glassmachinery world plants&accessories

BI-MONTHLY INTERNATIONAL MAGAZINE FOR GLASS MANUFACTURING

YEAR 37 • ISSUE NO. 6/2023

Hastening net zero: BDF develops Panorama 4.0™

All eyes on contractor GSE ITALIA following VETROPACK facility triumph

Customized conveyance: a DMA MASCHINEN success story

Hot-end coating by VIDROMECANICA bolsters glass protection

Packaging and reusability: POLITECNICO DI MILANO engineers revisit glass bottles life cycle

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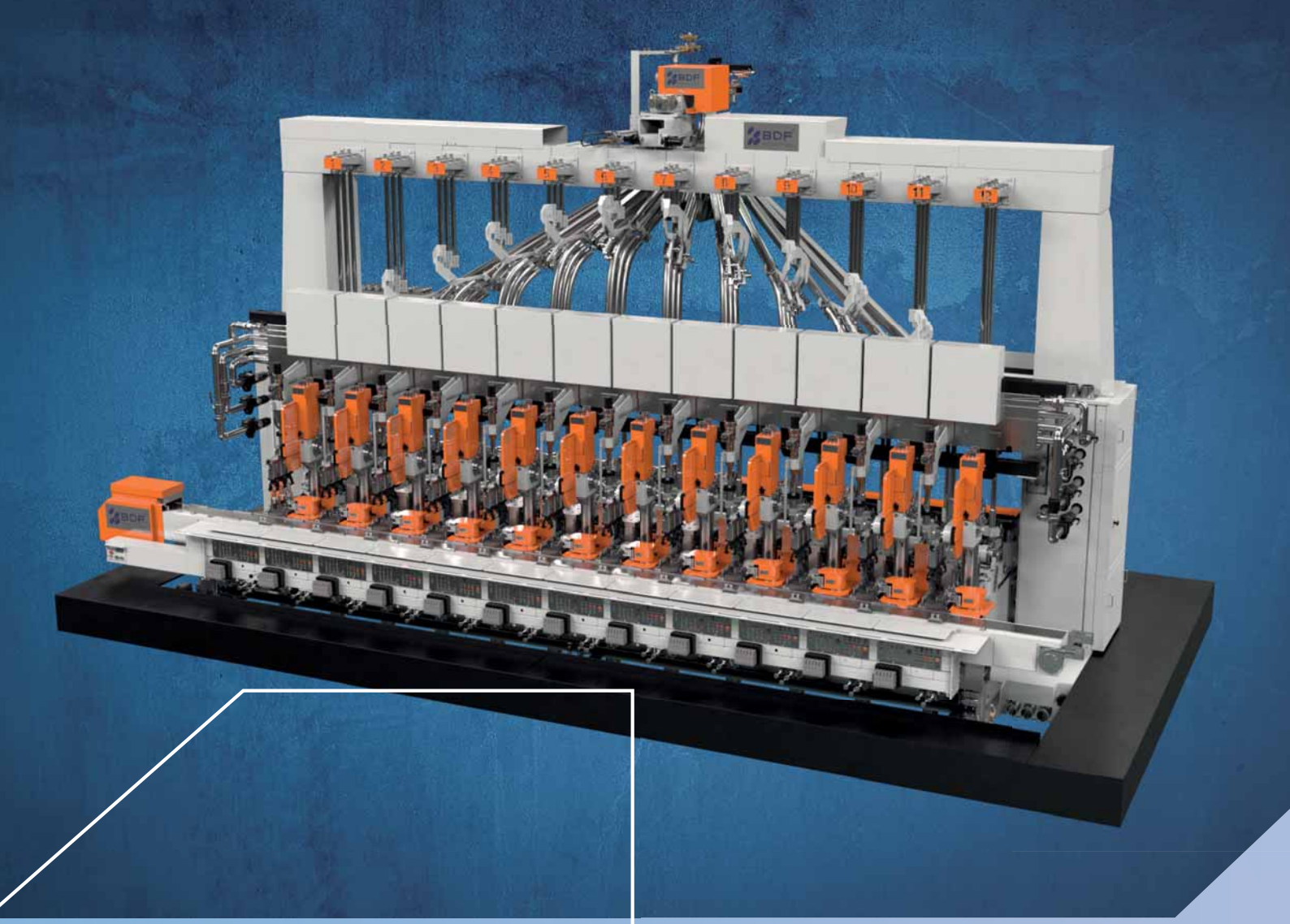

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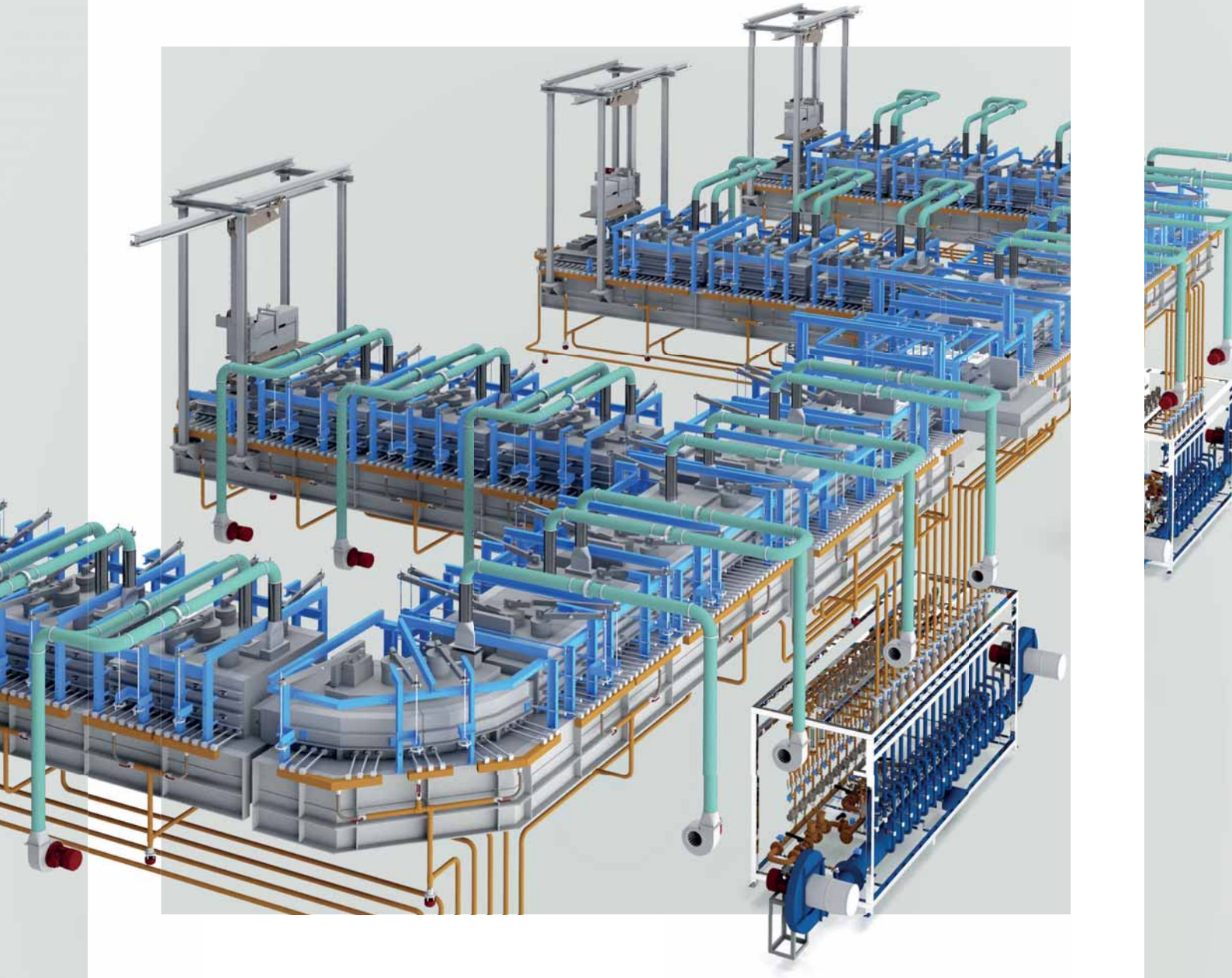

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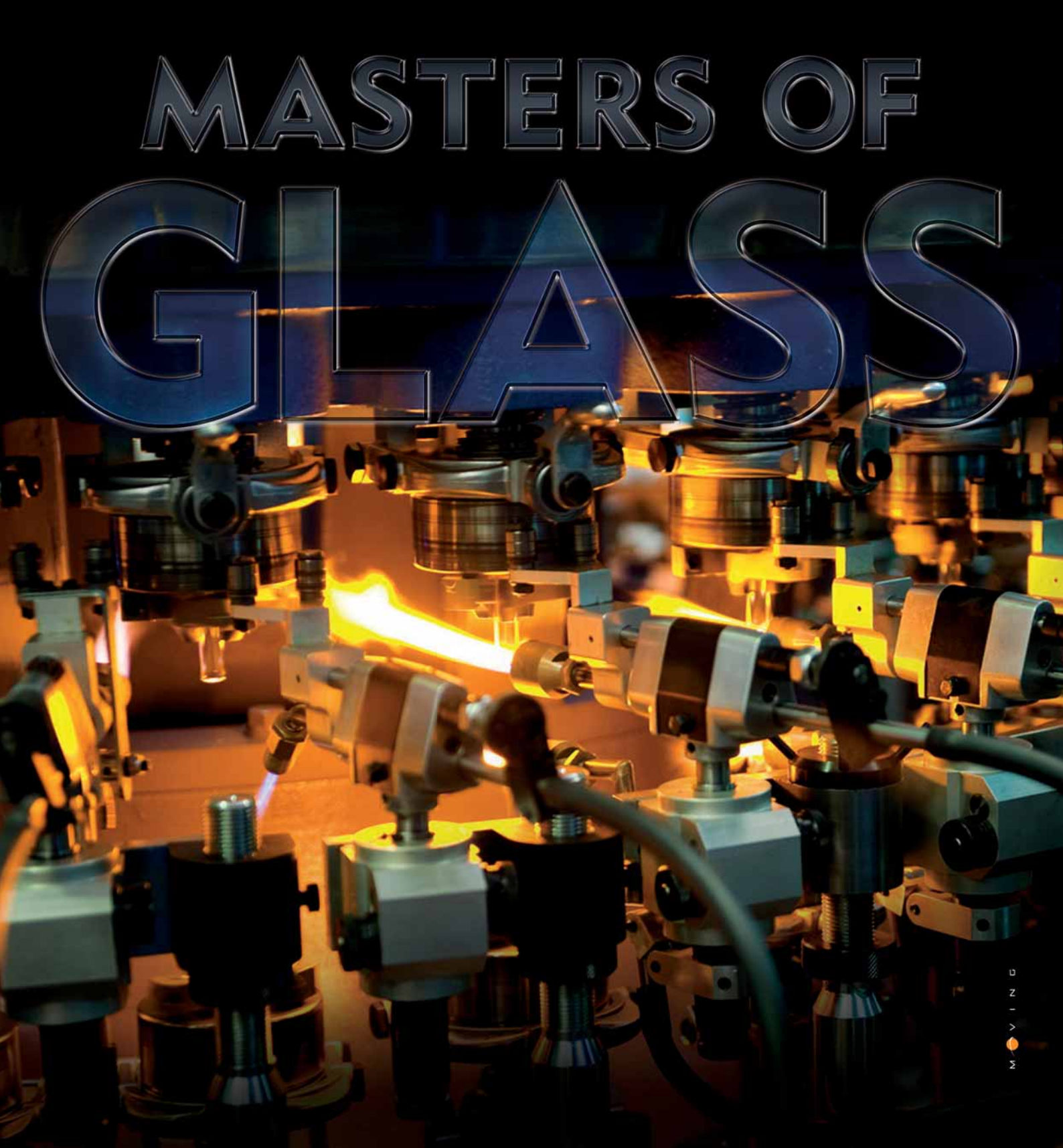

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2024 TRADE FAIRS CALENDAR

PROVISIONAL

The magazine will be distributed at the following Events

	issue	exhibition/conference	date	venue	deadlines
2024	1	MIR STEKLA	27 February 1 March	MOSCOW Russia	
		COSMOPACK	21-23 March	BOLOGNA Italy	Editorial files: 22-01-2024
		FEATURED CONTENT: BATCH CHARGE & REFRACTORIES			Deadline Adv files: 29-01-2024
2024	2	CHINA GLASS	25-28 April	SHANGHAI China	Editorial files: 15-03-2024
		FEATURED CONTENT: FORMING			Deadline Adv files: 22-03-2024
2024	3	GLASSMAN LATIN AMERICA	15-16 May	MEXICO CITY Mexico	
		PACKAGING PREMIERE	21-23 May	MILAN Italy	Editorial files: 05-04-2024
		GLASS TECHNOLOGY CONFERENCE	27-29 May	AACHEN Germany	Deadline Adv files: 12-04-2024
2024		Glass Industry Directory 			Editorial files: 07-06-2024 Deadline Adv files: 14-06-2024
2024	4	ICG ANNUAL MEETING	25-28 August	INCHEON South Korea	
		AFGM	Date to be announced	SOUTH EAST ASIA	Editorial files: 22-07-2024
		FEATURED CONTENT: GLASS MOULDS			Deadline Adv files: 29-07-2024
2024	5	GLASSTEC	22-25 October	DÜSSELDORF Germany	Editorial files: 20-09-2024
		ALL GLASSTEC EXHIBITORS ADVERTISING IN THIS ISSUE ALSO RECEIVE A FREE GLASSTEC PREVIEW			Deadline Adv files: 27-09-2024
2024	6	CONFERENCE ON GLASS PROBLEMS	November	COLUMBUS (OH) USA	Editorial files: 11-10-2024
		ALL4PACK	4-7 November	PARIS France	Deadline Adv files: 18-10-2024

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SAVERGLASS

First hybrid furnace trials prove successful

SAVERGLASS continues on its path towards decarbonization and reducing its carbon footprint: at the end of September, the company's Sustainable Research and Development department successfully led the first hybrid furnace trials at the Feuquières, France, industrial site. The aim of this experiment was to develop a mixed combustion of hydrogen and natural gas - revolutionizing the traditional glassmaking process and marking a significant step towards a more sustainable, environmentally-friendly production process.

Hydrogen is considered a "clean" source of energy, because when it burns, it emits only water and no C02. For this reason, substituting hydrogen for natural gas could pave the way for a significant transformation of the glass industry, helping to combat climate change and preserve resources.

The project team, made up of industrial production, melting and the Corporate Health, Safety and Environment Department, carried out tests on hydrogen injection at three different rates: 10 percent, 20 percent and 30 percent. This test campaign confirmed Saverglass' decision to use hydrogen to decarbonize its glassmaking process.

WWW.SAVERGLASS.COM

LCN

Acquisition of Anchor Hocking glassware manufacturing facility

LCN Capital Partners (LCN) recently announced that it has successfully completed the sale-leaseback acquisition of the primary manufacturing and warehouse facility of **Anchor Hocking**, LLC, an Ohio-based glassware company, whereupon LCN then leased the facility back to Anchor Hocking under a 25-year, triple-net lease.

The 1,000,000 square foot industrial facility, located in Lancaster, Ohio, has three 200-tonne glass furnaces and accounts for nearly 100 percent of Anchor Hocking's production and revenue. The facility operates 24 hours a day and is key to the US glass manufacturing industry, since it contains three of the ten glass furnaces that currently operate in the USA.

Jared Ciejek, a Partner at LCN Capital Partners, noted, "We are pleased to partner with Anchor Hocking, one of the major glass manufacturers in the U.S. The company is a leading national manufacturer of household consumer and commercial glassware. The Lancaster property is a highly specialized facility with a footprint unique to glass manufacturing, and this transaction helps Anchor Hocking unlock capital that can be reinvested into its core business." Anchor Hocking was established in 1905 and employs approximately 800 people between its Lancaster facilities and Columbus, Ohio, headquarters. It is a nationwide leader of household consumer glassware and operates three business units: consumer, food-service and commercial. The company markets products globally under the Anchor Hocking®, Anchor®, Anchor Home® and FireKing® brands. The company's customers range from Fortune 500 to medium and small sized companies. Tom Wall, Partner at LCN Capital Partners, said: "LCN is a recognized leader in the primary sale-leaseback and build-to-suit markets, where investments and leases are directly originated with corporate users of mission critical real estate. LCN delivers a long-term solution for its tenant-clients by providing a non-bank capital resource, efficient monetization of on-balance sheet real estate, continued operational control of key assets, enhanced financial metrics, and potential tax benefits. And LCN's investing partners benefit from the long-term, real estate secured and inflation protected distributions that it supplies."

WWW.ANCHORHOCKING.COM

HORN GLASS INDUSTRIES

Kostopil Glass Works specialists welcomed

HORN GLASS INDUSTRIES recently had the pleasure of welcoming a team of specialists from their valued customer from Ukraine, **Kostopil Glass Works**. On site in Ploessberg, Germany, they were trained on the equipment of their future glass melting furnace and also received the necessary know-how. The training included wa theoretical part as well as practical instruction including simulation of the system components, e.g. training on control cabinets, cooling water system, batch charger, combustion system and the control system as well as a workshop on functional safety.

WWW.HORNGLASS.COM

VERALLIA

Advancing sustainability through collaboration with Glass Futures

VERALLIA recently took a new significant step to create innovative, eco-friendly solutions that enhance the lives of its global consumers. By becoming a member of the not-for-profit organization, the company will benefit from the connection of **Glass Futures** to the global glass industry and academia in order to deliver both R&D and innovation.

A visionary purpose

Verallia's aim here is to transform the glass industry by making glass synonymous with sustainable packaging. This vision aligns with Glass Futures' values, uniting their commitment to a circular economy and a thriving planet.

Corinne Payen, R&D Director at Verallia Group, said: "Our goals are ambitious. To achieve them we must introduce breakthrough innovations. The Glass Futures facilities offer an unparalleled opportunity to test a spectrum of solutions, mitigating risks during the initial industrialisation phase."

Richard Katz, CEO of Glass Futures, added his perspective: "Our collaboration with Verallia reshapes the glass packaging landscape. Aligned in commitment, we will cultivate innovative solutions that lead to a more eco-friendly future."

Verallia's union with Glass Futures marks a pivotal milestone in their pursuit of sustainable excellence, innovation and industrywide transformation. With this collaboration Verallia will integrate a worldwide glass ecosystem that epitomizes its dedication to a sustainable future, a commitment shared by Glass Futures and the global industry. In parallel, Verallia will join its expertise at the service of the association.

This collaboration sets a remarkable precedent, illustrating the power of visionary partnerships in propelling industries towards a brighter, more sustainable tomorrow.

Here Verallia's goal is to transform the glass industry by making glass synonymous with sustainable packaging. This vision aligns with Glass Futures' values, uniting their commitment to a circular economy and a thriving planet.

WWW.VERALLIA.COM

XAAR & KAMMAN

A decade of collaboration

Leading printhead and inkjet technologies manufacturer **XAAR** is celebrating a decade of successful collaboration with innovative decorative print machine manufacturer **Koenig & Bauer KAMMAN**.

Headquartered in Loehne, Germany, Kammann is a specialist within the Koenig & Bauer Group for the high quality decoration of glass, plastic and metal containers, including spirit and soft drink bottles, drinking glasses, cosmetics and hygiene packaging, cans and containers for a variety of other industries worldwide.

Over the last ten years Xaar's print heads have enabled Kammann to deliver the quality and results its customers demand from their decorative digital print applications.

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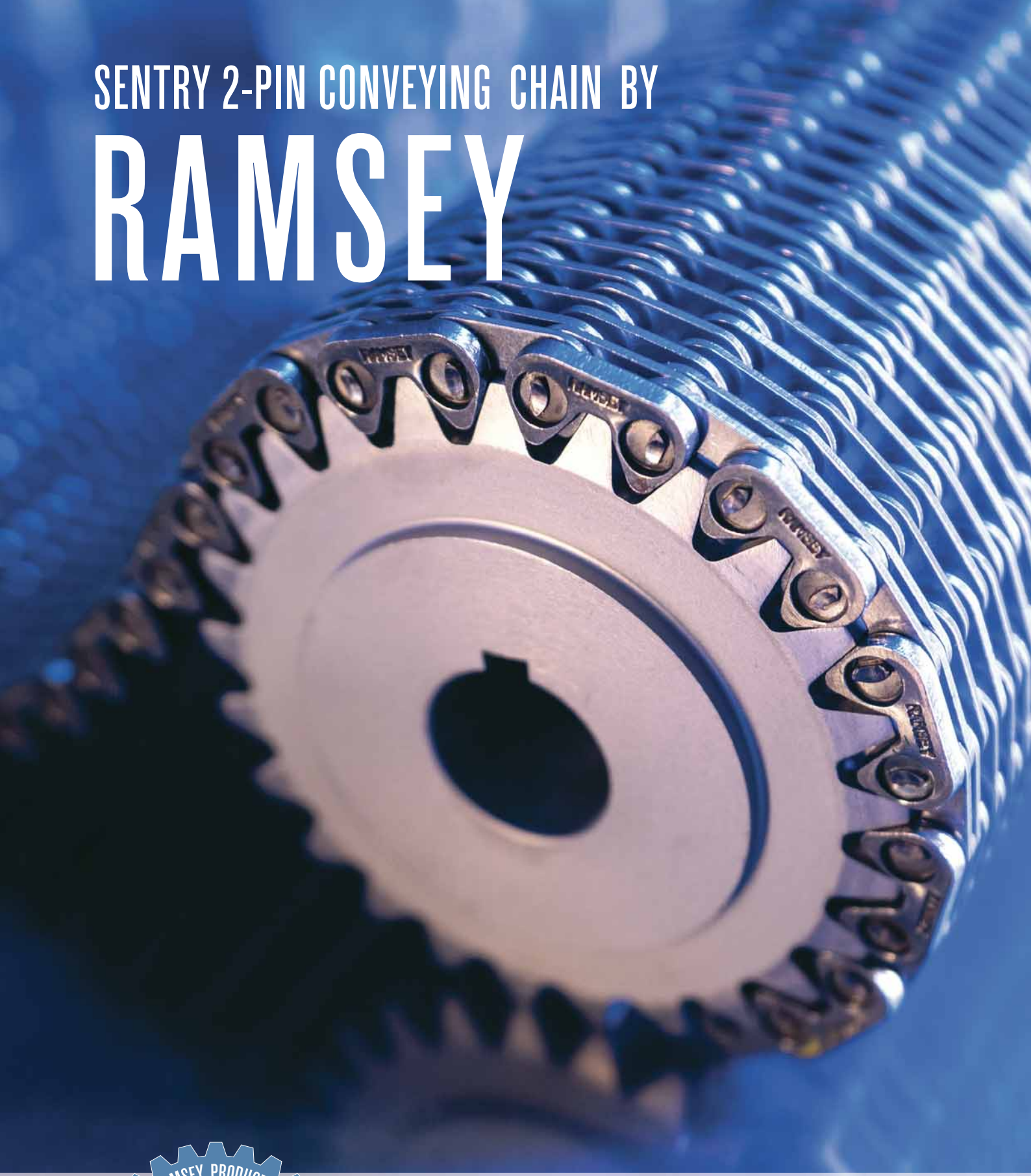

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SUN EUROPEAN PARTNERS

Sale of Vetrerie Riunite Group

Sun European Partners recently reached an agreement to sell Vetrerie Riunite Group ("VR Group"), including **Vetrerie Riunite S.p.A.** ("Vetrerie Riunite") and **Borromini S.r.l.** ("Borromini") to Teak Capital and Tangor Capital for an undisclosed sum. The Novaref division of the VR Group is not included within the transaction.

Teak Capital is an investment company owned by the Moreira da Silva Family, while Tangor Capital is the family office of the Silva Domingues family. Teak Capital and Tangor Capital hold shareholding interests in BA Glass, one of the leading glass packaging companies in Europe, and Cerealis, a reference in the Portuguese food sector.

Head-quartered in Colognola ai Colli, Verona, Italy, VR Group is a global leader in glass windows for front-load household laundry appliances. The Group, founded in 1968, is also specialized in the design and production of moulds for pressed glass and for plastic injection, especially for the automotive lighting sector.

Paul Daccus, Senior Managing Director at **SUN EUROPEAN PARTNERS**, said: "VR Group is a remarkable business, spearheaded by an exceptional management team. In our partnership with the company since 2019, we diligently identified and pursued numerous operational opportunities, shaping VR Group's trajectory for growth. "This successful sale not only marks a significant milestone for VR Group and our investors but also showcases our confidence in VR Group's continued prosperity under its new investors."

Davide Vassena, CEO of VR Group, added: "Our partnership with the Sun European team has been a great success. Our shared values and focus on delivering a customer-first strategy, combined with Sun European's operational knowledge and deep manufacturing expertise have allowed us to transform and grow the business further.

"We look forward to partnering with Teak Capital and Tangor Capital, who also bring extensive experience and an impressive track record as investors and operators, and with whom we look forward to a new growth phase for VR Group."

Carlos Moreira da Silva, Founder and Director of Teak Capital, said: "Aligned with VR Group's management, we are dedicated to enhancing business expansion, including a focus on continuous improvement of the Italian operations while expanding our footprint in China, which we believe are key to protecting and strengthening the position of the VR Group as a global market leader. Our ambition is to contribute to further value creation in the Group's development."

WWW.VETRERIERIUNITE.IT

FURNOTHERM GLASS

Rebuild project of furnaces completed in record time

FURNOTHERM GLASS has successfully completed a project with Sevam, a prominent container and tableware glass manufacturer in Morocco. The company was recently tasked with rebuilding their 210 tonnes-per-day container glass furnace in just 34 days. This involved complete refractories, partial steels, stainless steel piping, furnace drilling, glass draining and heat-up - including cullet filling.

Furnotherm's dedicated team finished the project ten days ahead of schedule on October 24, 2023, after which the company extended its heartfelt gratitude to Sevam group, **BDF** and all project stakeholders for their invaluable support in achieving this remarkable feat in record time.

WWW.FURNOTHERM.COM

SGD PHARMA

Rebuilding of Saint-Quentin-Lamotte plant furnace

SGD PHARMA has recently announced a high performance rebuild of one of the two furnaces at the Saint-Quentin-Lamotte (SQLM) manufacturing plant in France.

This rebuild is part of an ambitious global decarbonization strategy and will contribute to a two-thirds reduction in the total carbon emissions of the company by 2040. The project, which will cut the SQLM CO2 emissions by almost 20 percent, will have two phases that both reduce the consumption of natural gas while increasing the use of electricity on site.

The SQLM furnace rebuild accelerates the electrification of one of the two furnaces (yielding a 40 percent increase in electricity output), the other furnace already being 100 percent electric for many years. The project will also deliver a 50 percent reduction of gas consumption in the forehearths.

This ambitious investment project is partly financed by the French government as part of France 2030, (operated by ADEME) and in part by the European Union - Nextgenerationeu / RePowerEU.

WWW.SGD-PHARMA.COM

ENCIRC

Management change announced

Encirc Managing Director, Adrian Curry has revealed that he will step down from his role after 19 years at the helm of one of the UK's largest glass manufacturers and bottle fillers.

Current Finance Director, Sean Murphy will assume the role of Managing Director, on an interim basis, until a successor is appointed. Sean has been with the company for 19 years having worked previously with Coca Cola.

Adrian commented, "I have decided to resign from my position as Managing Director of **ENCIRC**. After 27 years with the business and 19 years as MD, I have been so privileged to have worked with such truly genuine, honest, and talented people.

"We have shared many challenges along the way but most importantly, many more successes. Today the business is leading in all areas, has a clear strategy for the future and is very well invested. I am delighted to hand over to Sean Murphy, our current Finance Director, who has worked with me since I became MD and is certainly the right person to lead the business through the next chapter. I will step back from my role on December 31 and will remain in an advisory capacity for the first quarter of 2024 (until March 3w1). From that point I look forward to the many new challenges that life will bring. I wish everyone in Vidrala well for the future and I will certainly miss the Encirc people. Our purpose "Great People, Great Place and Great Future" remains something I believe in and I know Sean and the wider business in Vidrala will be resolute in its pursuit of this."

WWW.ENCIRC360.COM

FORGLASS

High-tech solutions for reducing CO2 emissions presented

The recent science and technology conference "Glass Industry 2023" in Ustroń, Poland, gathered the management, technical staff, technologists and representatives of the glass industry, as well as scientists from universities and science centres who collectively work for the needs of the glass industry.

FORGLASS was invited to present its newest innovation for reducing energy consumption and emissions in the glass melting process, based on extensive research of energy parameters in glass furnaces, which the company designs and builds.

The head of Research & Development at Forglass presented the mathematical modeling studies that led to the development and, ultimately, successful launch of the Forglass Mixing Electrodes® - a revolutionary approach to accelerating the melting process by combining the functionality of electrodes and bubblers.

The synergy of the two processes offers incredible opportunities for constructing hybrid furnaces that these days have the full attention of virtually all glass producers.

Forglass Mixing Electrodes® have been gaining considerable interest from the industry and judging by the number of positive comments and inquiries received by Forglass, the participants of the "Glass Industry 2023" conference in Ustroń were no exception.

WWW.FORGLASS.EU

ARDAGH

Major solar energy installation launched in the Netherlands

A major new solar power plant at the **Ardagh Glass Packaging** (AGP) facility in Dongen, the Netherlands, is now live, supplying renewable electricity on-site. The development is part of Ardagh Group's strategy to use 100 percent renewable electricity by 2030 in order to significantly reduce its carbon footprint.

The Netherlands is the first country in which ARDAGH will supply all production facilities -glass and metal- with on-site generated sustainable energy via large-scale solar energy installations.

Annelene Ikemann, Sustainability Director of AGP-Europe, commented: "The start-up of the new solar installation, which we expect to generate over 8000 MWh of electricity per annum, is a significant step in making our target to use 100 percent renewable electricity by 2030 a reality. We are excited that two additional installations in other regions will also be commissioned soon."

Hans Monden, Operations Director of AGP-Europe Benelux, commented: "The investment in solar panels proves Ardagh Group's commitment to a sustainable future. I am proud that the Dongen facility is at the forefront in generating and using its own solar electricity within our industry."

Ardagh plans to roll out the technology, with local energy partners, across all regions by 2030.

WWW.ARDAGHGROUP.COM

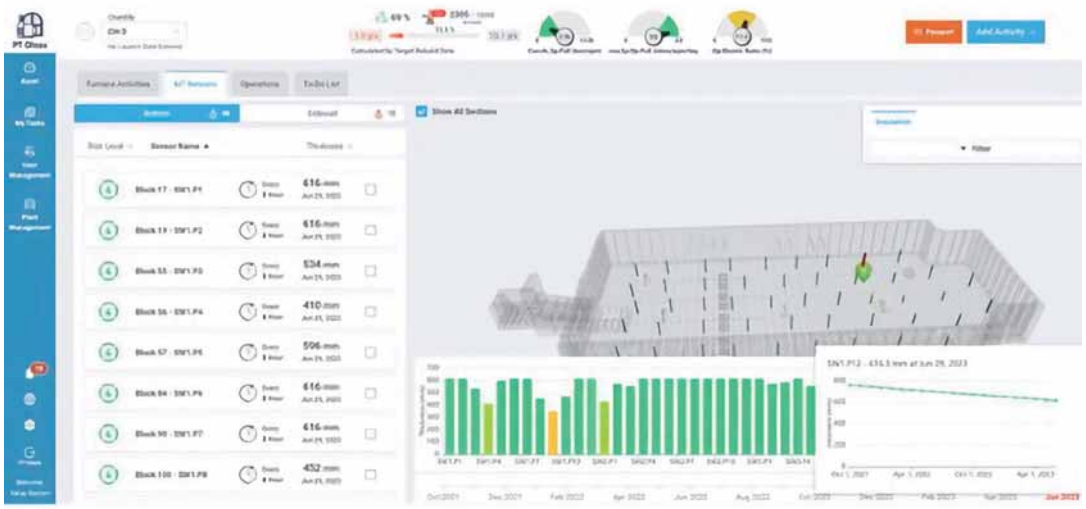
VIDRALA

Enrollment of all furnaces in PaneraTech's monitoring programme

As a leading European glass manufacturer that produces over eight billion glass containers per year, Vidrala consistently participates in world-first initiatives such as installing smart manufacturing lines at their plants and working with IPGR, Glass Futures and Universities to foster solutions in sustainable glass manufacturing - all with a robust customer-centric approach. One of their latest innovative decisions is to enroll all furnaces in **PaneraTech's** Digital Furnace Monitoring (DFM) programme.

In 2015, **VIDRALA** was one of the first companies to validate PaneraTech's SmartMelter® technology as part of International Partners in Glass Research (IPGR) in one of their plants in Portugal. Over the last five years they have used PaneraTech's radar technology to regularly make critical decisions about maintenance of their furnaces.

When PaneraTech introduced a holistic programme to manage furnace health through digital transformation, it was the software platform, XSight, that first captured Vidrala's attention. "XSight brings visibility and transparency into our furnace KPIs, asset health and maintenance schedules," said Vidrala's Technology Team. "It is a true digital transformation of our furnace management programme."



XSight acts as the command centre for the programme. When a furnace is onboarded, a digital model is created and PaneraTech's team enters all furnace history and activities to date. XSight captures furnace data such as regular walk-downs and observations, inspections, audits, repairs and maintenance. This data is analyzed based on best practices in the industry and recommendations are made for operational improvements to extend furnace life.

Enrolment in DFM includes an experienced PaneraTech Asset Manager assigned to Vidrala's furnaces to support their staff. The Asset Manager will train employees to evaluate information on the platform and make data-driven decisions). Asset Managers will work with the plant teams to meet KPI's developed by Vidrala.

A customized schedule of furnace evaluations will include SmartMelter® radar scans, continuous monitoring of electrodes with Polaris IoT sensors, and periodic SmartAudit checks (visual, thermal and endoscopic evaluations).

"Vidrala has been a valuable partner to PaneraTech since the earliest days when our technology was being validated," said Yakup Bayram, CEO of PaneraTech. "We are happy to continue this relationship by working together to optimize the life of their furnaces."

The objective of Digital Furnace Monitoring is to help manufacturers make more glass, even with a workforce that is evolving into younger generations. As experienced employees retire and turnover increases, PaneraTech provides the consistent support needed to increase production and reduce CAPEX.

WWW.PANERATECH.COM - WWW.VIDRALA.COM

RHI MAGNESITA

Acquisition of P-D Refractories

RHI Magnesita, a leading global supplier of high-grade refractory products, systems and solutions, recently announced the completion of the acquisition of the Germany, Czech Republic and Slovenia based refractory businesses of the Preiss-Daimler Group (P-D Refractories).

P-D Refractories is a producer of high quality alumina-based refractories for industrial applications in process industries, with a leading market position in the glass and aluminium sectors. In 2022, P-D Refractories recorded revenues totalling EUR 171M.

The acquisition offers multiple growth opportunities, not the least through enabling RHI Magnesita to offer a significantly expanded product and service portfolio to an extended customer base. While the production facilities of P-D Refractories are based in Europe, the company has a global market presence, with well established brands and top-performing products that are esteemed by customers worldwide.

Through the acquisition, four production facilities (in Germany and the Czech Republic) and two raw material mines (in the Czech Republic and Slovenia) are added to the global production network of **RHI MAGNESITA**.

Commenting on the acquisition, Stefan Borgas, CEO RHI Magnesita, said: "The production capabilities and vertical integration of P-D Refractories, combined with RHI Magnesita's know-how and renowned R&D capabilities, will complement our product portfolio and enlarge our production footprint and sales channels on a global scale. This acquisition is our sixth transaction to close in the year to date and marks a major milestone for both companies in the process industries sector. Together we look forward to expanding our footprint and strengthening our market presence by offering high-grade refractory products and solutions to an enlarged customer base."

WWW.RHIMAGNESITA.COM

SCHOTT

Funding received to build first climate-friendly melting tank

Speciality glass manufacturer **SCHOTT** has received funding of around EUR 14.8M for the construction of its first large-scale industrial pilot plant. In this pioneering project, pharmaceutical glass is to be manufactured largely without causing greenhouse gas emissions, melting glass using green electricity and green hydrogen. The pilot plant represents a technological milestone for the specialty glass industry.

The glass industry is one of the most energy-intensive industrial sectors in Germany. High CO2 emissions are generated during production. The largest share of the energy requirement is generated in the melting process. The glass raw materials are melted in refractory furnaces at temperatures of up to 1,700 degrees Celsius.

Pioneering work for the entire glass industry

Over the past two years, the experts at Schott have been doing basic work in various research projects. Now, the company is taking the next step: the research results will be tested on an industrial scale in an innovative melting tank concept. This pilot is pioneering work for the specialty glass industry.

Pilot plant and multi-million investment in Mitterteich, Bavaria

Around EUR 40M are being invested in the “Prospect Pilot” project for the construction and use of the new glass melting tank. It will be built in Mitterteich, Bavaria. The project period is the next three years. The pilot plant will be powered primarily by green electricity. Greenhouse gas emissions will be reduced by about 80 percent compared to current technology.

The promotion of the climate-friendly process takes place as part of the “Decarbonization in Industry” programme of the German Federal Ministry of Economics and Climate Protection (BMWK). The programme is managed by the Competence Centre for Energy Intensive Industry in Germany (KEI).

With this funding, the BMWK is supporting an energy-intensive industry in permanently reducing process-related greenhouse gas emissions. The project is also financed by the European Union through the “NextGenerationEU” fund. The main contact for the “Decarbonization in Industry” programme is the Competence Center for Climate Protection in Energy-Intensive Industries based in Cottbus (Brandenburg).

WWW.SCHOTT.COM/EN-GB

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Polyethylene emulsion.
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VERALLIA

First batch preheater now operational

Taking decarbonisation to the next level,recent progress at **VERALLIA** has seen the successful commissioning of the company's innovative raw material preheating system at the Bad Wurzach, Germany, plant.

This is a major industrial step - allowing the company to save 3,100 tonnes of CO2 per year. It's a technical feat that works with cullet as well as raw materials to help Verallia achieve carbon neutrality by 2050.

WWW.VERALLIA.COM

TIAMA

Photovoltaic panels installed on headquarters roof

Tiama is proud to announce the installation of brand new photovoltaic panels on the roof of its headquarters - bringing the company one step further in their commitment to save energy.

Transitioning to solar energy helps to reduce a key environmental indicator: the carbon footprint. As a responsible player, **TIAMA** firmly believes it is its duty to actively contribute to the transition to clean and renewable energy sources.

The company recently warmly thanked all who made the project possible among partners, employees and supporters - ever convinced of its continuing responsibility to explore new ways to innovate and positively contribute to the fight against climate change.

WWW.TIAMA.COM

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VIDRALA

2022 Annual Report published

A cursory glance at the 2022 Annual Report of **VIDRALA** would suffice for an overview of the company's 'Glass Made Good' sustainability , which is based upon the 4 Ps (People, Place, Planet and Prosperity). In the Report, Carlos Delclaux, Chairman of the Board of Directors, said: "Vidrala's results throughout this entire period are a good example of the strength of our business model. Thus, throughout 2022, our initially deteriorated operational margins gradually recovered as a result of internal energy cost mitigation actions, a sustained solid manufacturing performance, the first effects of our ambitious investment plan and a progressive adaptation of our sales prices."

He also added: "Looking ahead, we have recently announced two important corporate operations. On the one hand, since January 31, 2023, our subsidiary in the UK owns the beverages filling facilities and the logistic infrastructure previously operated by Accolade Wines in Bristol, known as 'The Park'. The business purchased will reinforce Encirc's unparalleled characteristics as the only player to offer a full 360 approach to the beverage supply chain. Besides, in early February 2023 Vidrala announced the acquisition of a stake of 29.36 percent in the Brazilian company Vidroporto, S.A. This acquisition, although it is a minority stake, evidences Vidrala's long-term strategy towards diversifying the business - creating platforms for future growth in regions that will offer interesting opportunities and strengthening long-term partnerships with strategic customers."

WWW.VIDRALA.COM

SIGMA GROUP

Forthcoming green investments

In a plan for continuous innovation while staying abreast of the times, **SIGMA GROUP** recently commissioned the installation of two photovoltaic systems for its Locate Varesino facility. Now a 320 kWp and an 89kWp system signals great improvements in terms of both energy efficiency and sustainability. 743 panels are to be installed on the roof of two manufacturing buildings to produce over 425.560kWh.

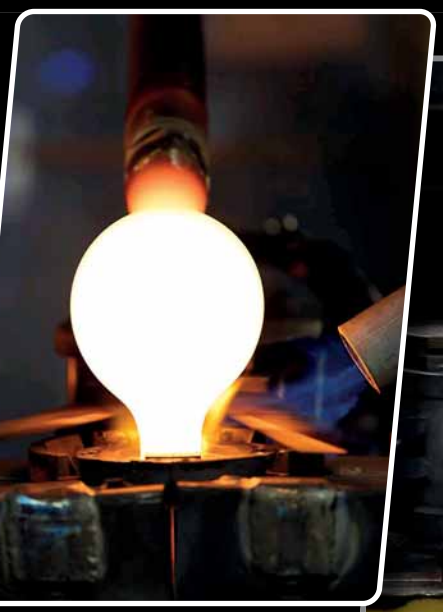
82 percent of the energy produced is to be self-consumed - thereby avoiding 110t CO_2 emissions per year. The installation of these photovoltaic systems is an important step forward on the path to sustainability begun back in 2014 with the installation of the first solar panels with 120kWp. Here Sigma lives up to its name among today's pioneers in the search for anything that can improve quality, service and competitiveness respecting the environment.

WWW.SIGMAREF.IT

FAMOR

for the glass industry

We Know How



GATHERING

FORMING

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The important steps for your quality

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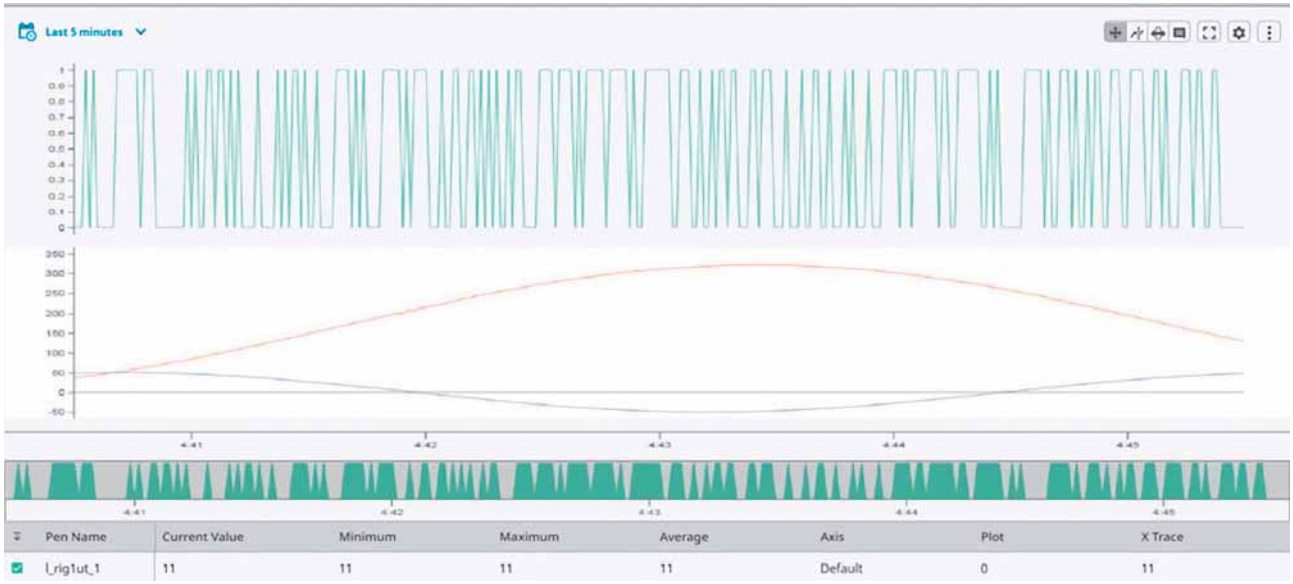
Hastening net zero: BDF develops Panorama 4.0™

With a venerable legacy dating back to 1906, BDF addresses green challenges to meet today's environmental deadlines by emphasising historical insights. Leveraging regenerative furnaces and technology, the company also focuses on CO2 emissions reduction, which led to its development of Panorama 4.0™ to advance real-time data management and decision-making - all in the pursuit of zero emissions across multiple sites.

Given the impending 2035 and 2050 deadlines, rigorous attention to current green challenges is widely accepted and is even more crucial today than ever before. Here, to support that drive, BDF solutions include its hybrid and all-electric radiative conditioning zone. Founded back in 1906, the gap in time now affords the company new opportunities to analyse its contribution to the industry over a trajectory that's spanned more than a century. Indeed, looking back can often be a good initial step towards shaping the future - mindful how significant historical developments are to geopolitics, industry and the market itself.



HINDSIGHT LEADING TO FORESIGHT

In briefly focusing here on the various solutions currently under discussion for the mission of reducing CO2 emissions one can identify the regenerative furnace as being the state-of-the-art competitor in this regard - particularly for container glass production. Regenerative furnaces have a long history in the industry, with their initial appearance dating back to the 1850s. Since then, there has been tremendous improvement in terms of energy efficiency - especially over the last four to five decades. It's worth noting that during these years, energy reduction has been achieved in parallel with emissions control (SOx, NOx, CO) to prevent major corrosion of the refractory material. But all this begs a straightforward question, namely: How was such a significant performance upgrade possible within such a short period when compared to previous advances? The answer lies in technology, which has provided sensors and tools that are more precise, are faster, and are more accurate than ever before. This has allowed for the evaluation of new materials, the conducting of new procedures, the employment of new equipment, using new fuels and innovative contributions to heat. Today the glass industry calls for ever closer attention to both emissions and process control. Here's why R&D at BDF has been focusing on green solutions while enhancing its process control level. This is achieved not only by increasing the number of sensors and the information provided but also by organising this data in a useful manner so as to secure reliable data that's readily available in order to ensure the best possible analysis and cross-checking.

REAL-TIME DATA

Such is the foundation upon which BDF developed its Panorama 4.0™. Modern industrial process management increasingly requires real-time and statistical data from process control. Here, to provide its customers with the ability to access real-time process data on their desks, the company offers a solution that integrates with the basic supervision system. Glass manufacturers can now manage data from BDF furnaces, forehearths and IS machines - all through this intelligent application. Panorama 4.0™ is the product BDF has designed for mathematical management, thereby enabling the

acquisition and long-term historical storage of the main parameters from BDF systems. Panorama 4.0™ is designed to work on a web browser, making it accessible not only from fixed workstations but also from mobile devices. Here both database and historical storage are supported on standard SQL - with different versions available such as MySQL or SQL Server. Not only. Panorama 4.0™ consists of various modules that make up a complete package, providing scalable management that can be adapted to each customer's needs. The basic package includes historian storage management and enables the viewing of graphs with numerous associated functions, such as data export to Excel or CSV files. The default dashboard provided with the basic package allows for the viewing of both instantaneous and historical variables. Advanced user management ensures that each user can view only the data and functions that are relevant to them.

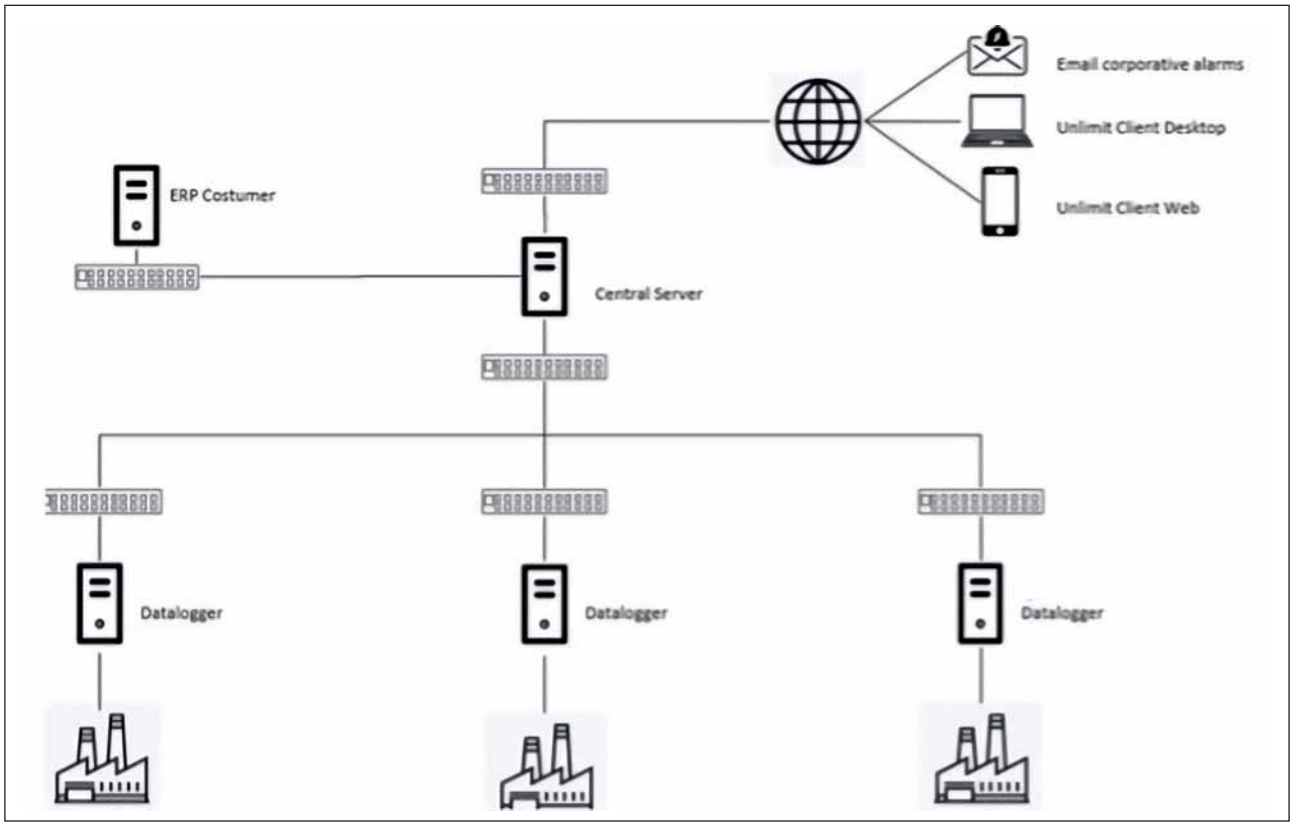
SOME SPECS

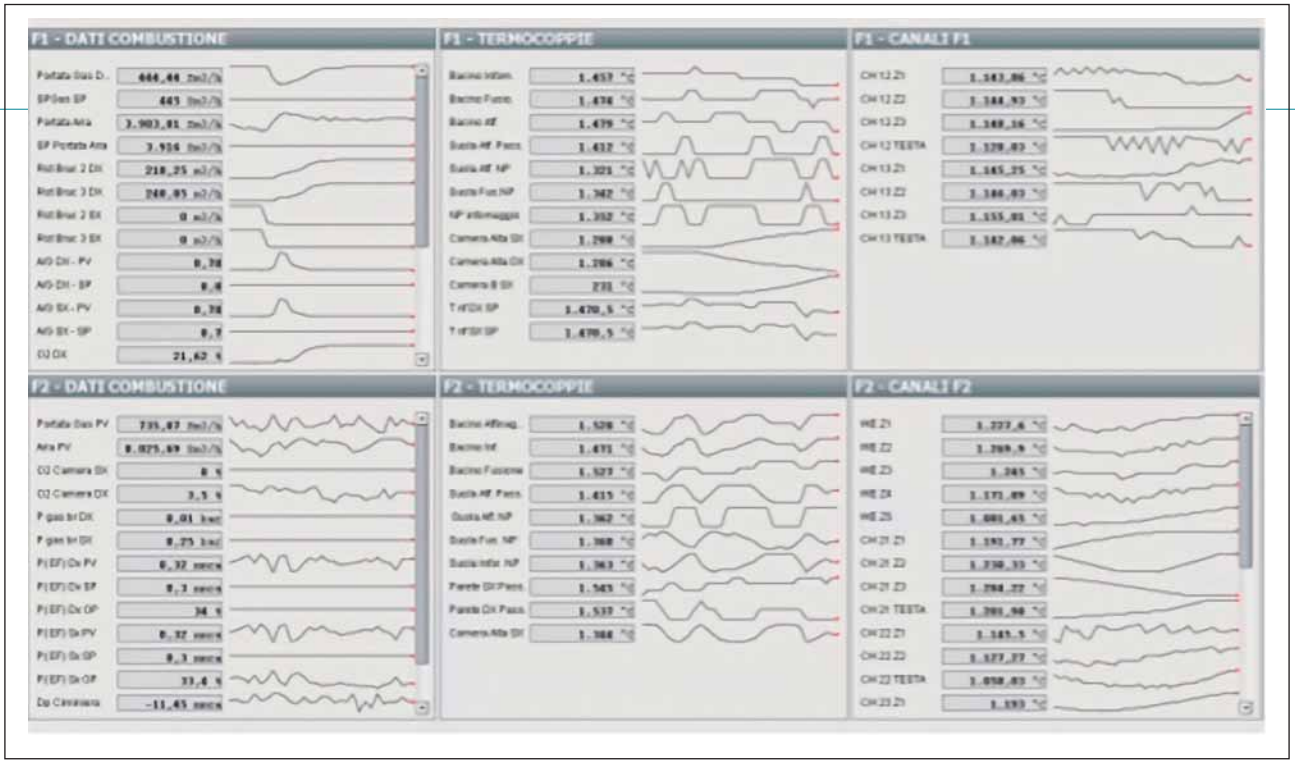
Besides the basic package, Panorama 4.0™ offers additional modules, including alarm notifications via SMS. Its functions encompass:

- The possibility of using virtual or physical servers
- User-configurable variable display dashboards
- User-configurable production reports
- Recipe logging and BDF IS machine configuration
- Historian module
- Report module with an option to schedule and modify automatic report emissions
- Alarm notifications via email or SMS
- Multi-Plant Architecture for gathering data from several plants of the same glass manufacturer

The Panorama 4.0™ network structure consists of two distinct networks, with the data logger serving as a bridge/router between them. Of these, the former is configured with the SCADA or PLC for real-time acquisition of process data while the latter is connected to the factory network, thereby allowing access from the entire intranet (factory PCs) and the internet (external PCs and mobile devices).

Thanks to this infrastructure, Panorama 4.0™ can serve as an information concentrator for several production sites within the same organisation. The data logger function can be integrated into the base server module in the case of a centralised structure for a single production site. However, for multiple production sites or lines (furnaces) it can also be used in a decentralised manner and dedicated to a single production site or lines. The dashboards present real-time or historical variables of the system, are fully-configurable by the user and are even linked to each individual user. Through widget configuration, users can select and change the type of presentation dashboard for the variables from the various options available.





ACCURATE SYSTEM OVERVIEWS – AT A GLANCE

Much like standard SCADA and MES systems, Panorama 4.0™ similarly allows for the graphical representation of all variables contained within the database. The management and representation of variables are intuitive - making it easy to add variables to the histories, cross-reference them, and use simple tools to establish reference lines. It is also possible to integrate the IS machine data module, allowing for the acquisition of data from BDF IS machines, which can then be stored and made available for export to other systems. The log and events function permits management and viewing of all alarms and events within the system. Every alarm, anomaly or event is recorded and displayed within a dedicated screen. System administrators can receive notifications via email for major system alarms, such as communication loss or SQL engine block. Additionally, any recorded alarm in the system can be notified via SMS to specific numbers or via email to specific addresses.

REPORT GENERATION

The reports function essentially replaces traditional production books, thanks to the acquisition of variables. It allows for all the information previously contained in paper production books to be consolidated in a single electronic sheet. Reports can be generated manually or automatically through a scheduler. The variables to be included in the reports, like the dashboards, are fully configurable by the user, providing maximum flexibility in report management. Generated reports are saved in a user-defined location and can be stored in Excel spreadsheet format. In sum, Panorama 4.0™ is indeed a most valuable tool, particularly in today's context which necessitates a clear understanding of the steps required to achieve zero emissions. Evaluating each modification and its impact on multiple layers is something that begins now to warrant serious consideration. ■

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INDUSTRY VISIONARIES

All eyes on contractor GSE ITALIA following VETROPACK facility triumph

GSE Italia has taken a big step forward after establishing itself as a point of reference for industrial construction in Italy - particularly respecting heavy industry. The company recently delivered Vetropack's new facility in Boffalora sopra Ticino. Constructed on a brownfield site, operations adhered to the highest sustainability standards - all while integrating with the surrounding environment. Here, with the precise intention of minimising land use, GSE Italia assisted Vetropack in reclaiming a de-industrialized site that spans 347,000 square metres. This process involved the complete remediation of land contaminated with mud, asbestos and cement materials. It also included the demolition of 20 pre-existing buildings. Totalling approximately 120,000 cubic metres, materials resulting from the demolition were subsequently crushed and reused on-site as both primary and secondary resources, with contaminated materials being subject to reclamation.

A TITANIC PROJECT

Numbered now among Italy's major industrial projects of the last decade, the new Vetropack facility is to be dedicated to the production of container glass, with more than half of its output consisting of bottles for the Italian wine market. This makes it a strategically important facility within the realm of Italian excellence (Made in Italy). The project is notable for its complexity, its regulatory approvals - even the scale of the investment itself. That certainly makes it one of Italy's key industrial projects over 2023, especially in the heavy industry sector and particularly in the glass industry. Besides, the installation of two melting furnaces in Boffalora sopra Ticino opens up new possibilities in terms of product availability and logistics.

SOUND MATTERS

Here project features include a

Skillfully managing every challenge while keeping both worker safety and noise reduction top of mind, GSE ITALIA recently completed the construction of VETROPACK's new eco-friendly, 347,000-square-metre industrial facility. Now, prioritising sustainability, the installation of two melting furnaces in Boffalora sopra Ticino are all set to make a significant difference to Italy's container glass industry - enhancing both product availability and logistics.

construction area spanning 347,000 square metres, in which 160,000 square metres are dedicated to buildings. Notably, it has incorporated an operational 'hot end' with two highly-efficient melting furnaces, a 'cold end' focused on quality control and a two-level warehouse for finished products. Construction prioritised the well-being of workers - carefully designing the ergonomics of production spaces as well as dedicated colour studies for flooring, walls, roofing and external facades. This approach ensured that noise emissions remained below the legally-authorised limits through optimised internal acoustics. Moreover, specific ventilation and heat extraction systems were employed to maintain a suitable indoor microclimate for production workers, thereby minimising additional electrical consumption.

LOOKING OUT FOR THE LOCAL COMMUNITY

Sustainability, integration with the local environment and benefits for the local community were all key aspects of the new Vetropack production facility. The design, too, integrated seamlessly with the surrounding landscape - fully respecting its morphology. As for the project, it focused upon selecting technologies that could reduce energy and water consumption in order to best address the substantial energy and water demands of the production process. This involved solutions for highly-efficient resource utilisation, together with a significant reduction in the company's environmental footprint. Here's just one example: a heat recov-

ery system from the furnaces and a closed-loop water circuit were used so as to minimise groundwater withdrawals while ensuring continuous filtration and purification.

A HIGH FIVE FOR TEAMWORK

Collaboration between the municipality, Vetropack, and the support of GSE Italia proved instrumental in the project's community-oriented design - emphasising both environmental planning and sustainable development in the area. The project introduced a 35,000-square-metre public park along the Naviglio Grande and a 2.5-kilometer cycling path connecting the new facility and the public park to the existing cycling network. Not only. To mitigate the impact on local traffic, extensive on-site parking was provided for company vehicles and public use. Here GSE Italia demonstrated its stellar design and management capabilities in handling the bureaucratic complexities and challenges of this multifaceted project. Said GSE Italia Country Manager Valentino Chiarparin: "We're truly proud to have successfully completed this complex, sizable project for the Italian industry. Here, dual activities of intensive and meticulous preliminary design have afforded us the opportunity to manage all the bureaucratic and operational phases to obtain the building permit getting positive approvals by more than 50 authorities grouped within a unique administrative process, including the environmental authorization to operate, while handling a construction site that, at peak times, involved more than 750 people per day."

THE ENDURING FRUITS OF PARTICIPATION

According to GSE Italia Senior Project Director Stefano Piccoli, one very complex challenge was that of dividing various lots - both to ensure backup contractors and to minimise risks associated with rising labour and material costs, which are influenced by the challenging national and international context in which the project was conducted. Finally, being part of a project that had significant national relevance and which represented a significant challenge was a source of great satisfaction for the team.

AN EXCELLENT 2022 FOR GSE ITALIA

After announcing consolidated data for April 2023, GSE Italia continues its exponential growth. Indeed the company's revenue has more than doubled, increasing from EUR 123M to EUR 259M (plus 111 percent). These figures affirm the company's position in the Italian market, where it has managed over 1.9 million square metres of projects in 24 years.

Said GSE Italia Country Manager Valentino Chiarparin: "We're very satisfied with these results -all achieved in a complex historical context. They confirm the commitment and quality that every team member places at the core of every project. Today, we're proud to be among the one percent of companies certified as Ecovadis

Platinum, which is also why we aim to create an ecosystem of expertise to accelerate the ecological transition in the real estate sector."

COMMITMENT TO SAFETY AND TRAINING

The success of GSE Italia is rooted in a people-centric corporate philosophy. Since 2018, the company has grown from nine employees to over 100, prioritising employee safety and rigorous training. In 2005, the Quality and Safety Department was established - focusing on constant risk assessment and continuous training. All to improve safety it emphasises near-miss accidents. In 2023, 1,304 hours of training were delivered - a 34 percent increase from the previous year.

2022–2023 PROJECTS

During this business cycle, GSE Italia focused primarily on seven projects that showcased versatility as well as innovative, eco-friendly solutions. These promote sustainable development by preferring brownfield sites over agricultural or urban areas to combat soil erosion. Half of GSE Italia's projects have been in brownfield areas - aiming to increase this percentage. Several projects achieved notable certifications. The Orbassano (TO) logistics warehouse, used by a leading e-commerce company, secured BREEAM International New Construction by BRE at the

ABOUT GSE

Founded in 1976, GSE Group is the reference global contractor for managing all aspects of a construction project - being contractually committed to delivering a fixed price, assured construction timelines and a guaranteed work quality. Currently employing 554 people across Europe and China, the GSE Group achieved a turnover exceeding EUR 1 billion in 2022. It specialises in the construction of industrial, logistics, office and commercial buildings. In 2019 GSE was acquired by Goldbeck GmbH, a European leader in the real estate market with a 2022 turnover exceeding EUR 6 billion and more than 10,000 employees across over 100 locations in Europe. The two companies jointly constitute the primary pan-European operator - capable of executing both 'tailor-made' and 'system-based' projects with a dense network of operational branches to be as close to the customer as possible.

As Italian subsidiary of the French group established in 1999, GSE Italia operates as General Contractor in the real estate and construction sector. It specialises in the logistics and industrial market - serving as partner to real estate funds, developers, grocery retail companies, logistics operators and manufacturing companies. With around a hundred employees, GSE Italia achieved a turnover of EUR 256M in 2022. Some of the end-users and clients of GSE Italia include such big names as Carapelli, Euronics, Kramp, Fresenius Medical Care, Lyreco, Marchiol, Michelin, P3 Logistic Parks, Pirelli, Vetropack, Susa Trasporti, DEA Capital Sgr, Prologis, Vailog, Carlyle, BentallGreenOak and Scannell Properties.

Excellent level and is competing for the Zero Carbon certification by the International Living Future Institute. Notable is the use of Class III/B and III/A cement with recycled aggregates, resulting in a 30 and 25 percent reduction in CO2 emissions as compared to traditional mixtures. Here GSE Italia delivered a 42,750 sqm logistics warehouse in Piacenza - with jointless flooring and high thermal insulation aimed at LEED Silver certification. The 49,983 sqm warehouse in Mesero (MI) included a 3.5-hectare ecological corridor for biodiversity preservation. In September, it will inaugurate a new logistics and office centre for a significant electrical material distribution player in Roncade (TV). This eco-friendly building, powered by renewable energy, covers approximately 40,000 sqm. October 2023 saw the completion of one of Italy's largest industrial projects - a cable glass production plant in Boffalora (Milan) featuring a 35,000 sqm green area for public use near the Naviglio Grande. This autumn, a 20,878 sqm logistics warehouse in Truccazzano (MI) is being delivered - aiming for LEED Gold certification.

ONGOING PROJECTS

Work has resumed in Vidigulfo (PV) for two logistics warehouses that are focused upon both landscape integration and environmental sustainability. Striving for LEED Gold certification, these cover a total area of 116,523 sqm. Another construction of a logistics warehouse began in Altedo (BO) on a brownfield area of 140.000 sqm, which aims for BREEAM Excellent certification. This project also includes such community benefits as road reconstruction, overpasses, bus stops and a 1.1 km cycle path with two cycle-pedestrian bridges.

ABOUT GOLDBECK

Goldbeck is a leading German company in industrialised construction, with 54 years of experience, 12,000 employees, 111 locations in Europe, and a turnover exceeding EUR 6 billion for the 2021/2022 fiscal year. In 2019, Goldbeck acquired 100 percent of the shares of the GSE Group, and in 2022, it also acquired 100 percent of the shares of the Danish construction company DS Gruppen. DS Gruppen is a leader in commercial building construction in Denmark and the production of steel and concrete building components. It operates in Norway, Sweden, the Netherlands and Germany. These acquisitions have solidified Goldbeck's position as the primary pan-European operator in 'turnkey' construction of buildings for both private and public markets, with a highly-optimised or 'customised' construction system. With sustainability being an integral part of product development, business activities and company culture, Goldbeck aims to achieve the ambitious goal of becoming carbon neutral at Group level through training, emissions reduction and compensation activities by the fiscal year 2023/2024.

GSE ITALIA BUSINESS AREAS

In 2022, GSE Italia expanded its operations by creating two dedicated units for specific business lines, namely industrial and multi-story parking structures constructed with the Goldbeck parent company's building system.

GSE ITALIA CERTIFICATIONS

GSE Italia prioritises quality, safety and sustainable development. The company embarked on a path to obtain certifications -including Ecovadis Platinum- which reflects its high sustainability performance, as well as ISO 9001 certification for quality management. It's also in the process of obtaining SOA qualifications for public projects. Sustainability is a cornerstone of GSE Italia's development strategy. Over the past year, GSE projects earned three LEED Silver certifications, one LEED Gold, two BREEAM Very Good, and one BREEAM Excellent certification. Five more projects, either completed or in progress, are competing for three LEED Gold certifications, one LEED Silver, one BREEAM Excellent certification and the prestigious Zero Carbon certification from the International Living Future Institute - a first for an Italian logistics building. ■

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Customized conveyance: a DMA MASCHINEN success story

A leading manufacturer of conveyance and process technology that typifies machinery and plant engineering of the highest quality, DMA Maschinen und Anlagenbau was founded in 1992. Today it has more than 19,000 machines and systems - serving over 900 customers worldwide. Whether for bakeries or glassworks, medium-sized companies or corporate groups (all traversing every industry as well as company dimensions of all types), DMA prides itself in robust automation partnerships.

PRIORITIZING EXCELLENCE

An example here is container glass manufacturers, for which the company offers innovative and complete cold-end solutions. But there's more. As a direct supplier with short delivery times, it typically offers a choice of complex conveyor systems, individual systems, retrofits, service and spare parts - all at an attractive price-performance ratio.

Furthermore, DMA Fördertechnik offers higher productivity and availability as well as possible savings on production costs. The company understands that every production site is different - as is every production requirement. As such, its conveyor systems remain

Founded in 1992, DMA MASCHINEN und Anlagenbau is a leading manufacturer of customized conveyance and process technology. Today, with over 19,000 machines that serve more than 900 clients worldwide, the company excels in innovative conveyor systems, reducing downtime through high-quality processes and technology - all while prioritizing customer success and expert guidance.

adaptive to individual circumstances.

In other words: companies will tell DMA what's required, whereupon its experts will plan everything down to the last detail - prudently, with foresight and all to ensure that companies are optimally equipped for success. Here DMA's planned layouts seek to epitomize clean production processes and professional interface connections, such that first-class products can strive to guarantee that production runs at 24/7, 365 days a year - for decades on end.

SERVICE AROUND -THE-CLOCK

High company process quality and conveyor technology jointly pay off with low maintenance requirements, professional repairs by service technicians and simple spare parts deliveries. Indeed, thanks to its production facilities, DMA can also manufacture spare parts within 24 hours - thereby ensuring a high level of process reliability - which includes low downtimes for its customers.

In sum, the success of the company's customers is perceived to be its own success. Here's why it relies on competent, reliable and cooperative advice - all to ensure that first-class concepts can be expected for the implementation for every requirement. ■

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E-Mail:dma@dma.de
www.dma.de

Success story

Taking measuring to the next level, LUBEN GLASS does it again

CONTROL OF THE FUTURE

Today ever-increasing demands upon the quality of glass containers demanded by the market force Luben Glass' customers to continuously improve their production quality. As is well-known, this can hardly be achieved without high quality moulding - constantly monitored to ensure it maintains the requisite production standard characteristics.

GALAXY LINE

Thanks to its partnership with engineering company Bi.Lab, Luben Glass shows itself at the forefront once again with both the design and implementation of control and measurement systems. With its new Galaxy line, the company ushers in a new era of controls for variable and mould equipment - providing customers with an unequivocal support for quality control of parts and thereby contributing to the constant improvement of production performance.

NRP AND AW1 MODULE

Equipped with the AW1 automatic warehouse module, the flagship of the GALAXY line is the NRP machine for measuring neck rings and plungers. NRP

Having jointly launched the Galaxy line just recently, LUBEN GLASS is proud to announce its addition of the NRP machine with its AW1 module for precise glass container part measurement, which uses both laser tech and probes while reducing operator workload. Not only. Enhancing quality control efficiency, a QRR module will now automate part recognition via pre-printed codes.

was developed for the dimensional control of plungers and neck rings in order to provide customers with an accurate picture of the wear and conformity status of their parts. The machine itself is equipped with two control stations, i.e. one for the plunger and the other for neck rings, which is equipped with specially-designed measuring systems based upon both laser technology and precision probes. Thanks to these systems, parts are checked with centesimal precision following which, using special software, a report is then returned indicating the measurements taken and certifying conformity of the part. The AW1 module also allows the NRP machine to perform checks on a preset number (depending upon the equipment supplied with the AW1 module) of parts - thus limiting to a minimum the operator time spent on the machine. The AW1 automatic storage system is equipped with trays with predefined workpiece positioning stations, which are designed to make it easier for the operator to position the workpieces. Once loaded, the handling system picks up the articles and then positions them in a double-row parking station to allow faster positioning in the measuring station while reducing cycle times.

QR CODE READER

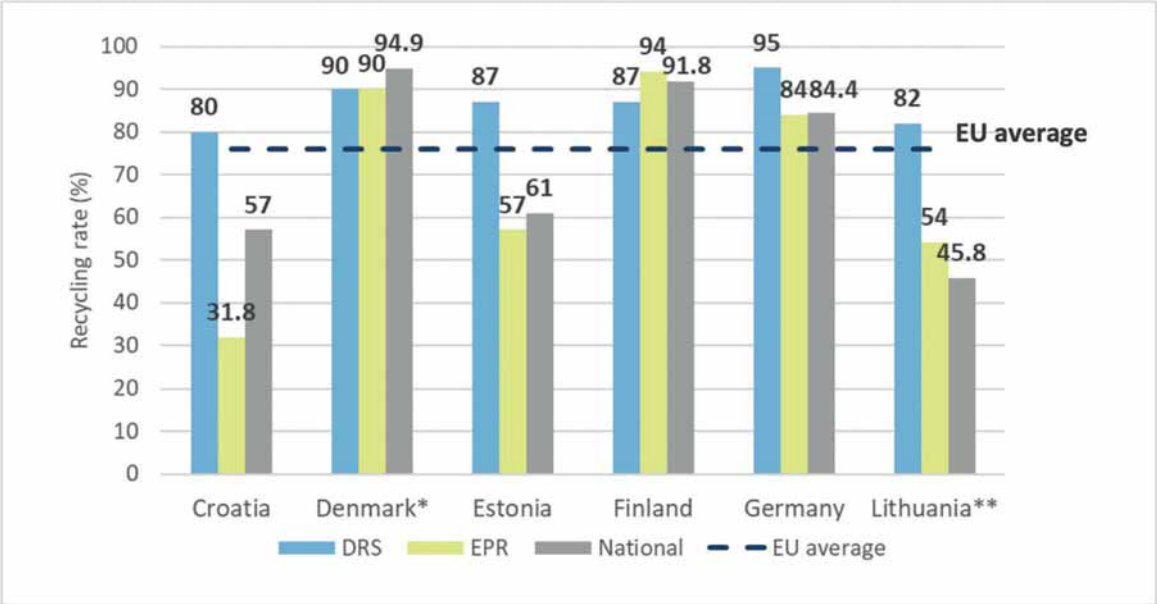
Machines of the Galaxy line can be equipped with the QRR module - an infrared reader that's specially-designed to read the pre-printed codes on parts by means of laser marking or mechanical engraving systems. Once the part is coded, the system can recognise the piece, thereupon performing the required checks completely independently - without the operator having to pre-set some item recognition programme.

Stressing its commitment to climate-neutral circularity while disputing claims that glass is incompatible with current EU climate objectives, the container glass industry recently opposed a 'free pass' recommendation by the PPWR for glass. In alignment with the EU's green vision, FEVE is advocating for comprehensive sustainability and material-specific waste targets as it addresses concerns over increased plastic use.

FEVE challenges PPWR glass free pass claim by Zero Waste Europe

As deliberations surrounding the Packaging and Packaging Waste Regulation (PPWR) continue to evolve, the container glass industry finds itself at the intersection between policy recommendations laid out in Zero Waste Europe RELOOP's document titled 'Reinventing Glass'. While there is alignment on several fronts, FEVE has categorically disputed a crucial assertion that suggests glass should be accorded a 'free pass' under the current PPWR plans.

Comparison of the glass recycling rates (%) for DRS and EPR in countries operating a dual system in 2017



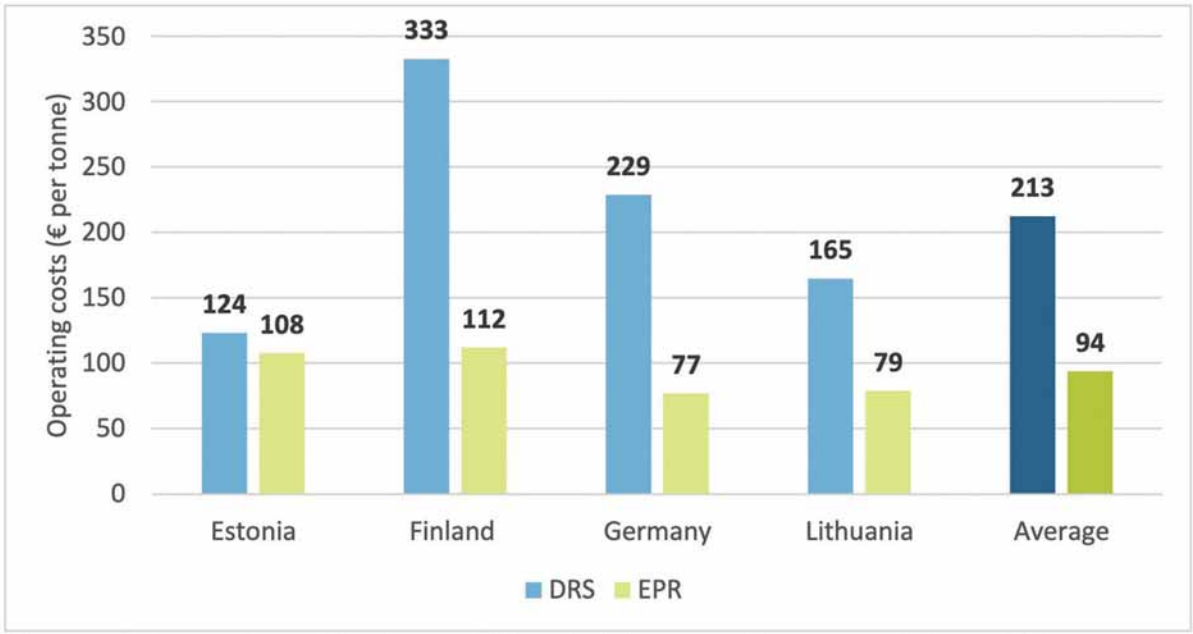
*The 90% figure for EPR in Denmark is a minimum estimate based on the national glass recycling rate of 94%.

***The 45.8% national recycling rate in Lithuania reported by Eurostat appears low since it is below the recycling rate for both the DRS (82%) and EPR (54%).*

GLASS ALREADY UNDERGOING CLIMATE-NEUTRAL REVOLUTION

As a genuine circular model for packaging the European container glass manufacturing perfectly fits current EU ambitions to build a circular economy. By 2050, the container glass industry is also committed to achieving a major revolution in making glass that is fit for this circular and climate-neutral economy. This goes beyond individual business commitments and roadmaps to reflect a sustainable business transformation with the full weight of the glass industry behind it. That's because under the EU Climate Law decarbonisation is not an option but an obligation. For this reason, FEVE holds that the ZWE/RELOOP claim about the 'incompatibility of single-use glass with the climate agenda' is not only untrue but also incoherent with EU law. The claim is based on a ZWE study commissioned from Eunomia on 'Decarbonisation of Single Use Beverage Packaging' - a study predicated on the assumption that decarbonisation is a choice for industry rather than something mandatory to maintaining the right to operate as an industry in the EU. It is also based on partial, unchecked and inaccurate assumptions - all of which FEVE will be addressing in a separate technical analysis.

FEVE holds that it is extremely short-sighted for an NGO such as Zero Waste Europe to completely ignore plastic pollution but continue to play the plastics game by only maintaining a narrow focus on CO^2 emissions and weight as indicators of sustainability. Their incomplete study and recommendations do not take into account all other key indicators such as closed loop recycling, food quality preservation and migration of substances from food to contact materials that are crucial components of sustainable packaging.



As ZWE even states in one of its own recent reports titled 'How FCM safety is fundamental to sustainability': "Safety and sustainability concepts are directly interlinked: in order for food packaging to be truly sustainable, it needs to be safe for both human and environmental health."

Offering safe, sustainable and circular packaging is at the heart of what the container glass sector does. For this reason, FEVE has welcomed the European Commission's ambition to further promote the circularity of all packaging in the PPWR proposal. It supports PPWR measures that will effectively contribute to the following objectives:

- Fair effort sharing on packaging prevention by all packaging materials, with material-specific targets;
- 90 percent collection for recycling rate, with emphasis on high-quality and closed-loop recycling for higher uptake of recycled content in glass packaging;
- All packaging placed on the EU market to be recyclable in practice and at scale by 2030;
- Reusable packaging must be a complementary option to one-way packaging.

AVOIDING INCENTIVES TO CHOOSE PLASTIC

FEVE expresses full agreement with Reloop and Zero Waste Europe that "it is crucial to avoid material substitution" and that material-specific waste prevention targets should be set to ensure fair effort sharing by all packaging materials. As for FEVE, it expresses total commitment to improving the sustainability of its products while further reducing the weight of packaging. It has in fact relentlessly shared its concerns that introducing packaging waste reduction targets that are not material-specific would cause severe market distortions, providing incentives to businesses to shift from heavier but circular materials (like glass), to lighter but difficult to recycle or reuse packaging materials. Instead of reducing environmental impact as intended, this move could even result in increased adverse environmental consequences, due to an increase in plastic pollution.

According to FEVE, the PPWR Impact Assessment shows that the proposed overall reduction targets are not material-neutral, as they will not ensure that all packaging materials contribute individually, equally and fairly to waste reduction. Instead, they would result in a major increase in plastics and significant decreases of all other packaging materials (including glass). This can be seen in the European Commission's own impact assessment, notes FEVE, with a projected four percent reduction in packaging waste generation in 2030 compared to the 2018 baseline leading to a 17.41 percent increase in plastic packaging waste. Here FEVE asks whether creating more plastic waste was really what the PPWR revision had set out to achieve.

RECYCLED PACKAGING BOOSTED BY 90 PERCENT COLLECTION TARGETS

Unlike recycled content targets, optimized collection, sorting and recycling technologies will improve both the quality and quantity of recycled glass, and ultimately ensure higher recycled content. This commitment to high-quality closed loop recycling is shared by glass producers across Europe.

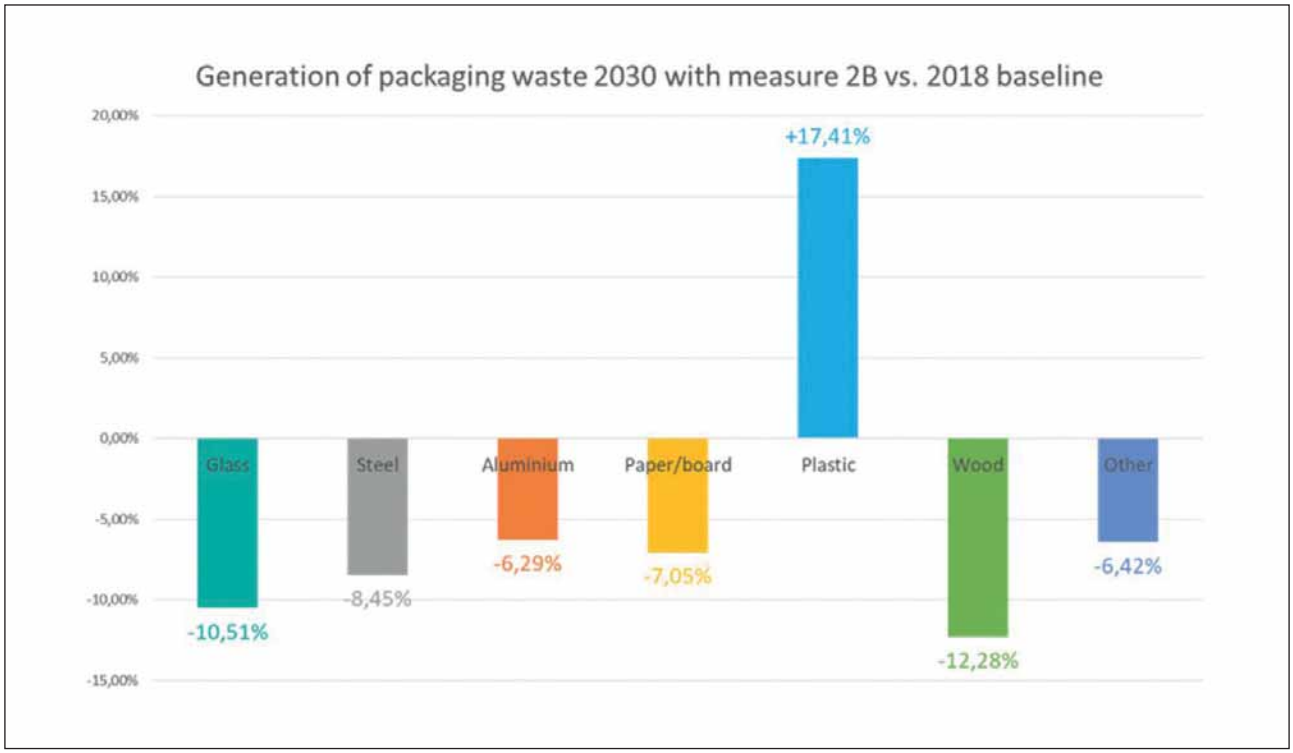
Post-consumer recycled glass is the most important raw material used to produce new glass packaging: today, the average glass container made in Europe contains 52 percent recycled content. Introducing recycled content targets under PPWR is a way to stimulate demand for materials that are not effectively recycled - particularly plastics, due to technical and market limitations directly linked to their inherent properties. However, for other fully recyclable Permanent Materials such as glass and metals, there are no limits to increasing average recycled content other than availability. Furthermore, unlike many other waste streams there is a high demand for recycled glass, where demand typically exceeds supply.

That's why the container glass industry shares an ambitious commitment to drive more higher-quality recycling across the EU. Glass packaging is already widely recycled in Europe, where the latest average EU collection for recycling rate is 80.1 percent (2021) and the vast majority is reprocessed back into bottles and jars (91 percent of recycled glass waste is recycled in a closed loop packaging manufacturing process, according to one 2023 study).

Market share of glass across product categories in European countries with and without a dual system

Product categories in scope	Product category	Market share of glass (%)	
		Non-DRS	Dual system
Typically included in a DRS	Beer	44.14	9.86
	Soft drinks	7.57	1.82
	Water	3.02	1.03
Typically excluded from a DRS	Cosmetic and toiletries	5.72	5.88
	Food	4.78	4.84
	Hot drinks	5.58	5.94
	Household care	0.51	0.40
	Spirits	95.87	96.33
	Wine	87.32	96.00

Source: Produced by Oakdene Hollins using GlobalData



Here FEVE believes more can be done. In 2020, it launched Close the Glass Loop to bring together glass manufacturers, recyclers, food & beverage producers, EPR schemes, and local and regional authorities to improve the quality of recycled glass, and achieve a 90 percent average EU collection rate of used glass packaging by 2030.

Through the PPWR revision, it also calls for the introduction of a mandatory 90 percent collection to meet the recycling target for 2030 for glass. Separate collection and sorting are a prerequisite to guarantee high-quality recycling processes and to meet proposed recyclability criteria.

Conversely, says FEVE, including a selective range of one-way glass packaging products in Deposit Return Schemes (DRS) is not the right solution to achieve 90 percent overall collection for recycling for all types of glass packaging. Instead, an insistence on imposing DRS could put glass collection and recycling at risk. Furthermore, there is no evidence to support ZWE/Reloop's claim that implementing a DRS for one-way glass containers results in 'a shift to more reuse'. Over the years, there has been a general reduction in the sales of reusable packaging across Europe across all three relevant product categories (beer & cider, soft drinks and bottled water) irrespective of whether the country operates a DRS for one-way containers. To this end, FEVE supports improving existing Extended Producer Responsibility (EPR) and municipal waste management systems for one-way packaging to make collection simple for the consumer, and optimal for the recycling value chain.

RECYCLABILITY OF ALL EU MARKET PACKAGING BY 2030

Says FEVE: welcome the European Commission's ambition to require that all packaging placed on the EU market must be recyclable, based on harmonized criteria for 'recyclable packaging' to ensure that all packaging is sufficiently and effectively collected, sorted and recycled - in practice and at scale. We support new 'Design for recycling' criteria and A-E recyclability performance grades, as a basis for the eco-modulation of EPR fees. Yet we believe there are several missed opportunities to transition to a fully circular economy for packaging, and actively call on EU decision-makers to raise the ambition of the PPWR:

- All packaging should be recyclable already as of 2030;
- The qualities of secondary raw materials should be differentiated, with a strong definition of high-quality recycling;
- The quantitative description of the recyclability performance grades should be complemented by a qualitative description, with grade A rewarding packaging that can be recycled multiple times and feed a closed material loop scheme.

These requirements will apply to all packaging materials and will enhance the recycling of glass packaging as well.

RETURNABLE GLASS NOT THE ONLY CURRENT MARKET REALITY

Reusable glass has been a reality in Europe for decades, if not centuries. Glass dominates the refillable beverage containers market, where it accounts for 22 percent of packaging placed on the market in the key segments of beer, soft drinks and water (representing 96 percent of refillable beverage containers in 2017).

Reusable packaging can be an efficient solution for products in a short supply chain, and an important waste prevention measure. Yet it is not always suitable – or the optimal solution – for all product categories when transport distances, use and consumption patterns are considered. Any move towards reuse must be implemented in an economically viable and environmentally sustainable way that would bring tangible benefits, compared to recyclable one-way packaging.

CONTINUATION OF GLASS PRODUCTION DECARBONISATION – AT A PACE

By 2050, the industry will be making climate-neutral glass in a circular economy, Says FEVE: This is non-negotiable. Brands and retailers alike have committed to ambitious sustainability goals, and as a leading packaging material, the industry knows it plays a big part in this transition. There is no single European roadmap for decarbonisation, but many national and individual company strategies and commitments exist under a common 'Furnaces for the Future' vision. Industry is already exploring, testing and implementing many disruptive paths to decarbonise the production process, resulting in glass that is already 70 percent less energy-intensive and emits 50 percent less CO^2 than fifty years ago. This progress will continue, and European glass companies will continue to invest to manufacture glass products fit for a resource-efficient, low-carbon society.

To get there, shared efforts will be needed to support systemic change. Reducing carbon emissions is the biggest challenge of our time. It requires a clear, stable political and legislative framework, along with support and collaboration with the industry to explore innovative solutions that require security of renewable energy supplies at competitive costs.

Once this energy transition challenge is complete, glass -whether recyclable or refillable- will be in a league of its own: a packaging material that meets the needs of brands, businesses and retailers, while being better for people and the planet.

Better for business, because it offers a circular packaging material that meets the demands of everyday consumption in a sustainable way. Better for people because it remains inert no matter how many times it is recycled, making it safest for consumer health and best to preserve quality and taste of products. And better for the planet, because glass is not made of oil, but materials sustainably sourced from nature -such as sand, soda ash, limestone and recycled glass- and can be endlessly recycled, without loss of its intrinsic properties.

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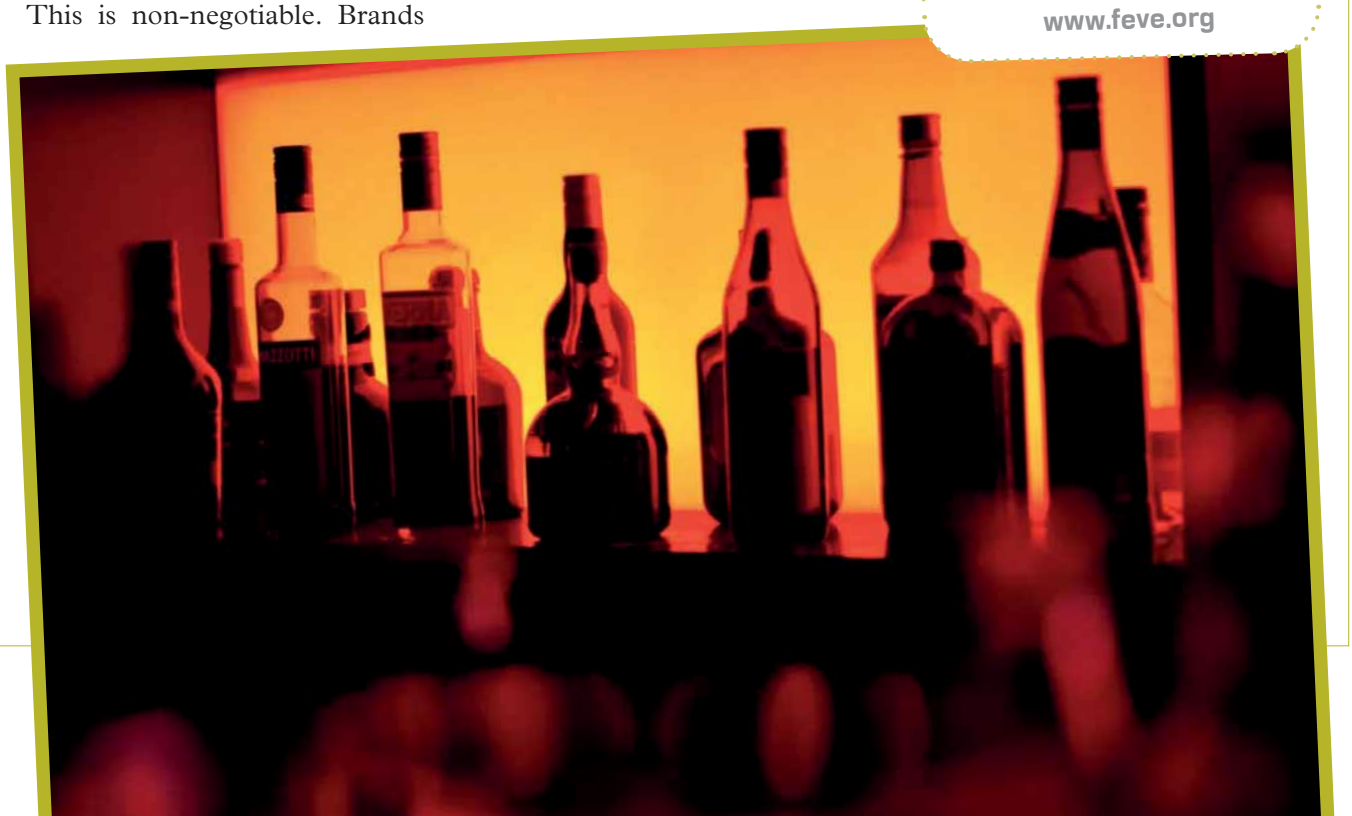


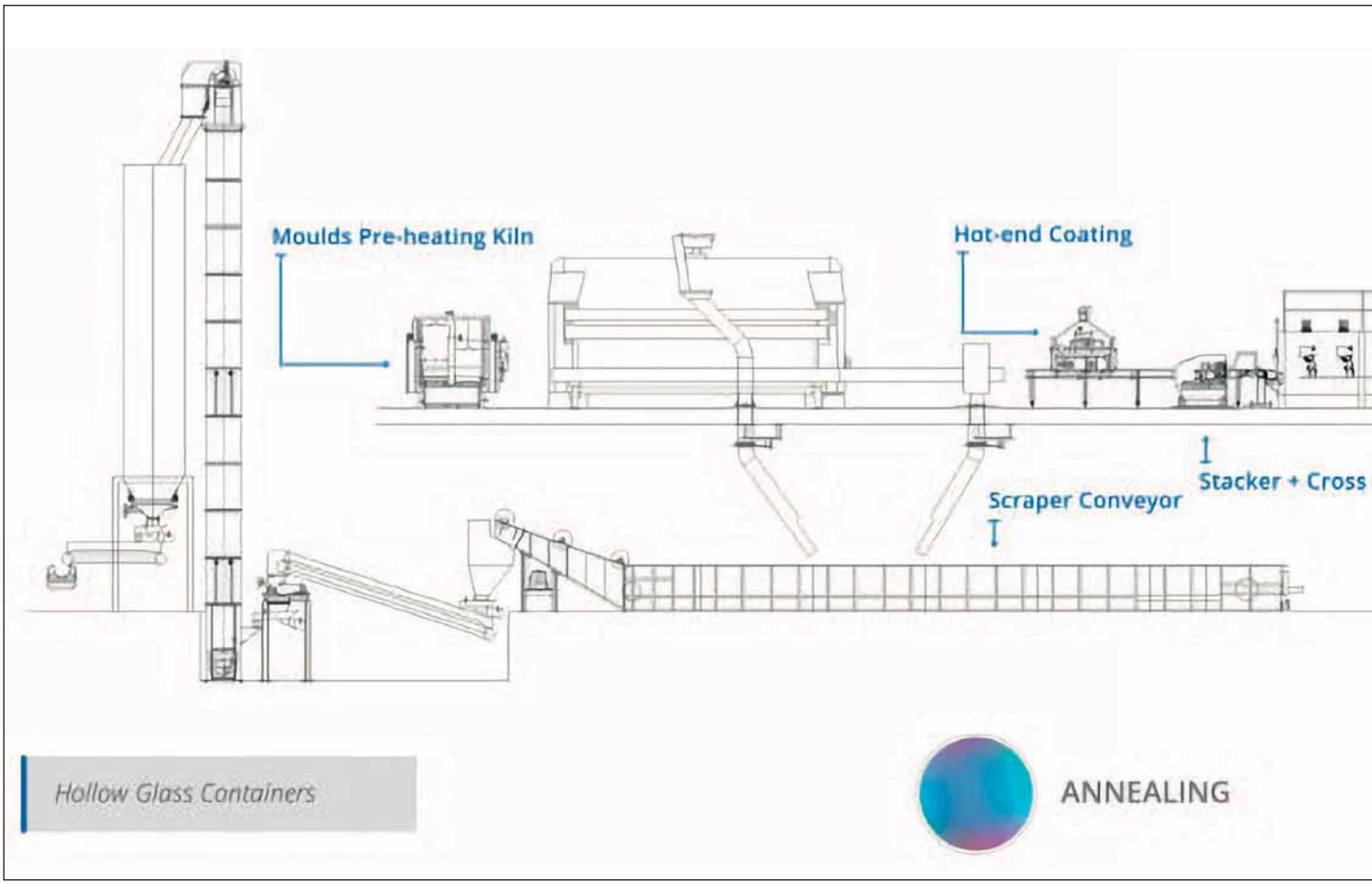
Hot-end coating by VIDROMECANICA reinforces glass protection

When it comes to enhancing the durability and aesthetic appeal of glass containers, Vidromecanica has devised two innovative systems, namely hot-end coating and cold-end coating. These now play a pivotal role in surface treatment - addressing the specific requirements of glass bottles, flasks and plates. Both are strategically-applied before and after essential thermal treatment, which is designed to eliminate internal glass tensions - a process known as annealing.

ADVANTAGES OF HOT-END COATING

For glass containers, the hot-end coating process offers the following key benefits:

- Increased internal pressure: It enhances the internal pressure of the bottle, thereby contrib-

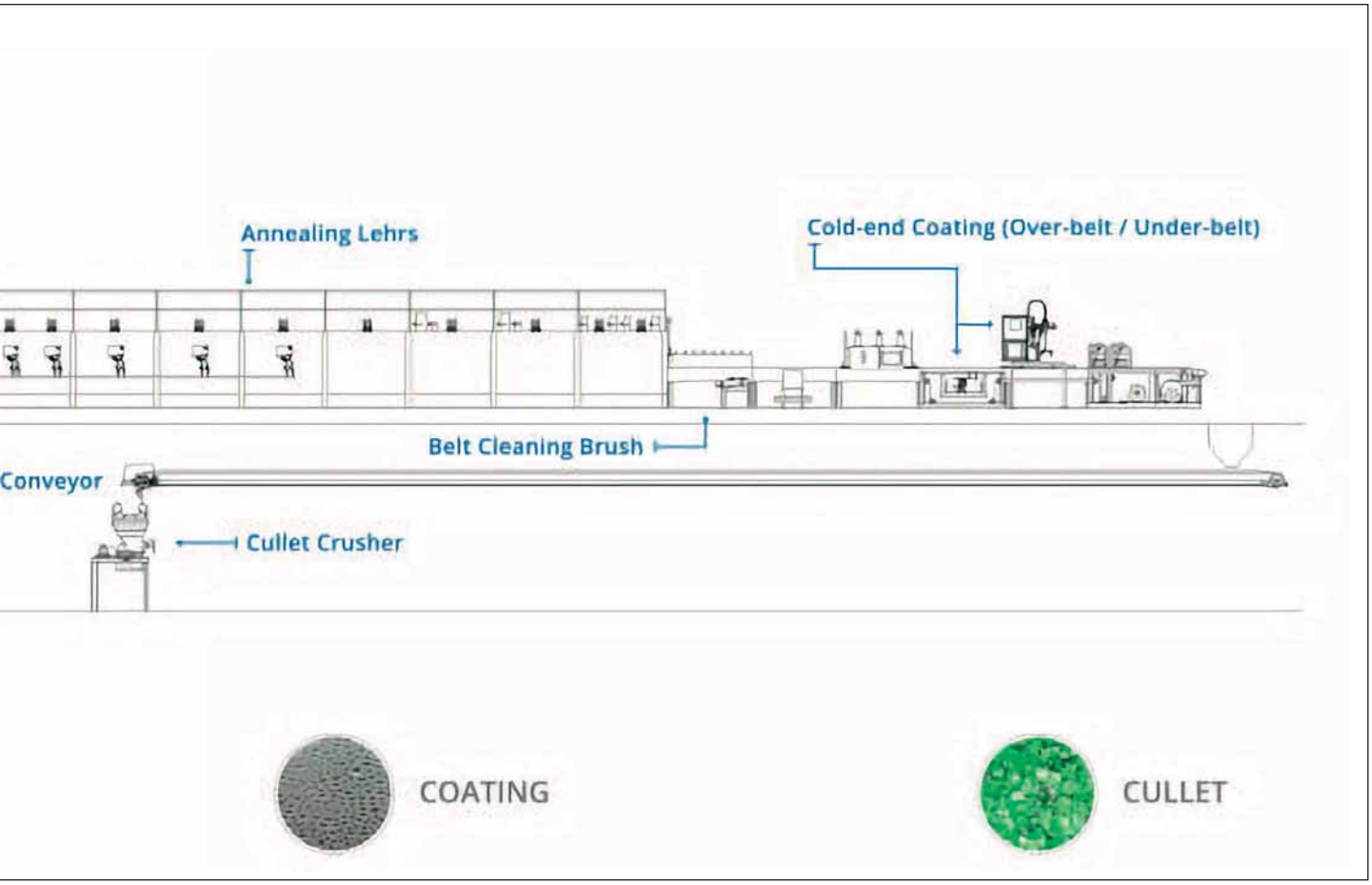


While VIDROMECANICA's expertise in manufacturing hoods ensures quality surface treatment, its hot-end coating improves glass container durability, aesthetics, internal pressure and abrasion resistance. For enhancing glass protection, the company's equipment provides precise control, environmental compliance and global reliability.

uting to its structural integrity;
- Reduced risk of rupture: Glass containers become less susceptible to rupturing, ensuring product safety;
- Improved abrasion resistance: The coating significantly bolsters the resistance of the glass to abrasion, thus reducing wear and tear;
- Enhanced aesthetic appearance: Given that articles are rendered more attractive, the treatment process itself enhances the visual appeal of glass.

HOT-END COATING HOODS

Vidromecanica boasts over three decades of expertise in manufacturing hot-end coating hoods. Traditionally, hot-end coating was performed using smaller hoods, i.e. typically less than a metre in length, with limited consideration for the environmental impact and product



contamination. However, evolving environmental concerns and a growing need for equipment enhancements have prompted extensive research, jointly with efforts in development to address such weaknesses.

Determining the capacity of hot-end coating equipment necessitates careful evaluation of key factors - including the type and quantity of articles passing through the hood coupled with product concentration therein as well as the time each article passes in tunnel treatment. Achieving a delicate balance between hood length, product concentration and treatment duration is vital to maximising coating efficiency - essentially minimising product consumption while keeping environmental contamination within acceptable limits.

Here Vidromecanica's hot-end coating hoods are engineered to ensure uniform distribution as well as high-quality surface treatment of both bottles and containers. Achieving effective adhesion of the subsequent cold-end coating largely depends upon the achievement of a consistent hot-end coating.

Standard Vidromecanica production includes the following models (ever mindful that customised hoods may also be developed upon request):

Based upon hood dimensions, product deposition is meticulously managed, employing laminar single-flow, double-flow or triple-flow systems. The choice of deposition system is determined by application and production rate, with options for adjustable product spraying concentration and one, two or three recirculation loops. The equipment also provides precise air circulation speed regulation.

Daining ratings have been incorporated into the construction to prevent environmental leakage of the product - adjusting product concentration such that it be higher at the central part and lower near the entry and exit doors - depending upon article diameter.

Model	Tunnel Length	Production speed
VTSQ-23	1250 mm	< 300 bpm
VTSQ-24	1800 mm	< 550 bpm
VTSQ-25	2000 mm	< 650 bpm
VTSQ-26	2250 mm	< 850 bpm

Special Models:
VTSQ – 17: Hood for small articles
VTSQ – 20: Special hood for tableware

Notably, the geometry of the new convergent/divergent interior duct ensures better temperature control, distribution and uniformity of the coating film across the entire bottle diameter.

Here, Vidromecanica equipment is offered in either mild steel or stainless steel - featuring a modular design for adaptability to different glassware dimensions. To date the company is very satisfied with its performance on this score, owing to an impressive coating thickness levels of 35 CTU (Coating Thickness Units) in the bottle's body, coupled with a deviation of just 5 CTU. Not only. The equipment is efficiently-managed by an HMI+PLC system

with online communication to a PC, which provides precise control over temperature, product weight, product flow and article flow.

ADDED OPTIONAL FEATURES:

1- Optimal temperature regulating devices *- Heating with resistances* *- Cooling of the equipment by fans*
2- Dosing Pump Control with IR-Sensor
3- Digital weighing system and drum stand
4- System for elevating / descending the equipment *- Model type 1 – Portic next to the conveyor* *- Model type 2 – Cables above the hood* *- Model type 3 – Underneath the conveyor*
5– Hood prepared to receive SEPOAN
6- Lifting System by opening side door
7- PLC + HMI touchscreen panel

STANDARDISED PROCESSES

Boasting a wealth of experience spanning over 30 years in the industry, Vidromecanica's expertise is rooted in dedicated research and development. The company's relentless pursuit of excellence has led to the design and testing of a wide range of technical solutions in order to meet unique customer requirements. Machinery is typically built to deliver peak performance and can operate around the clock - making it a reliable and efficient choice for glass production plants worldwide.

In sum, Vidromecanica's hot-end coating offers a cutting-edge solution for the protection and enhancement of glass containers. Whether customers be focused on improving durability, upon aesthetics or on glass product safety, the company's state-of-the-art equipment and standardised processes are nonetheless equally designed to meet specific needs - all to ensure that glassware maintains its appeal and quality. ■

VIDROMECANICA

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2023 sees STEKLARNA HRASTNIK hailed as Exporter of the Year

Acclaimed as 2023 Exporter of the Year, STEKLARNA HRASTNIK gained international recognition recently for excelling at premium bottle production for spirits, wines and mineral waters, accompanied by its global reach, sustainability efforts and a growth in revenue that's no less impressive – all characterized by innovative glass production and a measurable carbon footprint reduction.

Received by General Manager Peter Čas, The Exporter of the Year award was recently presented to Steklarna Hrastnik at the 10th Slovenian Exporters Conference in Brdo pri Kranju. During the conference, such prominent figures as Minister of Economy, Tourism, and Sport Matjaž Han, Acting Director of Spirit Slovenia Rok Capl all joined economic experts to discuss economic forecasts and provide insights on increasing the added value of companies. Selection of Steklarna Hrastnik as the ninth Exporter of the Year was made from a pool of five finalists, which included Steklarna Hrastnik, Adria Dom, Cetis, Intersocks, and Robeta.

WHY STEKLARNA HRASTNIK?

Being numbered among the top three global providers of premium bottles for spirits, Steklarna Hrastnik also manufactures bottles for high-quality wines and mineral waters. Over the past two years the company has achieved a remarkable increase in sales - reaching EUR 99.5M in the previous year. This growth in volume has led to a substantial improvement in the profit margin from operations, with a whopping 23.8 percent EBIT margin, which places it among the best large companies in this regard. Here sustainable development is a cornerstone of the business, with a focus on setting trends in the glass packaging industry. Indeed, General Manager Peter Čas predicts 'a 20 percent increase in Steklarna Hrastnik sales, a 33.5 percent rise in the EBITDA margin, EUR 29.5M in operating profit, EUR 40M in EBITDA, and a 21 percent net sales network for the current year.'

SALES IN 60 NATIONAL MARKETS – WITH ITALY TRUMPING ALL

Steklarna Hrastnik derives 97 percent of its revenue from foreign markets and serves customers in 60 countries. Its primary export markets are within the European Union, accounting for 84 percent of total sales (39 percent in Italy, 20 percent in France and 10 percent in Germany). Beyond the EU, significant exports were also made to the USA (7 percent) and the United Kingdom (5 percent). In the previous year, it expanded its prestigious spirit bottle exports to new destinations - including Cuba, Armenia, Georgia and Finland. Steklarna Hrastnik caters to both beverage brand owners and bottle distributors.

ALL-IN-ONE PRODUCTION OF PREMIUM BOTTLES

Over the past six years, Steklarna Hrastnik has invested more than EUR 93M in its operations, revamping its production programme and implementing automation processes. It has shifted its focus from table and lighting glass to producing premium bottles for spirits, rosé wine and premium water. Today it's among the top three global suppliers of high-end bottles for renowned beverage brands such as Remy Martin, Pernod Ricard, Bacardi, Belvedere, Hennesy, Brown Forman, William Grants and SPI groups, among others. It offers a comprehensive, full-service approach - from idea con-

ception, design and development right through to production and delivery. Additionally, customers can choose from Hrastnik1860's extensive collection of 32 different bottles. In 2022, it received the Red Dot Design Award for its smart solution, the e-bottle, as well as the EcoVadis gold medal for sustainability while this year it has received the Red Dot award for its water bottle developed in collaboration with the JRE Association.

REDUCING CARBON FOOTPRINT FOR CLEANER BOTTLE GLASS

Today Steklarna Hrastnik is committed to offering very high quality bottles in the market, crafted from one of the purest forms of glass that does not contain heavy metals. It recently introduced a new hybrid furnace worth USD 25M that runs on electricity (up to 40 percent, up from the previous 10 percent) and natural gas. Last month it showcased the production of bottles with a significantly reduced carbon footprint, with one of the glass furnaces using a higher proportion of hydrogen as an additional energy source (up to 30 percent of energy input). The company is also heavily investing in automation and digitization. This year, it became custodian of the CEDIT project for digital transformation of the industry, which integrates cutting-edge technologies into production as well as other processes. Automation has also been implemented in the glass production process, where radar measures the quality of each drop used to make a bottle, and each bottle undergoes automated quality inspection with at least two multifunctional control machines.

OWNERSHIP AND EMPLOYEE GROWTH

Steklarna Hrastnik is owned by the Vaider Group, which includes not only the Hrastnik factory but also a facility in Serbia (SFS Paraćin). The Group aims to increase its revenue from EUR 100M last year to EUR 300M within five years. The General Director of the Vaider Group is Peter Čas, with Igor Lah as its President and Matevž Fazarinc as the Operational Director of the Vaider Group and the Executive Director of Steklarna Hrastnik. Steklarna Hrastnik currently employs slightly over 600 people, having hired 151 new employees last year. In the first half of this year, it added 33 new staff members, with further hiring expected by the end of the year. ■

Container glass in INDIA: an industry overview

Rajeev Jetley

Surpassing China in demographic terms this year, INDIA has become the most populated country in the world. With its estimated 1.40 billion people, India has emerged as one of the largest consumers of packaged foods, beverages and pharmaceutical products – all necessitating scores of glass containers. In this issue of Glass Machinery Plants & Accessories we take a look at the Indian container glass industry.

GAINING MOMENTUM

Consisting of more than 30 glass container producing companies of different sizes, Indian container glass industry has been among the fastest growing container glass industries in the Asian region. Rapid spread of modern forms of retail during the past decade, increasing disposable incomes in the hands of a vast section of the population, growing awareness of health and hygiene, and increased spending on nonalcoholic beverages all represent some of the impor-

tant factors which have fuelled growth in the Indian container glass industry. Major container glass producers Hindustan National Glass Limited, AGI Greenpac and PGP Glass (formerly Piramal Glass) have all expanded their capacities and capabilities during the last few years. Indeed nearly a dozen new mid and small-sized container glass producers have joined the industry over the last decade.

Factors such as growing income, changing lifestyle habits, increased internet penetration, the rapid expansion of organised retail, the popularity of online food delivery and renewed emphasis on safety and hygiene are all creating huge opportunities for the packaging industry - particularly for glass packaging. Alcoholic beverages are witnessing rapid growth owing to their high-growth potential and increasing social acceptance. The share of glass packaging in Indian Made Foreign Liquor (IMFL) is expected to increase as premium segments constituting more than 40 percent of IMFL volume use 100 percent glass packaging. The share of this segment is expected to grow to 67 percent in volume by 2027. Hence the overall share of glass packaging in IMFL will also increase. In the Mass/ Popular segment, the share of glass bottles is currently reduced due to emergence of cheap alternate PET bottles. However, revenue leakages and ill effects on health are forcing state governments to phase back glass packaging for liquor. Riding the wave of a strong consumption story, the packaging industry is poised to gain the most from the increasing demand from the food and beverages industry, as well as that of the pharmaceuticals and cosmetics sector. India's food and beverages packaging market, which was valued at USD 33.22 billion in 2020, is expected to reach USD 156.25 billion by 2026, registering a CAGR of 29.88 percent.

COMPANY	LOCATION	CAPACITY
HINDUSTAN NATIONAL GLASS INDUSTRIES	RISHIKESH, RISHRA, NASIK, PUDUCHERRY, AND NAIDUPETA	4400 TONNES PER DAY
AGI GREENPAC	HYDERABAD AND BHONGIR	1754 TONNES PER DAY
PGP GLASS	KOSAMBA, AND JAMBUSAR	1530 TONNES PER DAY
CANPACK INDIA	AURANGABAD	900 TONNES PER DAY
HALDYN GLASS	VADODARA	350 TONNES PER DAY
SUNRISE GLASS	SURAT	220 TONNES PER DAY
JANTA GLASS	VADODARA	220 TONNES PER DAY
HYALINE GLASS	BHOPAL	150 TONNES PER DAY
VITRUM GLASS	MUMBAI	130 TONNES PER DAY
PRAGATI GLASS INDUSTRY	KOSAMBA	170 TONNES PER DAY
ENKI GLASS INDUSTRY	BHARUCH	120 TONNES PER DAY

Table- Container glass producers in India

HINDUSTHAN NATIONAL GLASS & INDUSTRIES LIMITED (HNGL)

Hindusthan National Glass & Industries Ltd (HNG) is a key player in India's container glass industry - boasting 13 furnaces with 4300 TPD installed capacity. It caters to a broad range

of industries including food & beverage (F&B), pharmaceutical and wellness, alcoholic beverages and household and cosmetics. The company has a large client base and supplies top customers in every segment - exporting to more than 23 countries.

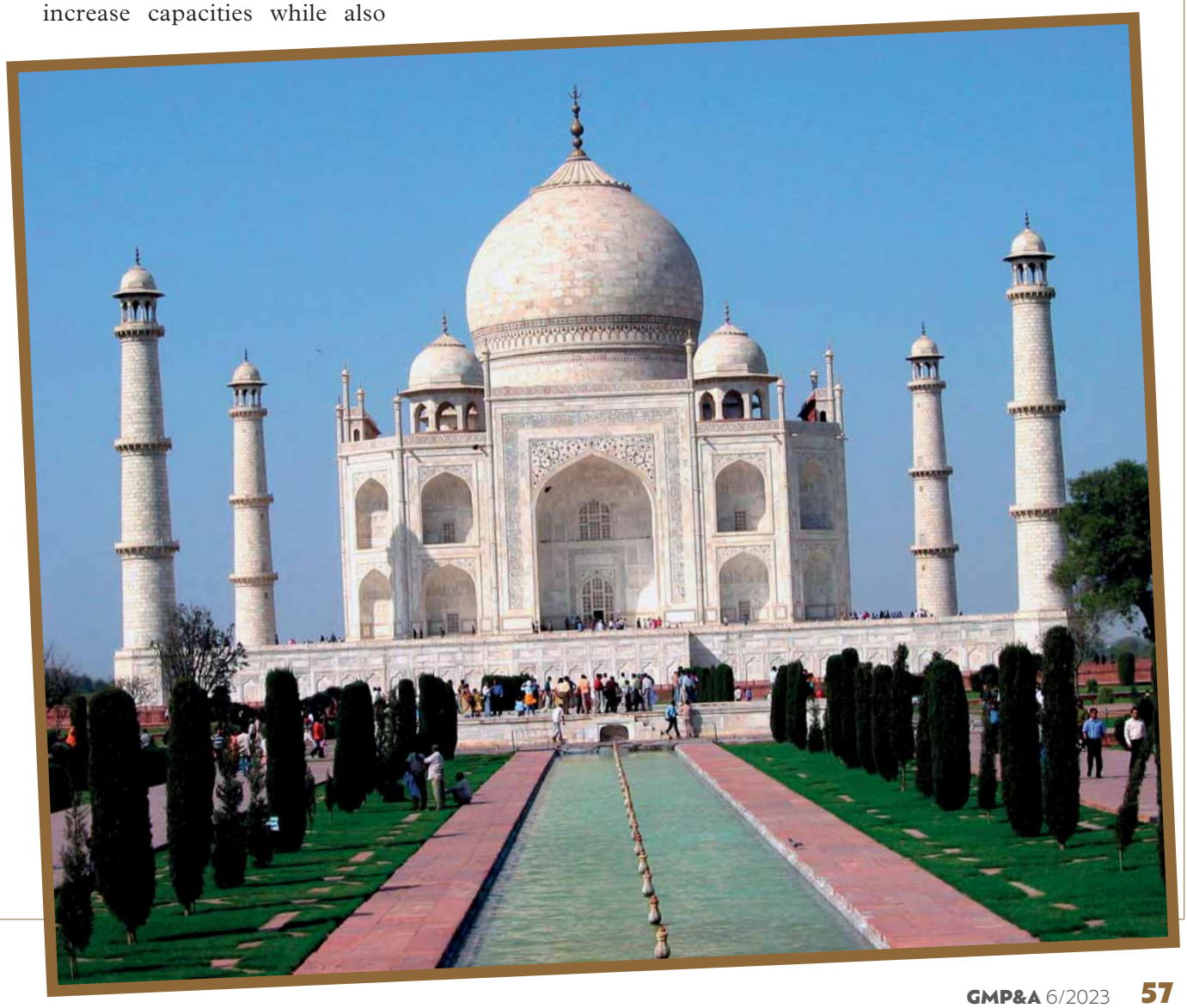
The largest container glass-maker, HNG, had been facing issues of insolvency for quite some time. The company was on the path to an over-ambitious expansion spree which led to huge debt pile up. The company had undertaken aggressive capacity expansion during the last decade. It commercialized greenfield operations of 600 TPD glass at Halol, 650 TPD greenfield expansion at Naidupeta, 650 TPD brownfield expansion in Sinnar and other brownfield expansion to increase capacities while also expanding over these years via inorganic routes.

AGI GREENPAC

In recent years Telangana based AGI Greenpac has invested significantly in container glass production infrastructure. The company operates three modern container glass production facilities. Responding to customer needs and trends, it has developed and produced internationally-acclaimed bottle designs using cutting edge glass decoration techniques.

The company has one of the most modern, advanced screen printing facilities available in the country - which involves the use of Strutz, Rosario and Tecno 5 machines. All state of the art, they have the capability to print up to six different colours on a single bottle. AGI Greenpac has an installed capacity to print more than 1.2 million bottles per day.

Says company management: "Our machines can print up to nine colours, including precious metals such as gold, platinum and copper. On print runs from 100 cases to 25,000 cases, direct screen-printing costs are competitive with all other labeling applications. This alternative to paper creates eye-catching labels that are resistant to wrinkling, smearing, scuffing and are -most importantly- waterproof. Beverage Incentive Glass is a full-service bottle and glassware direct screen labelling company. We specialize in screen printing, simulated etching and decals for wine, spirit, beer and specialty food containers. Going paper-



less will actually strengthen your brand impact by elegantly screen printing your labels. There are many benefits from ACL such as increased bottling line efficiency, improved label durability, design flexibility and branding/packaging impact - all increasing client brand value by providing unique and cost-effective alternatives to paper labels. Our specially-adapted screen printing process lets you utilise a larger print area than paper labels, so you can dream big when it comes to creating striking graphics for your product. Think unusually shaped labels, multiple colours, graphics meant to be seen through transparent liquid or even designs that wrap right around the bottle."

The company is moving up the value chain with its foray into manufacturing of high-margin speciality glass by setting up a greenfield facility in Bhongir, Telangana - having manufacturing capacity of 154 tonnes per day. This new plant caters to the high-end cosmetic and perfumery sector, high-end pharmaceuticals including vials and premium spirits, among others.

The company commenced commercial production of this facility from Jan 1 of this year. It incurred capex of Rs 270 cr for this new plant, which includes one new furnace with five manufacturing lines spread across 15 acres. The plant will also consist of an integrated decoration facility for hot-foil stamping, coating, lacquering and colouring.

Apart from domestic requirements, products manufactured from this expansion are likely to focus on exports to the US, Australia and European countries. This 154 TPD furnace is in the process of full loading and is currently operating at 65-70 percent capacity utilisation - that's above breakeven levels, which is why management anticipates reaching 100 percent capacity utilisation by the end of this fiscal year.

PGP GLASS

PGP Glas Private Limited is a global specialist in design, production and decoration of glass packaging (flaconnage). The company leads the way globally for glass packaging solutions in businesses such as Pharmaceutical, Cosmetics & Perfumery and Specialty Food & Beverage. PGP Glass operates two production facilities at Kosamaba and Jambusar.

At Kosamba the company produces USP Type I, II, and III glass bottles and vials for the pharmaceutical industry, Type III glass bottles for cosmetics & perfumery industry and also feeder-coloured bottles in various shades. It has a dedicated facility for Type-I borosilicate glass for moulded pharmaceutical glass packaging and a dedicated facility for premium cosmetics and perfumery glass bottles.

At its Jambusar facility it has one of the world's largest single installed capacities for pharmaceutical packaging in amber. At this facility the company produces type III amber glass bottles and vials for pharmaceutical industry and type III flint bottles for cosmetics and perfumery, as well as the speciality food and beverages industry.

Says Vijay Shah, Director of PGP Glass: "We offer the complete end-to-end glass packaging solutions in over 50 countries under the globally recognized brand name of 'PGP Glass.' We have our design, production and decoration footprint in both India and Sri Lanka with an overall capacity of 1,530 tonnes per day thanks to 11 furnaces and 64 production lines. Our manufacturing facilities provide the best in class configuration in terms of technology, design and layout to serve our global customer requirements. We have offices and warehousing facilities in France, Germany, Turkey, Spain, Brazil, India, UAE, UK and Sri Lanka. We offer an entire range of glass packaging (flaconnage) solutions under one umbrella - making us a one-stop-shop for global industry requirements. We have world-class, in-house bottle and mould design capabilities, creative design & innovation studio, state-of-the-art CNC machine workshops for mould manufacturing and dedicated facilities for premium glass decoration solutions such as printing, hot-foil stamping, coating, frosting, decal, fitment gluing and metallization." ■

Glass Industry

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First half of 2023 shows VETROPACK's signature determination

Looking back over H1 2023, VETROPACK has exhibited great resilience – with a 9.9 percent sales increase to a whopping CHF 477.9M and EBIT at CHF 70.1M. Not only. Following its Echovai innovation, the Group's revived Gostomel Ukrainian plant reflects ambitious expansion efforts. This signals a robust sturdiness that has the company anticipating still more growth ahead, despite current market challenges – all as employees display a genuine team spirit that's second to none.

In a world marked by economic volatility and uncertainty, Vetropack sought to shine as a beacon of resilience and growth over the first half of 2023. With an impressive 9.9 percent increase in net sales from goods and services, or a substantial 13.9 percent when adjusting for currency effects,

the group's revenue surged to CHF 477.9M, which is up CHF 435.0M from the previous year. Furthermore, its consolidated EBIT has seen a mammoth leap - reaching CHF 70.1M as compared with CHF 48.3 million in the year before. An impressive performance that now positions the company for further growth, it reflects the Group's ability to bounce back from the challenges of 2022, which were heavily influenced by the Ukraine conflict.

Among the success stories behind this Vetropack resurgence has been the revival of the Group's Ukrainian plant in Gostomel near Kyiv. The plant had been severely damaged during Russian military attacks in the early weeks of the 2022 war, leaving doubts about its future operations. However, against all odds, the process of resuming production commenced in May - turning the Gostomel facility into a symbol of hope, not only for the local workforce but for the Group at large.

TEAM SPIRIT AND HIGH MOTIVATION TO PERFORM

The inspiring turnaround owes much to the unwavering team spirit and high motivation displayed by employees across all Vetropack sites. In a heartwarming display of solidarity, the Vetropack Foundation Gostomel distributed funds in February to assist Ukrainian employees severely affected by the war. Contributions from employees, business partners, customers, the Vetropack Group, and Cornaz AG-Holding all totalled over CHF 960,000 - sending a powerful message of solidarity as well as shared pride.

AN ATTRACTIVE EMPLOYER WITH A BURGEONING WORKFORCE

The Vetropack Group, which employed 3,570 people the previous year, now boasts a workforce of 3,764 since the first half of 2023. Notably, 139 new colleagues have been added in Ukraine alone. The company's reputation as an attractive and fair employer, known for its sustainable and environmentally-friendly packaging solutions, has made it a magnet for talent.

GOOD PERFORMANCE IN A CHALLENGING MARKET ENVIRONMENT

In the face of a demanding market landscape, the Vetropack Group's workforce has been pivotal in overcoming these challenges across their nine global sites. Notably, the sales of packaging glass in the first half of 2023 stood at 2.27 billion units, a decline from the 2.69 billion units achieved in the same period the previous year. This outcome was below the company's expectations and raised several pertinent questions. Various factors contributed to this dip in performance. The company had experienced an unusual surge in the sales of packaging glass in the fourth quarter of 2022, which had led to customer warehouses brimming with products, thereby reducing their immediate demand.

Moreover, in the first quarter of the previous year, Vetropack benefited from a catch-up effect following the COVID-19 pandemic, which notably boosted sales. However, the dynamics have shifted in 2023, largely due to the inflation-induced changes in consumer behaviour which, so far, have negatively impacted the market environment.

While market dynamics have presented certain challenges, there is a silver lining in the form of energy costs. Unlike the previous year, 2023 has seen relatively less volatility in energy costs. That said, it's worth noting that recent fluctuations in energy prices have compelled some customers to adopt procurement strategies that are less price-sensitive, increasing their reliance on alternative packaging solutions. Vetropack remains nevertheless optimistic and considers this reliance on alternatives as a temporary phenomenon. Their conviction is rooted in the fact that glass packaging, being substantially more sustainable, tends to be the preferred choice in a multitude of scenarios.

Despite navigating this complex market environment, the Vetropack Group managed to achieve consolidated net sales of CHF 477.9M in the first half of the year. This represents a commendable year-on-year increase of CHF 42.9M or 9.9 percent, demonstrating their ability to adapt and thrive in a challenging business landscape.

Here Vetropack's journey in 2023 exemplifies the resilience and adaptability of the company. As it continues to tackle market fluctuations, the organization remains confident in the sustainability and value of glass packaging as it moves forward.

INNOVATION BOTH FOR ENVIRONMENT AND MARKET

In today's fiercely competitive market, innovation remains the cornerstone of success. The Vetropack Group understands this well and is committed to continuous investment in research and development. It maintains an Innovation Centre in Pöchlarn, Austria, where groundbreaking ideas come to life. One such innovation is Echovai, a product that's already taken the market by storm. Unveiled at the recent Drinktec trade fair, Echovai has earned its reputation as a game-changer. Representing a groundbreaking achievement, Echovai numbers Vetropack among the world's top glass packaging manufacturers in its offer of an exceptionally stable, lightweight glass bottle that's

Development of key figures

		Half Year 2023	Half Year 2022	+/–
Net sales	CHF millions	477.9	435.0	9.9%
EBIT	CHF millions	70.1	48.3	45.1%
EBIT margin	%	14.7	11.1	–
Cash flow*	CHF millions	85.7	81.4	5.3%
Cash flow margin	%	17.9	18.7	–
Consolidated result	CHF millions	50.7	– 9.7	622.7%
Investments	CHF millions	128.0	52.7	142.9%
Total assets	CHF millions	1 289.7	1 161.0	11.1%
Shareholders' equity	CHF millions	777.4	718.1	8.3%
Gearing ratio	%	60.3	61.8	–
Unit sales	billion units	2.27	2.69	– 15.7%
Production	1 000 metric tons	724	761	– 4.9%
Workforce	FTE	3 764	3 570	5.4%
Share price: registered share A high	CHF	47.80	58.90	–
Share price: registered share A low	CHF	36.80	34.55	–

* operating cash flow before change of net working capital

also highly efficient in its use of materials. Remarkably, it is up to 30 percent lighter than a conventional returnable bottle yet it boasts superior resistance to abrasion. Here Echovai's advantages extend beyond its reduced weight and reusability. It stands as a testament to sustainability. This eco-friendly innovation has not gone unnoticed, as it garnered multiple awards at the prestigious Swiss Packaging Award.

THE GLASS PRODUCTION OF THE FUTURE

Echovai and similar innovations hold the potential to revolutionize the market for returnable containers. Indeed growing interest and inquiries surrounding such innovations showcase the shift towards more sustainable packaging solutions. That said, the Group is hardly simply resting on its laurels. Instead it continues to invest in the expansion and modernization of its plants. Here a notable endeavour is its new facility in Boffalora sopra Ticino, Italy, which has seen over CHF 400M in investments. After an 18-month construction period, the facility is now being prepared for full operation - promising a 70 percent increase in production capacity compared to the Trezzano plant. Furthermore, smart technologies have been integrated to enhance production flexibility - particularly for unique packaging items that come in smaller batches. This new site has been designed with resource efficiency and sustainability in mind. Closed-loop systems ensure the efficient reuse of water and waste heat from the furnaces while cutting-edge filter systems significantly reduce emissions.

OUTLOOK FOR THE SECOND HALF OF 2023

Looking ahead to the second half of 2023, Vetropack is filled with optimism. The positive outcomes are a result of significant developments initiated as part of the group's Strategy 2030 in recent years. With a modest increase in unit sales expected compared to the first half, it's well-prepared to navigate the evolving market landscape. The company plans to adjust their capacities while prioritizing optimization projects to meet demand more efficiently. Despite ongoing challenges like high energy costs, inflation, a decline in purchasing power, and the start-up costs associated with the new plant in Italy, Vetropack anticipates a robust performance. The EBIT margin for the 2023 fiscal year is projected to be lower than the first half but will still remain in the double-digit range. Following a tumultuous 2022, the company expects a significant increase in consolidated results for 2023. Innovation, sustainability and a strategic outlook all position Vetropack for a promising future. Indeed the company's unwavering commitment to excellence ensures that it's well-prepared to face the evolving dynamics of the market. ■

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SUSTAINABILITY STUDY

Packaging and reusability: POLITECNICO DI MILANO engineers revisit glass bottles life cycle

Comprehensive examination of the impact on the environment of glass bottle re-use in Italy had POLITECNICO DI MILANO researchers Camilla Tua and Professors Mario Grosso and Lucia Rigamonti visiting mineral water bottling sites to consult delivery logistics. All from the Department of Civil and Environmental Engineering the trio further factored in production, washing and end-of-life data while analysing bottle rotations via life cycle assessment - also in comparison to single-use alternatives.

According to Markets and Markets (2018), of late there's been a burgeoning demand for reusable packaging across various industrial sectors - driven not only by industry but also by end-consumers seeking to reduce their reliance upon disposable items. Here comprehensive assessment of actual environmental benefits inherent to the practice of reuse calls for a reliable evaluation tool. Nestled within the overarching concept of the circular economy, the pre-eminent choice in this regard, recognized across the board, is that of Life Cycle Assessment (LCA). In like manner, prior research has scrutinised different types of reusable packaging - consistently affirming the superiority of reusability over single-use alternatives. That said, it's crucial to acknowledge the existence of certain ecological hotspots -primarily in the regeneration phase- warranting due attention (Biganzoli et al., 2018; Biganzoli et al., 2019; Tua et al., 2019).

BEVERAGES AND PACKAGING

Unlike many sectors, the beverage industry holds predominantly to single-use packaging. Indeed the market share of refillable beverage containers plummeted Europewide from 41 percent (90 billion units sold) in 2000 to a mere 21 percent (55 billion units) in 2015 (Reloop Inc 2019). Notwithstanding this decline, refillable bottles present themselves as a viable, sustainable alternative to single-use counterparts within various sub-sectors. For instance, a recent study on beer packaging from Germany revealed commendable environmental performance for glass refillable bottles, especially when catering to local markets within a 100 km radius and enduring over at least 25 cycles (Deutsche Aluminium Verpackung Recycling GmbH 2010). Similar findings were yielded by the French context. An analysis based upon a system of refillable beer glass bottles, subjected to 20 reuses and distributed over a 250 km radius, demonstrated substantially lower environmental impacts compared to an equivalent system reliant on single-use glass bottles: reductions of 86 percent in acidification, 79 percent in climate change impact and 76 percent in primary energy consumption (Deroche Consultants 2009). Even in the carbonated soft drinks sector, refillable glass bottles emerge as a sustainable option. A British study determined that reusing glass bottles thrice over could render the carbon footprint of drink distribution comparable to that of single-use 0.5-litre virgin PET bottles and aluminium cans (Amienyo et al., 2013). This study seeks to assess the environmental ramifications associated with the Refillable Glass Bottles (RBs) system concerning the number of deliveries within the Italian mineral water sector. Such an analysis assumes particular relevance in Italy given that it's among the largest consumers of bottled water both in Europe and globally - consuming 13.5 billion litres in 2017, equivalent to 222 litres per inhabitant (Bevitalia 2018). Primary data pertaining to the reconditioning process and distribution logistics were meticulously compiled from four bottled water companies, collectively representing a substantial 25 percent market share in RBs in Italy.

MATERIAL AND METHODS

The environmental assessment adhered to the LCA methodology, guided by ISO 14040 (ISO 2006) and ISO 14044 (ISO 2018) standards, in tandem with the Product Environmental Footprint (PEF) Guide (Zampori and Pant, 2019). Data processing

Table 1. Main characteristics of the packaging under study.

Component of RBs	Material	Amount (*g/bottle*)
Bottle (refillable)	Glass	452
Screw cap (single-use)	Aluminium (body)	1.4
	Plastic (seal and liner)	0.4
Label (single-use)	Paper	1.0

was facilitated by SimaPro software (version 9.0). In accordance with the aforementioned standards and documents, the LCA entails four primary phases: goal and scope definition, inventory analysis, impact assessment, and interpretation.

DEFINING GOALS

The study's overarching objectives encompass:

- Assessing the impacts of the RBs system with regard to the number of deliveries (hereinafter denoted as 'n') for mineral water distribution in Italy.
- Identifying the contribution of key stages (RBs production and end of life, RBs reconditioning, and RBs distribution) towards environmental impact, thereby offering insights for more sustainable management to companies.
- Ascertaining the circumstances under which the RBs system outperforms an alternative system predicated on Single-use Glass Bottles (SBs) of equivalent capacity.

SCOPE DELINEATION

System Description

The RBs system centres on glass bottles equipped with screw caps and informative labelling (Table 1). While bottles are available in diverse sizes, the 1-litre variant reigns supreme and serves as the reference point.

In the RBs system (Fig. 1), the constituent elements of refillable packaging undergo dedicated manufacturing in specialised facilities before being transported to a bottling facility. Here, bottles undergo

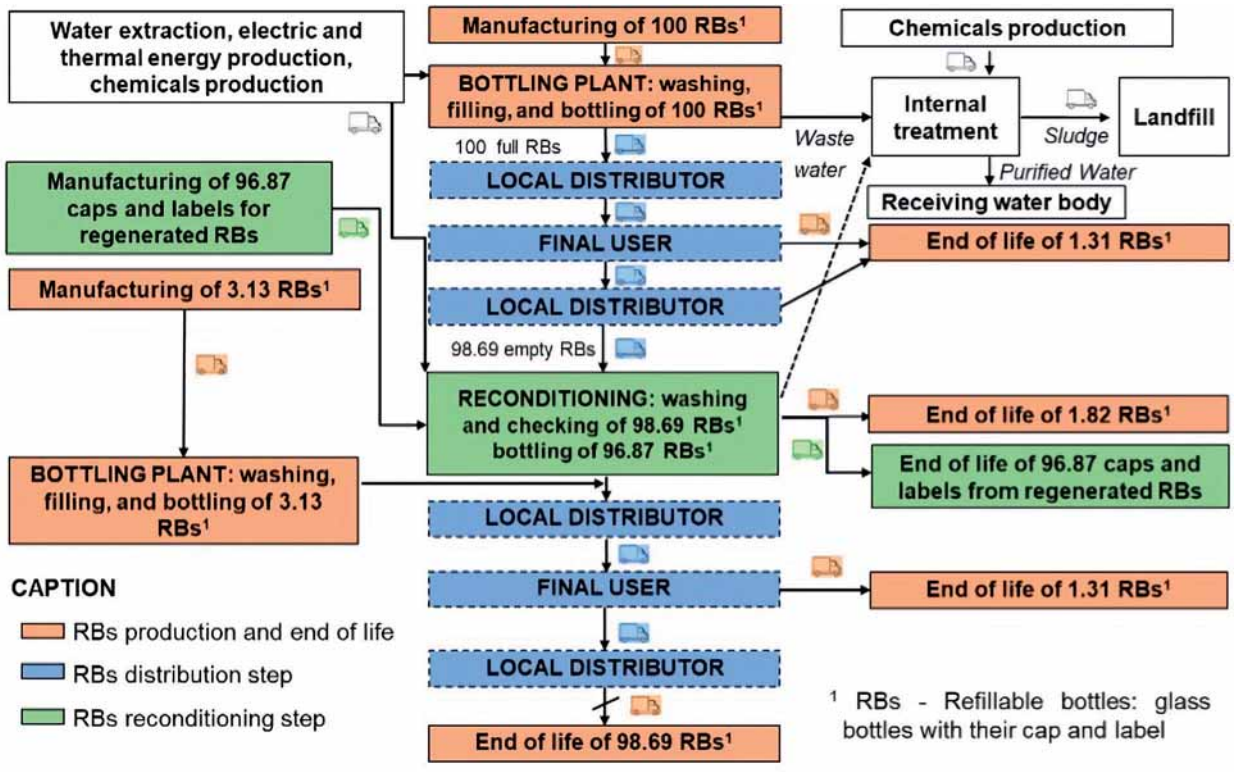

Fig. 1. Analysed system with the relative system boundary.

a sequence of processes, including washing with hot water and chemicals (detergent, release agent for labels, acid product, and disinfectant), filling with water, capping, labelling and packaging for distribution. Subsequently, full bottles are dispatched to local distributors, who simultaneously retrieve empty ones. An impressive 98.69 percent of empty bottles are reclaimed (primary data sourced from the surveyed companies), while losses during distribution (1.31 percent per delivery) are anticipated to be handled through separate collection and recycling of glass.

During the regeneration phase, caps are removed from all returned bottles, which then undergo manual and electronic inspections to detect any damage. At this stage, approximately 1.85 percent of washed bottles are deemed unsuitable for reuse. Regenerated bottles, along with new ones to compensate for distribution and regeneration losses, are filled, capped and labelled with fresh caps and labels before being packaged for delivery.

The bottling facility generates wastewater and solid waste, including discarded caps, labels and damaged bottles. Wastewater is subjected to chemical-physical treatment within an internal plant to adjust pH and reduce surfactant concentrations. Purified wastewater is subsequently discharged into a receiving water body, while process sludge is periodically dehydrated and sent to landfill. Solid waste is directed to a dedicated sorting and recycling facility.

Based on collected primary data, the study assumes a maximum of 30 deliveries. This reusability rate aligns with recommendations found in the PEF guide (Zampori and Pant, 2019).

Functional Unit

The functional unit revolves around provision of a specific volume of mineral water to end users through 1-litre glass bottles. Consequently, the functional unit (FU) equates to 100 litres of mineral water (equivalent to 100 bottles) per delivery, with the number of deliveries (n) ranging from 1 to 30. For n=1, refillable bottles are employed only once and subsequently discarded, setting the reference flow at 100 new bottles. For n=2, refillable bottles are returned to the bottling plant after the first use, resulting in 3.13 bottles being discarded (1.31 during distribution and 1.82 during reconditioning), while 96.87 are made available for the second delivery. Thus, the reference flow stands at 103.13 new bottles. In a general context, the reference flow translates to (100 + 3.13(n-1)) new bottles, as illustrated in Fig. 2.

System Boundary

The system boundary (Fig. 1) encompasses:

- Manufacturing of RBs components and their transportation to the bottling plant (comprising 100 new RBs and replacements for losses).
- Initial washing, filling, capping and labelling of RBs (involving energy, water and chemical consumption, along with wastewater treatment, including sludge management).
- RBs distribution (covering transportation from the bottling plant

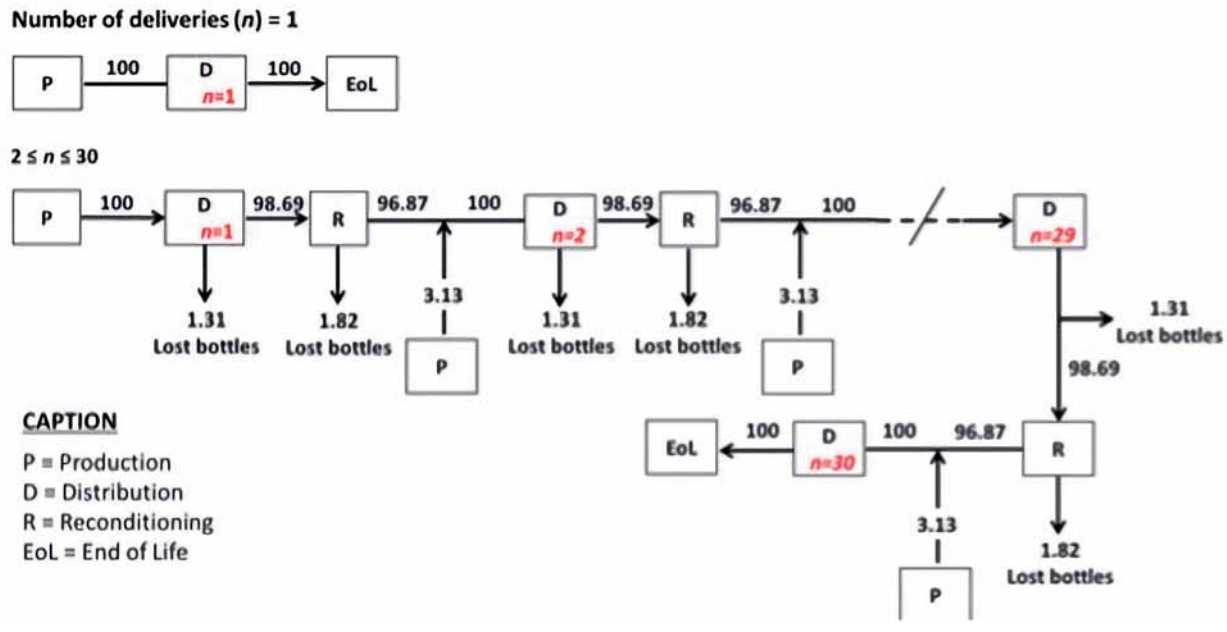

Fig. 2. Simplified chart of the life cycle of 100 RBs as the number of deliveries changes.

to local distributors and subsequently to end users).
- Reconditioning process for RBs (encompassing energy, water, chemicals, wastewater treatment and cap/label replacements).
- End of life of RBs components, including transportation and waste treatment at dedicated facilities (RBs after n uses and RBs discarded at each use). In certain instances, multifunctionality linked to the recovery of energy and materials was addressed by expanding the system boundary (Finnveden et al., 2009).

Data Quality

The study primarily relies upon the operations of four bottling companies situated in northern Italy, collectively responsible for water distribution across the national territory in 2017. Data sources are predominantly primary, encompassing distribution, initial bottling, reconditioning, as well as input from operators at waste treatment facilities in northern Italy regarding the end-of-life processes for RBs components and sludge. For background system processes (such as chemical production), data from the ecoinvent 3.5 database were utilised (with allocation cut-off by classification approach) (Ecoinvent 2018).

Selected Indicators

A comprehensive assessment was conducted, encompassing 14 impact categories derived from the Environmental Footprint Life Cycle Impact Assessment Method, version 2.0 (Fazio et al., 2018). These categories encompass climate change (CC), ozone depletion (OD), photochemical ozone formation (POF), particulate matter (PM), human toxicity (non-cancer effects - HTNC and cancer effects - HTC), acidification (A), aquatic freshwater eutrophication (FE), aquatic marine eutrophication (ME), terrestrial eutrophication (TE), freshwater ecotoxicity (FEC), water scarcity (WS), resource use (energy carriers - RUEC, minerals and metals - RUMM).

Inventory

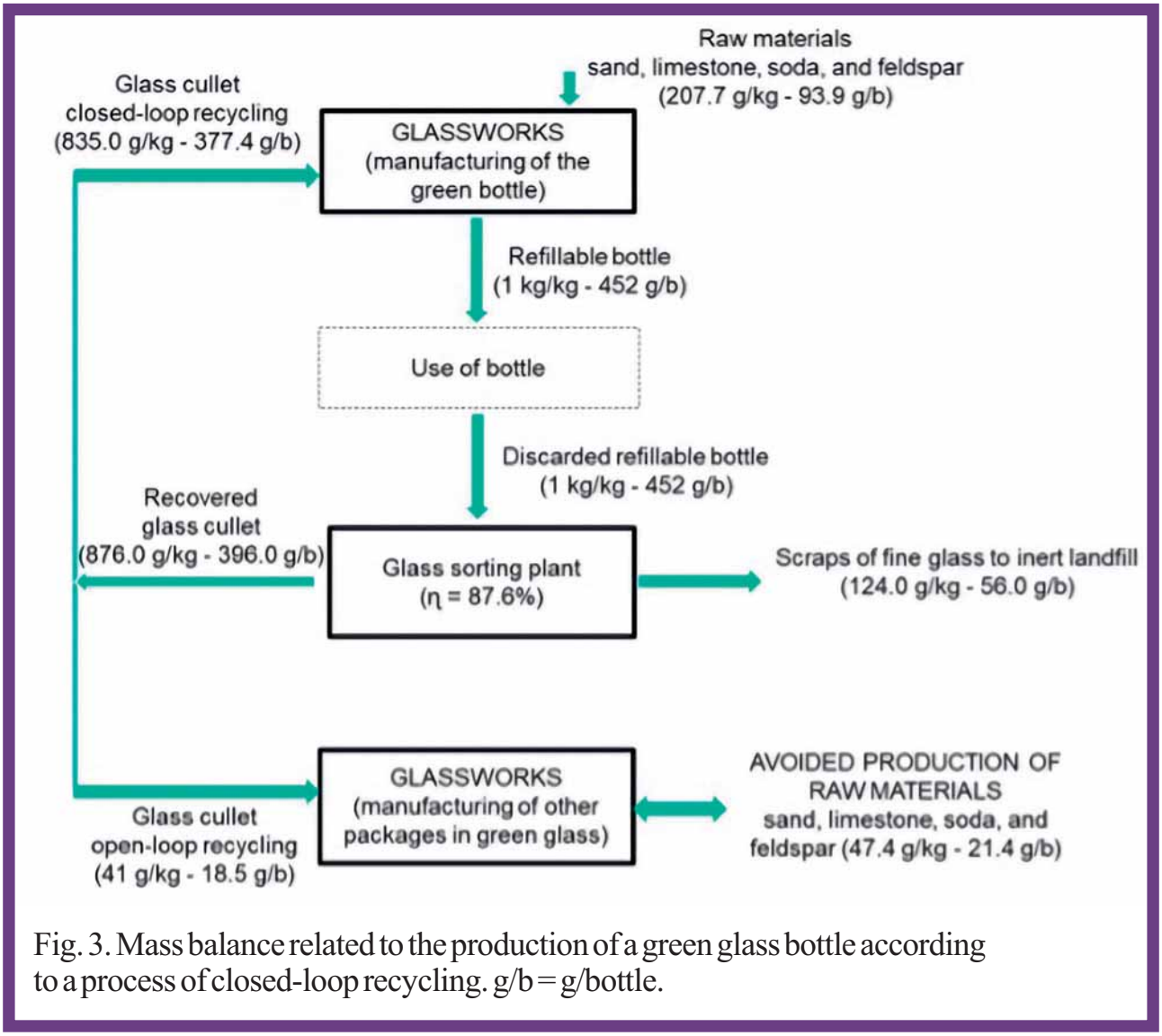

Fig. 3. Mass balance related to the production of a green glass bottle according to a process of closed-loop recycling. g/b = g/bottle.

This section catalogues the primary data employed in modelling the processes encompassed within the system boundary.

Packaging production and end-of-life

The manufacturing of green glass bottles adhered to the average European composition within the ecoinvent database (Ecoinvent 2018), a configuration consistent with the Italian context. The production process entailed melting glass cullet (835 g/kg bottle) and virgin raw materials such as sand, soda, limestone and feldspar (208 g/kg bottle). As depicted in Fig. 3, glass cullet, procured directly from end-of-life RBs after undergoing a sorting process (efficiency of 87.6 percent and electricity consumption equivalent to 19 Wh/kg bottle), constituted a significant portion of the raw materials. A portion of the reclaimed glass cullet (835 g/kg) was channelled into producing new RBs via closed-loop recycling, while the remaining segment (41 g/kg bottle) was allocated to the creation of other green glass packages through open-loop recycling, substituting virgin raw materials at a ratio of 1:1.15 by mass (Ecoinvent 2018).

Various stages, including melting in the furnace, forming, cooling, testing and packing, were modelled using European data reflecting actual consumption and emission levels within container glass manufacturing (Scalet et al., 2013). Transportation of the manufactured glass bottles from the glassworks to the bottling plant involved large-sized trucks (exceeding 32 tons) and spanned an average distance of 200 km.

The aluminium body of the cap was fashioned through the deep drawing of thin foils, primarily utilising the 8011 alloy (comprising 98.5 percent primary aluminium, 0.8 percent cast iron and 0.7 percent silicon of metallurgical grade; AZoM 2013). The liner and seal, on the other hand, were crafted via the extrusion of plastic granules, constituting a blend of polyethylene and polyvinylidene chloride. Given the cap's production location in Spain, the manufacturing process factored in the electricity mix of this specific region. Subsequent transportation to the Italian bottling plant (averaging 1100 km) was anticipated to involve small trucks, freight trains, and container ships, apportioned accordingly.

Following use, the cap was directed to a metal sorting facility, wherein the aluminium body underwent separation from plastic elements before being crushed and pressed (involving electricity consumption and diesel). The plastic waste was slated for incineration within a municipal solid waste incinerator, yielding electricity and thermal energy recovery (1.5 kWh and 3.2 MJ per kg of input waste). Aluminium scraps, conversely, were dispatched to a smelter, where they substituted primary pure aluminium (99.7 percent) at a ratio of 1:0.7 by mass, predicated on economic evaluation (Koffler and Florin, 2013).

Paper label production employed uncoated, wood-containing paper, followed by transportation to the bottling plant via small trucks (averaging 120 km). The end-of-life processing for labels depended upon the disposal context. In instances where labels were discarded at the bottling plant, they were directed to a paper sorting facility before ultimately reaching a paper mill. In the absence of primary data, the recycling process at the paper mill drew from the BREF document pertaining to pulp, paper, and board production (Suhr et al., 2015). Notably, no credits were factored in for material recovery or reductions in virgin paper production, owing to the low-quality nature of label paper necessitating substantial mixing with other paper types for recycling. Labels discarded by users (due to bottle damage or leaks) were presumed to be collected alongside the glass bottle (via separate glass collection) and sent to a glass sorting facility. Here, they were separated from the glass cullet through light body aspiration and subsequently incinerated for electricity and thermal energy recovery (0.7 kWh and 1.4 MJ per kg of input waste).

First Washing and Bottling / Reconditioning Process

A comprehensive inventory of operations conducted at the bottling facility is presented in Table 2, relying upon primary data sourced from the surveyed companies. In instances of first washing and bottling, cap and label replacements were omitted. Wastewater generated was subjected to treatment in a physical-chemical plant within the bottling facility. This treatment involved electricity (already incorporated into the bottling plant's overall consumption, as detailed in Table 2) and 3.69 kg of sulfuric acid per cubic metre. The process yielded 1 cubic metre of purified water and 0.54 kg of process sludge, with the purified water discharged into a receiving water body, accompanied by emissions comprising 27 g/m^3 BOD5, 54 g/m3 COD, 3 g/m^3 total nitrogen, 0.3 g/m3 total phosphorus, 55 g/m3 sulphate, 13 g/m3 chloride, and 10 g/m3 total suspended solids. Process sludge (at five percent dry matter) was subjected to conditioning and dewatering, entailing the consumption of ferric chloride solution, lime, and electricity. Outflows comprised dewatered sludge (178 g/kg input sludge, with 35 percent dry matter) destined for a nearby landfill and supernatant (0.84 litres per kilogram of input sludge) routed to a municipal wastewater treatment plant.

Table 2. Inventory of the operations in the bottling facility for refillable bottles based on collected primary data. Data refer to one bottle entering the facility.

Input	Amount per bottle
Electricity	44 Wh
Water for washing (well water)	0.67 l
Heating of water (natural gas, conventional boiler)	459 kJ
Detergent (solution of caustic soda)	0.24 g
Disinfectant (based on peracetic acid)	1.15 g
Release agent for label	
Type A (based on EDTA)	0.12 mg
Type B (based on sodium cumene sulfonate)	0.24 mg
Acid product - removal of the mineral residue	
Type A (based on sulfuric acid)	65 mg
Type B (based on lactic acid)	65 mg
Transport of chemicals to the bottling plant	1.52 g × 200 km
Caps substitution in the regenerated bottles (production + end of life) [1]	1.77 g
Labels substitution in the regenerated bottles (production + end of life) [1]	0.98 g
Output	**Amount per bottle**
Wastewater to the internal treatment	0.67 l

[1] The substitution is not performed in the first washing.

Distribution

Distribution of RBs encompasses transportation from the bottling plant to local distributors and onward delivery to end users. Relevant inventory data are detailed in Table 3.

RESULTS AND DISCUSSION

Impact Assessment

Impacts associated with the system involving 100 RBs prepared for the n_{th} delivery encompass the environmental loads of:

- Production and end-of-life processes for [100 + 3.13 (n-1)] RBs.
- Reconditioning of 98.69 × (n-1) RBs.
- Distribution of 100 × (n + 1) RBs.

With an increasing number of deliveries, the contribution of the

Step	Truck type	Transported mass (*kg/bottle*)	Transportation distance
Transport to the local distributor	Large-size lorries (> 32 metric ton) Euro 3: 84% Euro 4: 7% Euro 5: 6% Euro 6: 3%	Outward journey: 1.7 [1] Return trip: 0.7 [1]	200 km (A sensitivity analysis was performed on this parameter)
Transport to the final user	Small-size lorries (< 7.5 metric ton) Euro 3: 84% Euro 4: 7% Euro 5: 7% Euro 6: 2%	Outward journey: 1.65 [2] Return trip: 0.65 [2]	15 km

'production + end-of-life' stage gradually diminishes, consistently falling below 30 percent across all indicators for n = 30 (Fig. 4).

Conversely, the contributions of the reconditioning and distribution stages swell with the number of uses. For n = 30 (Fig. 4), the contribution of distribution generally exceeds 50 percent, surging to 80 percent for the impact category of freshwater ecotoxicity. Meanwhile, the reconditioning process exerts a more modest influence, remaining under 45 percent, except for impact categories such as freshwater eutrophication (53 percent) and water scarcity (59 percent). The principal burdens of the reconditioning process, contingent on the indicators, stem from electricity consumption, heating of washing water (facilitated by a conventional gas boiler), the production of primary aluminium for cap replacement and water usage. Chemicals consumption, wastewater treatment and label replacements exhibit negligible contributions. From an energy standpoint, optimising the reconditioning process could entail reductions in consumption and the promotion of alternative, more efficient energy sources (e.g. a combined heat and power boiler). Concerning

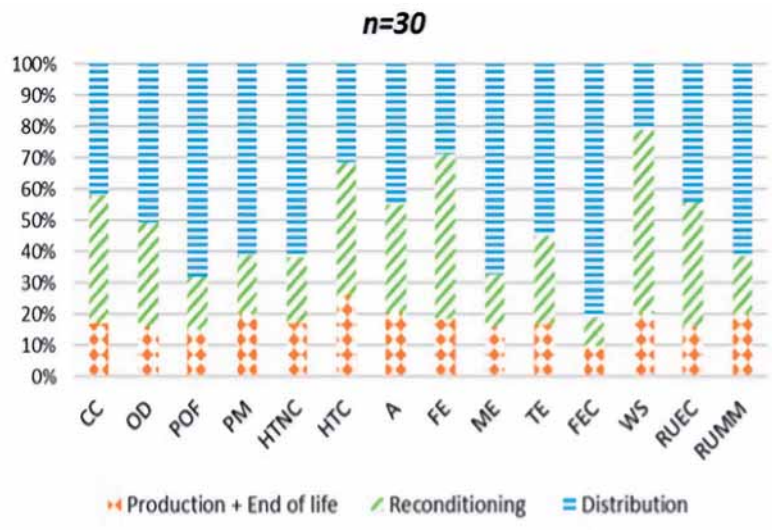

Fig. 4. Percentage contribution of the stages "production + end of life", "reconditioning", and "distribution" to the value of the indicator for n = 30.

cap production, it lies primarily beyond the control of bottling companies, barring supplier selection (with caps currently sourced from Spain). To address this, exploring alternatives to aluminium or weight reduction for caps may warrant some consideration during the design phase. In the distribution stage, a significant portion of the impact stems from transportation to local distributors. The baseline scenario presupposes an average transportation distance of 200 km, though the sensitivity analysis investigates the influence of this parameter. Promoting the use of vehicles featuring Euro class 5 or 6 motors, instead of class 3, has the potential to reduce transportation burdens.

Reconditioning vs Single-use

This section juxtaposes the RBs system against an alternative Single-use glass Bottles system (SBs). Here, the reference flow for meeting the functional unit (FU) entails 100 × n × SBs. Single-use bottles are portrayed as having identical capacity and weight to refillable bottles. Their production and end-of-life processes mirror the descriptions detailed in the inventory system for refillable bottles, with the distinction that all bottles are disposed of by users in the glass collection, without being returned to the company. In contrast to the RBs system, distribution modelling for single-use bottles differs. Single-use bottles are primarily retailed at large-scale retail stores, with transportation from retailer to user modelled as a roundtrip of four kms via private car, factoring in a purchase of 20 articles. Comparing the two alternatives, the RBs system exhibits superior environmental performance under average operational conditions, beginning with two deliveries. For n = 2, the ratio between the RBs system's impact and that of the SBs system spans from 44 percent to 74 percent, contingent on the indicators. With the maximum number of deliveries (n = 30), this ratio decreases to 17 percent–37 percent (as exemplified by the climate change impact category in Fig. 5).

Sensitivity Analysis

Several sensitivity analyses were conducted on the most crucial parameters within the RBs system (bottle weight and maximum number of uses, average refund rate, and distribution distance) to assess their influence on the results. Of these parameters, only the distribution distance between the bottling plant and RBs distributor (varied up to 1000 km) affected the comparison between SBs and RBs systems. For a 400 km distance, a mini-

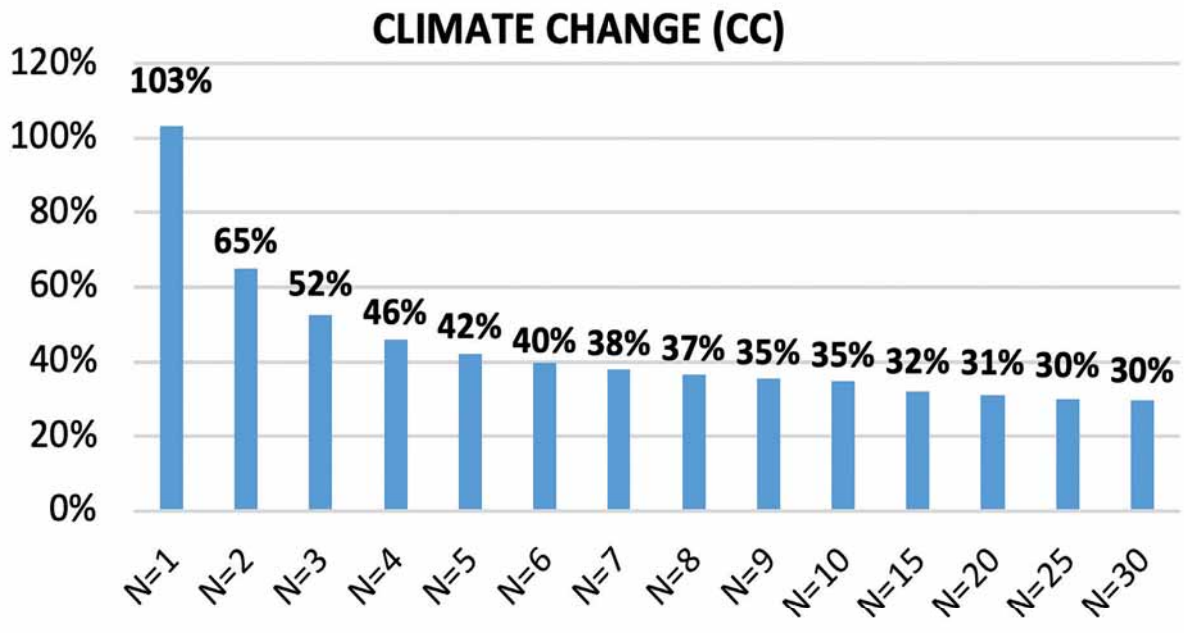

Fig. 5. Ratio between the value of the indicator *climate change* in the RBs and SBs system, for each number of deliveries.

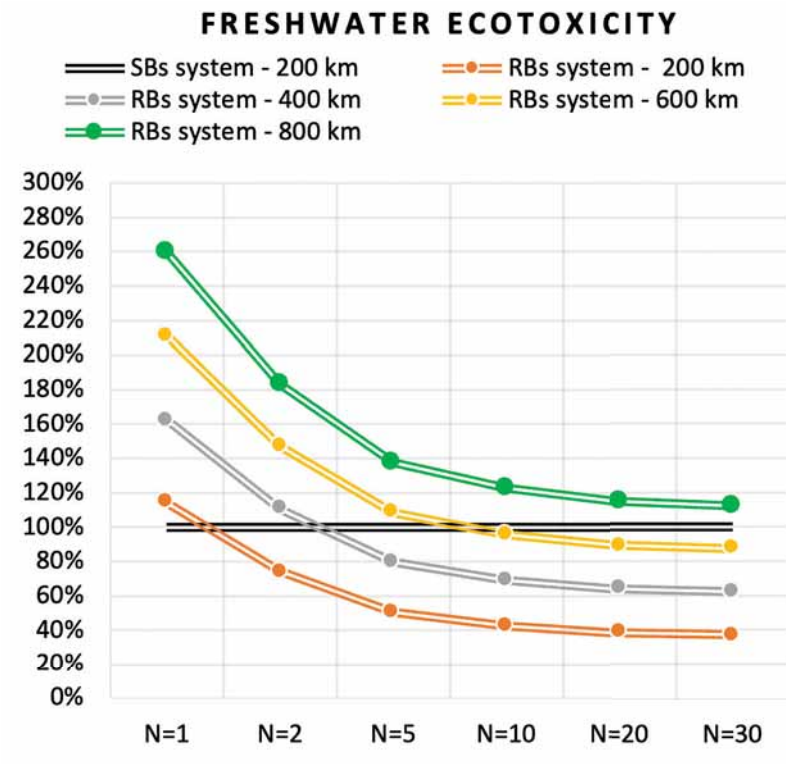

Fig. 6. Comparison between the value of the indicator in the RBs and SBs system (the value of the indicator in the SBs system is put at 100 percent), for each number of deliveries and for different values of transportation distance in the RBs system. The category freshwater ecotoxicity is taken as reference because it is the most influenced by the distance.

mum of four deliveries was required to outperform single-use distribution, while at 800 km or more, the RBs system failed to be cost-effective even for n = 30 (Fig. 6).

Conclusions and Recommendations

This study scrutinised the environmental performance of the refillable glass bottle system for mineral water distribution in Italy, contingent on the number of uses. Findings underscored that the RBs system's impacts were primarily linked to the distribution stage, particularly the transportation of bottles from the bottling plant to local distributors (averaging 200 km). For the maximum number of uses (n = 30), the distribution stage's contribution could reach up to 80 percent of the overall indicator. In contrast, the environmental burdens associated with the reconditioning process were more modest, typically remaining under 45 percent, except for specific impact categories like freshwater eutrophication (53 percent) and water scarcity (59 percent). Major contributors to the reconditioning process' impact included electricity consumption, heating of washing water (facilitated by a conventional gas boiler), primary aluminium production for caps, and water usage. Chemical consumption, wastewater treatment, and label replacements played a minor role.

In comparison to single-use bottles, the use of refillable bottles was substantially more environmentally preferable for a local market (within 200 km), achieving better environmental performance starting from just two deliveries. However, the distance between the bottling plant and the local distributor played a pivotal role in impact evaluation. For a 400 km distance, a minimum of four uses of refillable bottles were necessary to surpass single-use distribution, while at 800 km or more, the RBs system was environmentally disadvantageous even for 30 uses.

This study represents part of a broader research initiative focused on assessing the environmental implications of re-use practices in Italy. Future LCAs targeting other reusable packaging types will be undertaken employing a similar modelling approach. ■

Link to original article:

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Falorni Tech
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Vidromecanica
Waltec Maschinen

STEMWARE SEALING MACHINES

Falorni Tech
OCMI OTG
Olivotto Glass Technologies
Waltec Maschinen

STIRRERS

BDF Industries
Bottero
Falorni Tech
Forglass
GCG - Glass Consulting Group
Glass Service
Horn
MT Forni Industriali
Olimerk
Olivotto Glass Technologies
Revimac-Bottero
Vidromecanica

SUCTION GATHERERS

Falorni Tech
Olivotto Glass Technologies

SYRINGE AFTER FORMING MACHINES/LINES

Euromatic

SYRINGE FORMING MACHINES/LINES

Euromatic

SYRINGE FILLING INTO TRAY MACHINES/ MODULES

Euromatic

SUPERVISORS MODEL BASED PREDICTIVE CONTROL

GS - Glass Service

TAKE-OUT DEVICES & EQUIPMENT

BDF Industries
Bottero
Bucher Emhart Glass
Falorni Tech
Famor Engineering
Luben Glass
Olimerk
Olivotto Glass Technologies
Ramsey Products
Vidromecanica
Waltec Maschinen

TEMPERATURE MEASUREMENT & CONTROL

BDF Industries
Bock Energietechnik
Bucher Emhart Glass
Falorni Tech
Forglass
Graphoidal Developments
GS - Glass Service
Horn
KYP Accesories
Novaxion
Pennekamp

TEMPERING LINES

Pennekamp
Vidromecanica
Waltec Maschinen

THERMAL SHOCK TEST MACHINES

Vidromecanica

TECHNICAL ARTICLES IN RUBBER & PLASTIC

Simtech

THERMOCOUPLES & ASSEMBLIES

Bock Energietechnik
Falorni Tech
GCG - Glass Consulting Group

THERMO SHOCK TEST MACHINES

BDF Industries

TIN OXIDE ELECTRODES & CONNECTORS

Horn
TECO Group

TRAINING SERVICES

Agr International Inc

TRAY FORMERS

EMS Group

TOOLS & EQUIPMENT

Bottero
Luben Glass

TUBING LINES

Falorni Tech
Olivotto Glass Technologies

TURNKEY PLANTS ENGINEERING & CONSTRUCTION

Amig
BDF Industries
Falorni Tech
Forglass
EME
Glass Service
HFT
Horn
Olivotto Glass Technologies
Spami-Optrel-Stevanato Group
TECO Group
Waltec Maschinen

UV LAMPS

Graphoidal Developments

VACUUM PLANTS & ACCESSORIES

Pneumofore
Simtech

VACUUM PUMPS

Pneumofore

VIAL AFTER - FORMING MACHINES/LINES

Euromatic
Moderne Mecanique
OCMI OTG
Pennekamp
Spami-Optrel-Stevanato Group

VIAL FORMING MACHINES/LINES

Euromatic
Moderne Mecanique
OCMI OTG
Pennekamp
Spami-Optrel-Stevanato Group

VIAL PACKAGING MACHINES

Euromatic
KYP Accesories
Moderne Mecanique
OCMI OTG
R.Cestaro
Spami-Optrel-Stevanato Group

VIBRATING EQUIPMENT

EME
Forglass
Vetromeccanica
ZIPPE

WASTE GAS CLEANING SYSTEMS

BDF Industries

WASTE GASES DUCT WORKS AND VALVES CLEANING SYSTEMS

BDF Industries

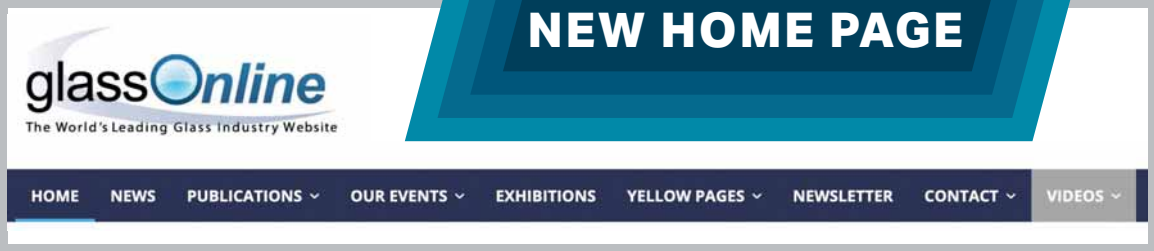
WATER CLEANING SYSTEMS

BDF Industries
Forglass
Graphoidal Developments
Luben Glass
ZIPPE

WATER COOLING SYSTEMS

Bock Energietechnik

NEW HOME PAGE



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Shanghai New International Expo Centre

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China Architectural & Industrial Glass Association
China National Association For Glass Industry
Shanghai Ceramic Society

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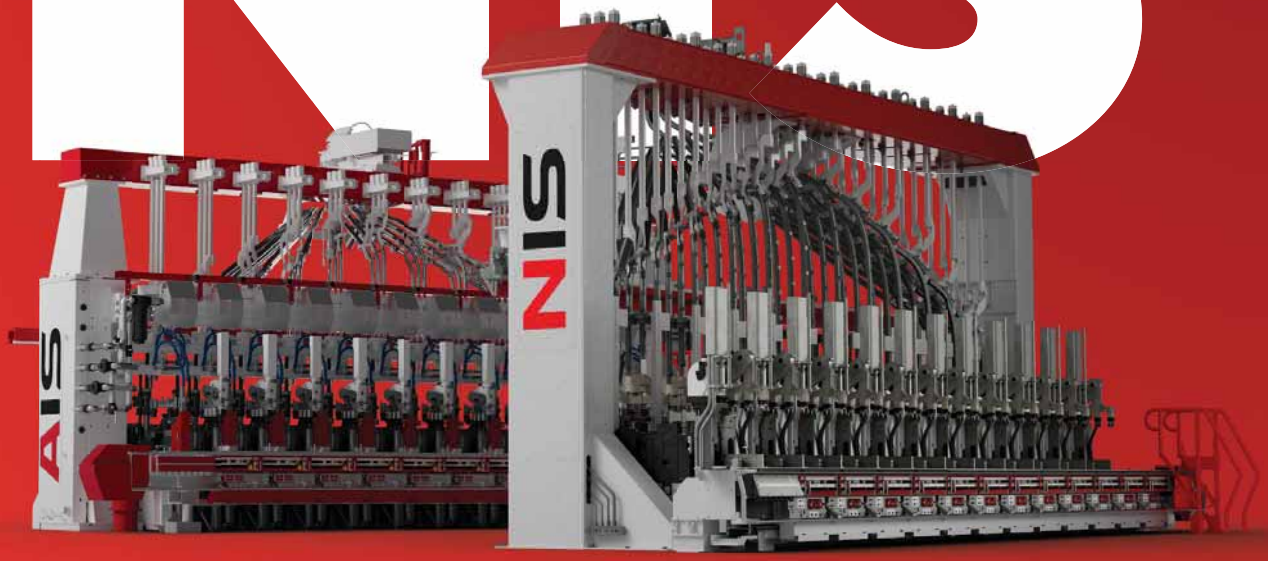

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