds a responsibility to manage critical resources efficiently, ensuring business continuity. Back in 2022, Verallia encountered challenges in cullet procurement. The entrance of new market players constrained availability and drove prices upward. Compounding this, the inconsistency of glass collection methods across countries -and even between municipalities- affects the quality of recovered glass. To address these issues, Verallia works continuously to foster cooperation across regions and stakeholders, with the aim of standardising collection practices. Over time, that effort seeks to improve both the quantity and quality of the external cullet that's available for reuse. Here Verallia's commitment to enhancing glass circularity is evident in several core areas: it maximises cullet usage in production, expands glass reuse initiatives, raises public awareness to boost recycling rates, advances eco-design for more sustainable products and continually optimises water consumption - all while reducing industrial waste.

DECARBONISING INDUSTRIAL ACTIVITY

Given that circularity lies at the heart of Verallia's mission -leveraging glass' unique capacity for infinite recycling- the transformation of recycled material into new bottles and jars still necessitates melting. This remains a major source of CO_2 emissions in glass manufacturing. To confront this challenge,



Verallia has undertaken an ambitious programme of investment aimed at overhauling technologies, resources and industrial infrastructure across its sites. These efforts were recognised in March 2022 with the validation of Verallia's 1.5°C emissions reduction trajectory by the Science Based Targets initiative (SBTi). In parallel, the company supports soil regeneration projects through partnerships with PUR Project and Reforest'Action. These initiatives support Verallia's long-term objective of achieving Net Zero emissions by 2050.

HYDROGEN COMBUSTION TRIALS IN ESSEN, GERMANY

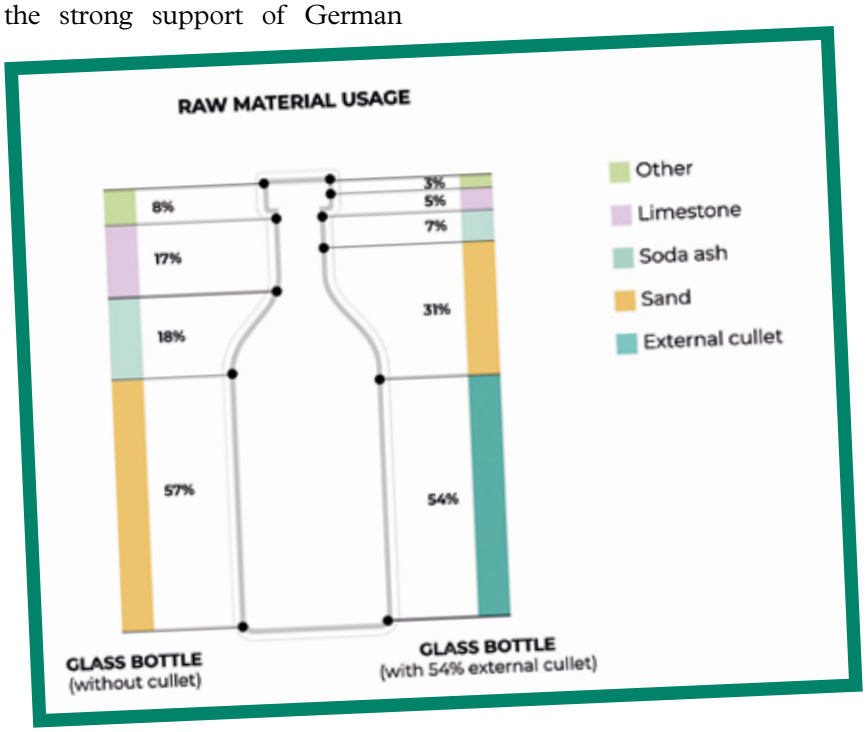
Hydrogen represents one of several decarbonisation pathways under active study at Verallia. In the Ruhr region, an integrated energy strategy includes a substantial share of hydrogen sourced from the ArcelorMittal coking plant, located near Verallia's Essen Karnap glass factory. This project enables the company to operate what is believed to be the largest hydrogen-powered melting capacity in the glass industry - 6MW in daily operations. As outlined in Verallia's decarbonisation roadmap, the company has committed to investigating all viable technologies related to glass melting, ensuring it remains positioned to adopt the most effective solutions based on geographic and energy-specific contexts. While furnace electrification, particularly through hybridisation, remains the central focus, other avenues under examination include biofuels and green hydrogen. In practice, several sites have already transitioned to renewable sources such as biogas, biofuel and syngas. Yet hydrogen integration demands even greater scrutiny, given its distinctive properties as the smallest molecular gas. Key considerations include the permeability and sealing of pipelines, flow control mechanisms and necessary plant modifications. Since hydrogen yields three times less energy than natural gas for a given volume, implications for melting performance are significant. Hydrogen combustion also produces water and various compounds, raising further questions about impacts on glass quality, air emissions and furnace longevity. Additionally, operational parameters may require daily adjustment. A fuel change is rarely seamless and in the case of hydrogen, this truth is even more pronounced. Accordingly, Verallia has adopted a measured, step-by-step strategy.

A FIVE-YEAR COLLABORATION WITH ARCELORMITTAL

Prior to launching the Essen initiative with ArcelorMittal, Verallia conducted an initial test campaign at its Zaragoza facility in Spain. During this phase, furnaces operated for several days with fuel blends containing up to 60 percent hydrogen, delivered by truck. Supported by Air Liquide, the trial enabled Verallia's R&D teams to assess


Michel Giannuzzi - CEO

combustion behaviour, safety protocols, equipment adjustments and impacts on performance, control systems and emissions. The Essen project represents a significant escalation. Hydrogen-rich gas is supplied from ArcelorMittal's Bottrop coking plant -an energy by-product of coke production- while Uniper handles pipeline transport between the two industrial sites, located approximately 3.5 kilometres apart. A five-year gas supply contract facilitates the study of hydrogen's long-term effects on the two furnaces at the Essen Karnap site. The aim is to ensure that hydrogen meets a substantial share of the site's energy requirements in the years ahead. As far as industry records indicate, this constitutes a world-first for large-scale hydrogen usage in glass manufacturing. Depending on injection ratios, annual CO_2 emissions at the Essen Karnap plant are expected to decrease by 8 to 10 percent. Though the hydrogen in use is not currently classified as 'green,' it is a co-product that had not previously been valorised. Its deployment in glass furnaces thus represents a meaningful step in the energy transition and has earned the strong support of German regulatory authorities. This collaboration became operational at the close of 2024. The facility now functions with a high proportion of hydrogen in its energy mix. A series of simulations and data analyses is underway, providing the technical insights necessary to evaluate broader energy transitions—should this method prove scalable. There remain considerable challenges, not least the availability and cost-efficiency of green hydrogen. Verallia maintains that there will be no single path to full decarbonisation of the glassmaking process. Each plant must adapt to local resources and national energy policies. The R&D and operations teams are systematically validating an array of technological options. With this long-term hydrogen supply initiative, another milestone in Verallia's decarbonisation strategy has been achieved.



GLASS: MATERIAL OF THE FUTURE

The glass industry stands at a pivotal moment. With the potential to become a model of sustainability and innovation, it bears both the opportunity and the responsibility to shape a future where environmental stewardship and industrial performance go hand in hand. Glass is infinitely recyclable with no loss of quality - a permanent material central to the circular economy. However, its manufacture still heavily depends on gas combustion, which contributes to roughly 80 percent of the sector's CO_2 emissions. Today, the industry is mobilising to reverse this trend.

AN INDUSTRY IN TRANSFORMATION

Verallia, the European leader in glass packaging for food and beverages, has placed transformation at the core of its corporate strategy. A clearly defined goal has been set: reduce scope 1 and 2 emissions by 46 percent by 2030. To reach this milestone, a series of tangible actions has been launched. Among them is the commissioning of the first fully electric furnace in Cognac, which cuts CO_2 emissions by 60 percent compared to traditional models. In addition, hybrid furnaces -powered up to 80 percent by electricity and 20 percent by gas or alternative fuels- are being deployed, achieving a 50 percent emissions reduction. The company also seeks to strengthen circularity by integrating 59 percent recycled cullet into production by the end of 2025. Lightweighting and eco-design have led to the creation of lighter bottles, reducing carbon impact across the supply

chain. Other efforts include adopting biofuels, installing photovoltaic panels, developing a syngas production plant and recovering residual heat to generate electricity. Verallia is also actively supporting reuse initiatives throughout Europe, financing projects that promote circularity and limit environmental impact.

A COLLECTIVE EFFORT FOR ACCELERATED TRANSITION

A recent report by FEVE underscores how technological progress in the sector aligns with increasing demand for sustainable packaging. Yet, policy frameworks must evolve in parallel. For industrywide decarbonisation to succeed, public policies must support access to decarbonised energy infrastructure and expand funding for innovation. Each year, European glass packaging companies invest over EUR 600M in carbon reduction. Achieving full decarbonisation by 2050 will require nearly EUR 20 billion in total investment. Glass production is foundational to numerous strategic sectors, including pharmaceuticals, food and drink, wine and spirits and perfumery. Investing in sustainable production modernises valuable expertise and supports a resilient, responsible future. For Verallia, this moment is seen not merely as a challenge but as a chance for reinvention. By driving innovation, fostering collaboration and adopting sustainable practices to support its clients' climate strategies, the company continues to shape a new era for glassmaking - one where every bottle is a testament to environmental commitment and forward-looking design. ■