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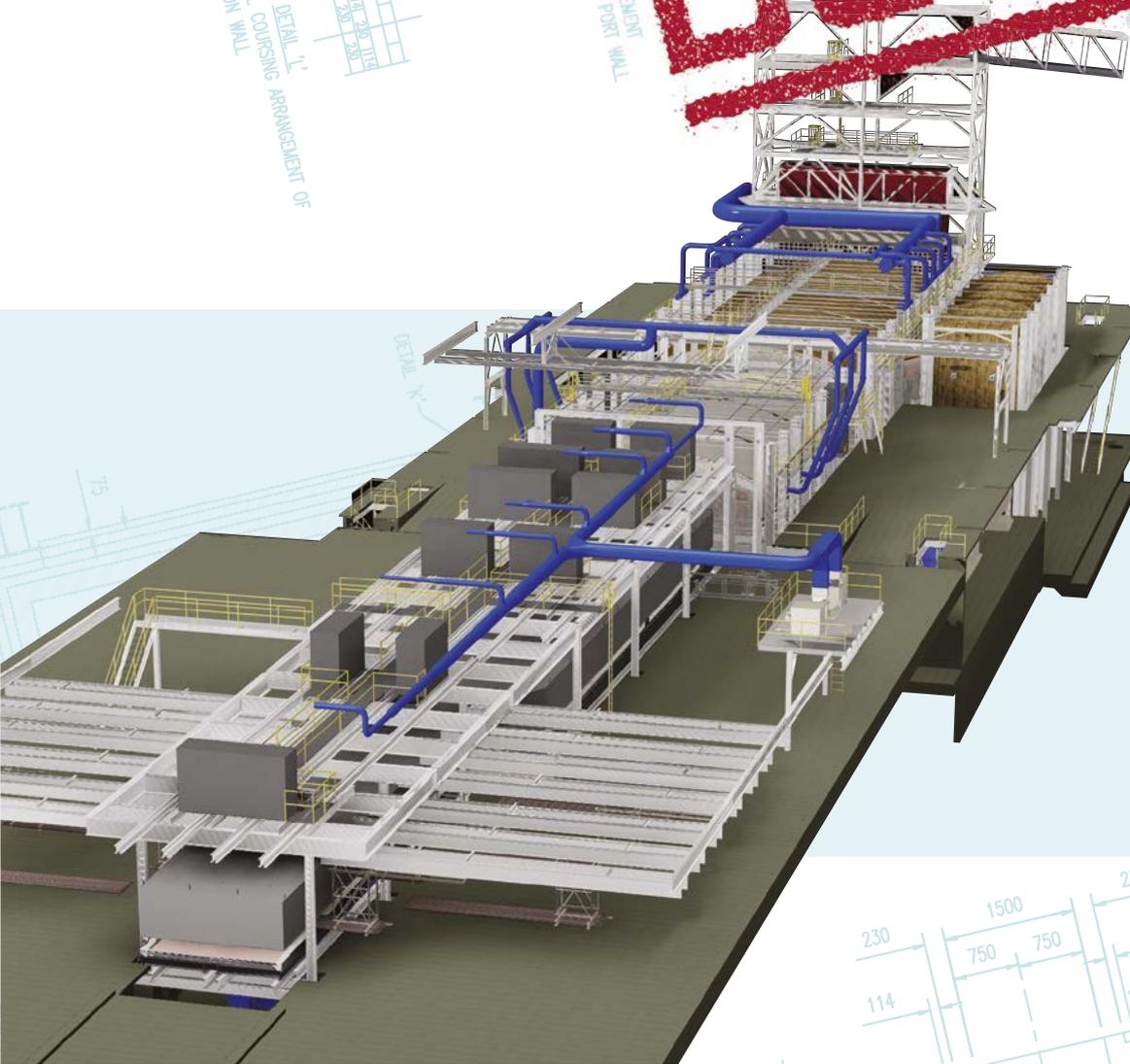
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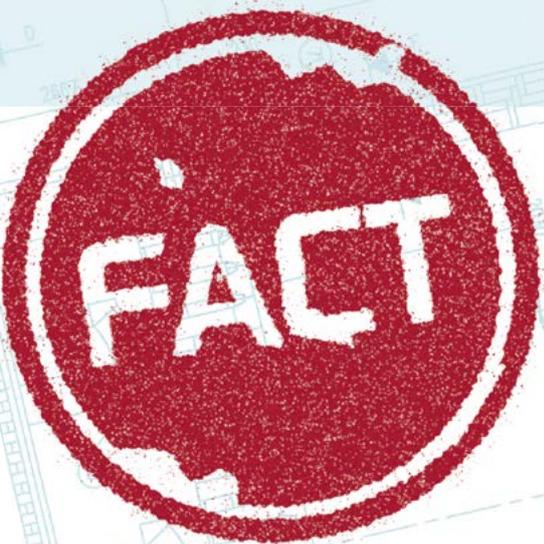
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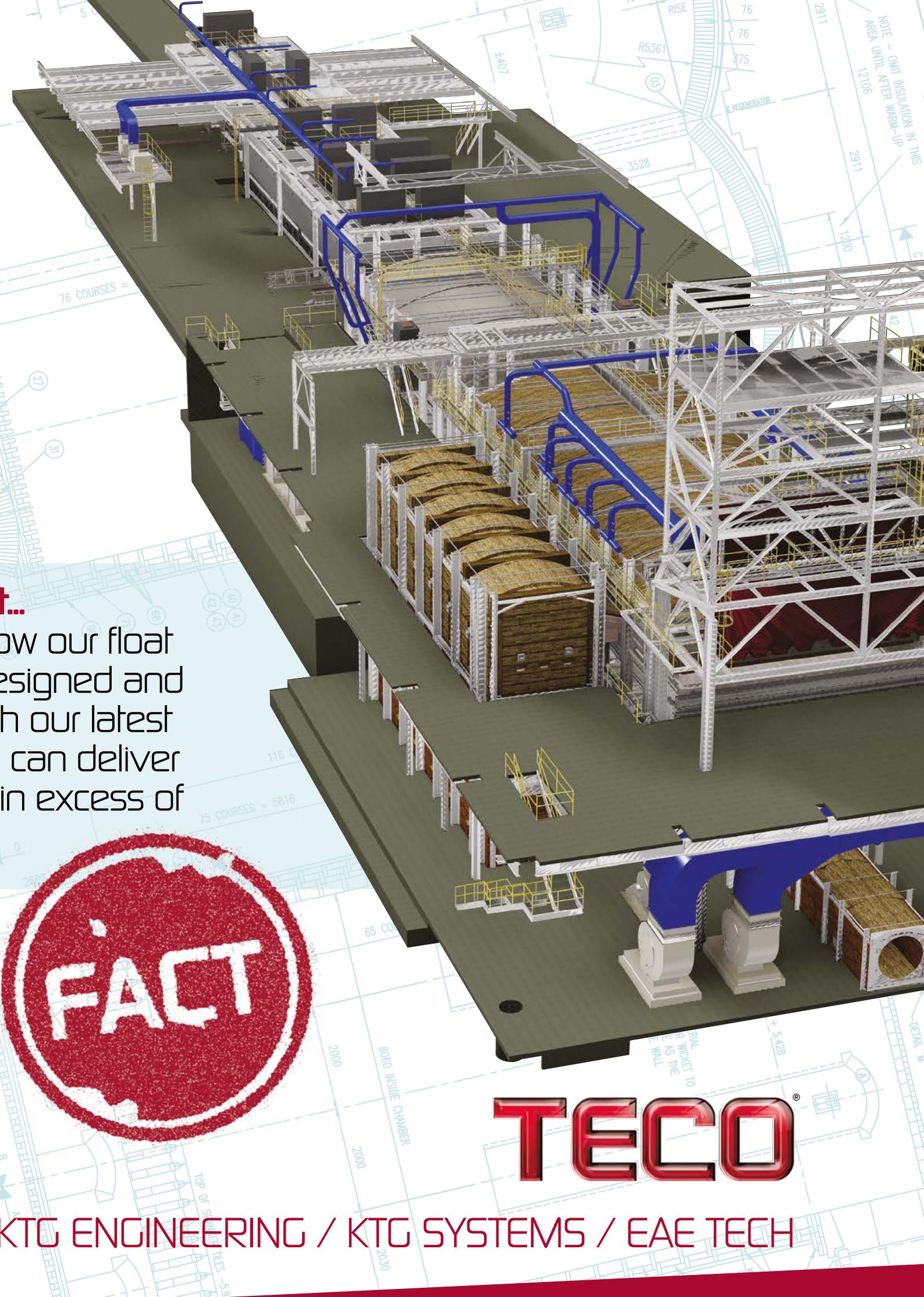
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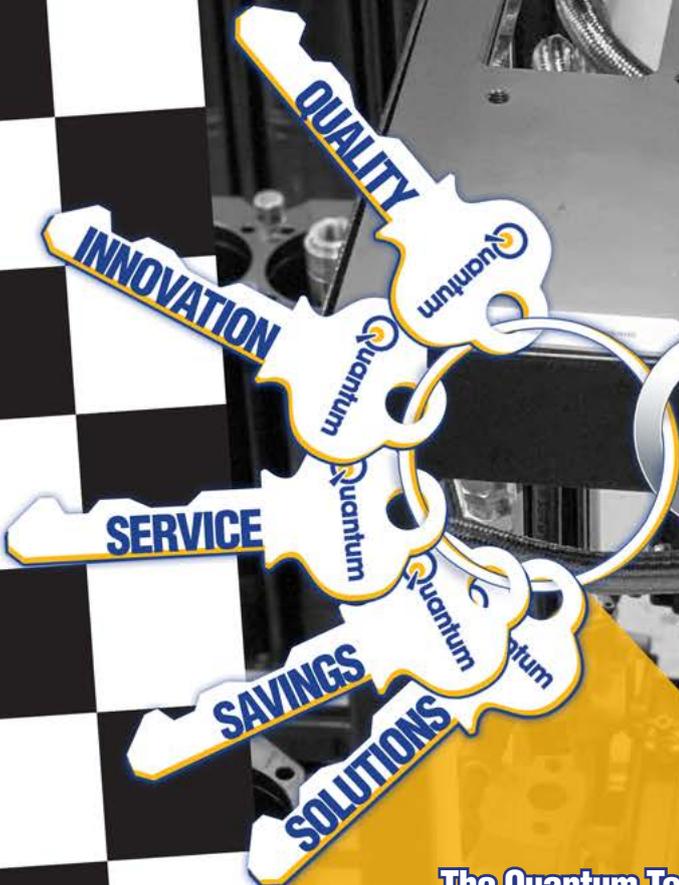
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# Welcome



Welcome to the latest issue of *Glass Worldwide*, which again is full of exclusives that cover the latest trends in glass manufacture and processing throughout the world.

Included in this issue are specially compiled regional reports devoted to the Czech Republic, Italy, South Africa and the ASEAN region as well as exclusive interviews with key individuals from Bangkok Glass, Bormioli Pharma, Pilkington Italia (part of the NSG Group), Şişecam and Stoelzle Glass Group revealing the latest developments at their hollow, flat and speciality glass operations.

Elsewhere, a broad cross-section of technical content is aimed at assisting multiple areas of production including coating, cutting, forming, inspection, measuring, melting, process control and ware handling.

Alongside the importance of technological advancements, the ability to develop the next generation of skilled and diverse engineers will go a long way to securing a prosperous future for the glass industry. Our series of articles addressing the challenges and opportunities continues with Savari Kognole sharing her experience of joining CelSian as a Computational Fluid Dynamics Engineer.

Readers will also discover previews and reports from key conferences and exhibitions, including details on early bird GlassPrint 2023 registration. See pages 124–127 for more details.

There is already a sense of excitement in the air with glasstec 2022 approaching, followed closely by other gatherings throughout the world including the ASEAN Glass Conference in Thailand and the Glass Problems Conference in the USA, to name just two. Often as official journal, *Glass Worldwide* will be well-represented at the industry's leading events this autumn with the bumper September/October issue. To guarantee receiving a personal copy, please visit our website to order your subscription (including a free copy of the new Who's Who / Annual Review 2022–23 yearbook).

Suppliers who have yet to reserve advertisements in what will be the most widely-circulated issue of *Glass Worldwide* this year are invited to request media information at [www.glassworldwide.co.uk](http://www.glassworldwide.co.uk), which also features the latest Hot Topics news and Virtual Marketplace showcase.

It is thanks largely to the close relationships maintained by the *Glass Worldwide* team with key industry personalities that such an eclectic mix of stories has again been assembled for this issue and we are pleased to acknowledge members of the greater glassmaking community for their continued support, encouragement and participation.

**The Glass Worldwide team**  
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[www.glassworldwide.co.uk](http://www.glassworldwide.co.uk)



**DAVE FORDHAM**  
Publisher  
Tel: +44 (0) 1342 315032  
Email: [davefordham@glassworldwide.co.uk](mailto:davefordham@glassworldwide.co.uk)



**REBECCA COLEGROVE**  
Editorial Consultant  
Email: [rebeccacolegrove@glassworldwide.co.uk](mailto:rebeccacolegrove@glassworldwide.co.uk)



**ALISON SMITH**  
Designer for Blue Daze Design Ltd  
Email: [copy@glassworldwide.co.uk](mailto:copy@glassworldwide.co.uk)



**GRAHAM LOVELL**  
Senior Sales & Marketing Manager  
Tel: +44 (0) 1342 321198  
Email: [grahamlovell@glassworldwide.co.uk](mailto:grahamlovell@glassworldwide.co.uk)



**FRAZER CAMPBELL**  
Publisher  
Tel: +44 (0) 1342 322278  
Email: [frazercampbell@glassworldwide.co.uk](mailto:frazercampbell@glassworldwide.co.uk)



**DEBBIE FORDHAM**  
Publisher  
Tel: +44 (0) 1342 322392  
Email: [debbiefordham@glassworldwide.co.uk](mailto:debbiefordham@glassworldwide.co.uk)



**SAM DUNMORE**  
Administration and Subscriptions Manager  
Tel: +44 (0) 1342 322133  
Email: [samdunmore@glassworldwide.co.uk](mailto:samdunmore@glassworldwide.co.uk)



**DAVID MOORE**  
Technical Advisor  
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## News For the latest news, visit the Hot Topics section at [www.glassworldwide.co.uk](http://www.glassworldwide.co.uk)

### Ardagh invests in sustainable glass and metal packaging in Brazil

Global metal and glass packaging supplier Ardagh Group is building its first glass production facility in Brazil, located in the east of the country, in Juiz de Fora, Minas Gerais. The glass plant will be co-located with a new multi-line beverage can manufacturing facility being built by Ardagh Metal Packaging, complementing three existing metal plants in Jacareí (Sao Paulo), Alagoinhas (State of Bahia) and Manaus (State of Amazonas).

Ardagh's new state-of-the-art facility will supply sustainable glass packaging to customers in the growing Brazilian market. Production is expected to commence in the first half of 2024 and, when operational, the facility will provide approximately 300 jobs. In line with the Group's focus on sustainability and the advancement of its ambitious ESG goals, the glassworks will be one of its most environmentally-efficient facilities. Following the completion of both investments, Ardagh's presence in Brazil will consist of five production facilities employing more than 1,650 people.

[www.ardaghgroup.com](http://www.ardaghgroup.com) ●

### NSG to increase carbon reduction target by 2030

As part of its commitment to achieving carbon neutrality by 2050, NSG Group has announced an increased target of carbon emission reduction by 2030.

In October 2019, the Group had set a target of reducing greenhouse gas emissions by 21% compared to its 2018 levels by 2030 as certified by the Science Based Targets Initiative and work has been taking place in line with the targets. At the same time, the Group has been working to achieve a 2% annual reduction in carbon emissions during the three-year period of the Company's Revival Plan 24 to 2024. NSG has now decided to raise the carbon reduction target by 2030 from 21% to 30%, and to set more concrete and feasible additional measures.

Initiatives for the 2030 target include improvement of furnace energy efficiency (design changes to ensure optimum efficiency technology is installed at furnace repairs; digitalisation of furnace operation utilising techniques such as advanced data analytics and AI to maximise efficiency; increased cullet consumption; increasing the proportion of non-fossil fuels, such as hydrogen and biofuels; and proceeding with small-scale electric melting until 2030, expanding this toward 2050).

NSG will also expand its use of renewable electricity to ultimately achieve 100% replacement of renewable electricity resulting in zero scope 2 emissions associated with purchase of electricity (includes the use of various contracting mechanisms such as PPA and expansion of on-site generation). There will be collaboration across the NSG value chain to reduce emissions.

In addition to these measures, NSG Group will promote the development of new technologies through 'disruptive innovations', such as 100% zero-carbon fuels (e.g. hydrogen); carbon capture, storage and utilisation; and the use of alternative glass raw materials.

[www.nsg.com](http://www.nsg.com) ●



NSG Group has increased its commitment to reducing carbon emissions by 2030 with hydrogen and biofuel tests at Greengate, St Helens the proving ground.

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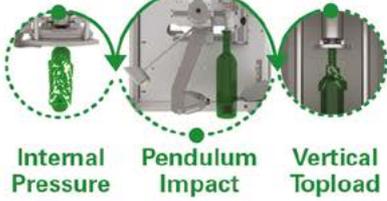
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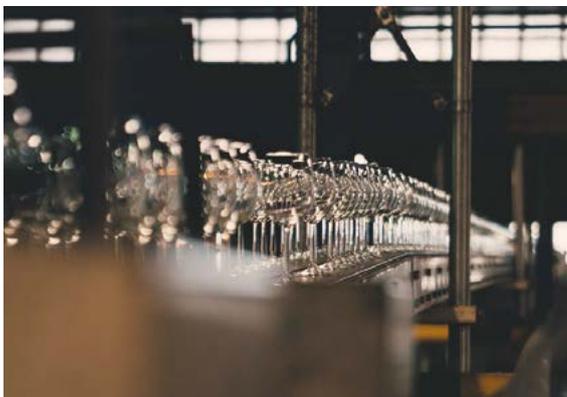
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### Anders Invest buys Royal Leerdam and Crisal

Dutch investment company Anders Invest has signed an agreement to purchase Royal Leerdam and its affiliated company Crisal – Cristalaria Automática from owners Libbey Glass. The closing of this transaction was anticipated – at time of writing – at the end of May 2022.



Anders Invest has bought tableware makers Royal Leerdam and Crisal from Libbey Glass.

Royal Leerdam was founded in 1878, and with the Crisal factory in Portugal, established in 1944, has grown into a strong player in the European market for tableware glass with a turnover of approximately €120 million and more than 600 employees. The company operates from production sites in Leerdam in the Netherlands, and Marinha Grande in Portugal. In addition, a distribution centre is located in Gorinchem. The combined operation serves customers in retail, wholesale and hospitality throughout Europe, Australia, India, New Zealand and the Middle East.

Libbey has reportedly decided to divest its European activities in order to strategically prioritise and expand its business within its core markets, especially the Americas. Libbey and Anders Invest have agreed to maintain an ongoing commercial relationship, including uninterrupted access to products and other support.

“We believe we’ve found a good fit for our European business unit with Anders Invest, which [...] has a successful track record of actively managing and growing industrial companies, and intends to make future investments in the European operations,” said Mike Bauer, Libbey CEO. “While Libbey will continue to operate as a global business, the proposed transaction paves the path for us to better leverage our core strengths and accelerate long-term, sustainable growth, while meeting the needs of customers and end users and inspiring the makers of drinks, makers of meals and makers of memories.”

andersinvest.nl  
www.libbey.com ●

### Optris develops bottom up system for glass tempering plants

A specialist in non-contact temperature measurement devices, Optris has developed a new ‘Bottom up GIS’ [glass inspection system] for low emissivity glass.

The Optris Bottom up GIS has two infrared imagers for installation underneath the tempering line to measure the temperature on the uncoated high emissivity side of the glass.



In order to achieve high energy efficiency in buildings, Low-E glass is used for windows and facade components. The low emissivity poses a challenge for infrared devices that traditionally measure the glass temperature from above when the panes move out of the furnace.

Optris’ Bottom up GIS solves this problem with two infrared imagers sited underneath the tempering line to measure the temperature on the uncoated high emissivity side of the glass (1,600 pixels scan line resolution and maximum field of view of 111°/4.3 m scan width). Both infrared cameras are protected

against glass breakage by an Optris CTlaser 4M pyrometer in combination with a digitally-controlled optical protection system (DCLP – two automatic shutters).

The Bottom up GIS can be installed in a very small space, without the need for mechanical positioning by (bulky) line scanners – the exact alignment of the scan line can be performed using the Optris software supplied.

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**Mexican glass manufacturer selects Heye check inspection machine**

Heye International's latest SmartLine 2 including Ranger 2 check inspection equipment has been installed by Vidrio Formas to deliver high performance at the glass manufacturer's new production site in Lerma, Mexico.

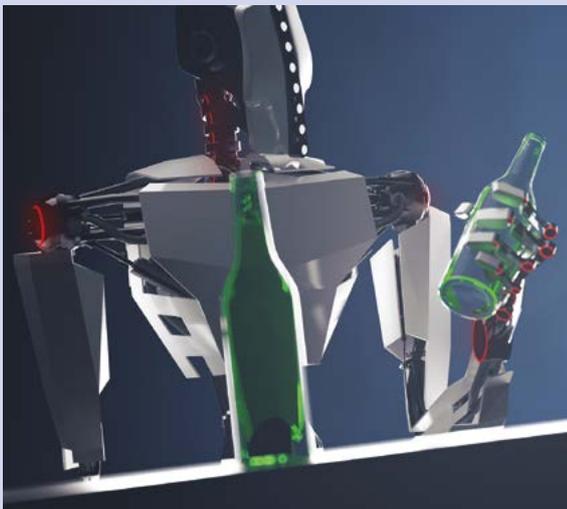
Developed in Germany as an inspection and sorting machine for the global hollow glass community, the SmartLine 2 device incorporates Heye's latest cold end equipment innovations. These include a high speed outfeed belt, multi servo drives, high precision check detection and multi-point non-contact thickness detection.

The equipment will service an expansion of production capacities at Vidrio Formas, which has recently opened a second glass packaging facility with a new furnace and two additional production lines.

The SmartLine 2 was manufactured entirely at Heye's Nienburg factory in Germany. Due to the coronavirus pandemic, users were trained by Heye personnel on site in Mexico. The customer commissioned the machines supported remotely by Heye staff.

"We have known Heye International as a reliable partner for many years. The inspection machines meet all of our requirements. Reliability and failure safety are particularly important to us, based on good experience of the Heye professionals," said Alex Schneeweiss, Operations Manager at Vidrio Formas. "For these reasons we have ordered two more inspection machines."

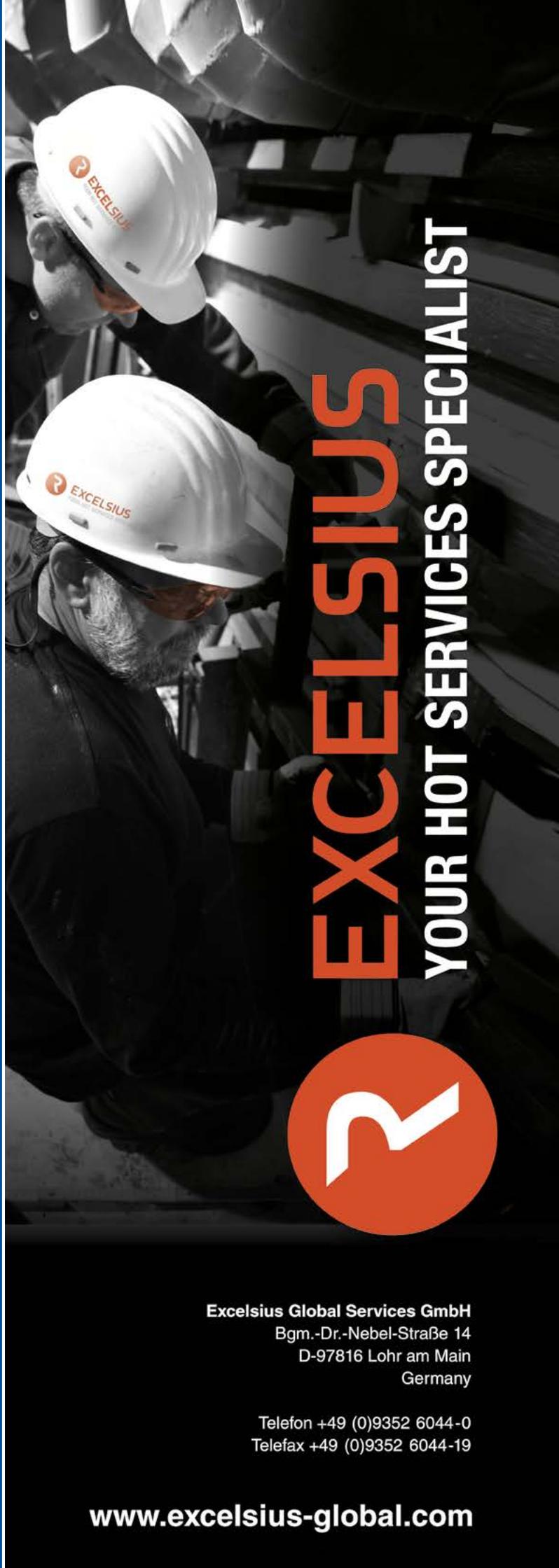
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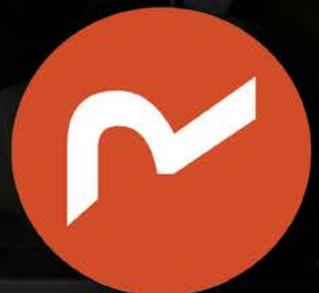
Vidrio Formas commissioned its equipment with remote assistance from Heye staff, due to the coronavirus pandemic.



Heye developed the SmartLine 2 as an inspection and sorting machine for the global hollow glass community.



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Bharat Somany, AIGMF President, alongside Sanjay Somany, a member of the awards jury, with the prestigious C K Somany Award.

### AIGMF to host fifth Awards and first writing competition

The All India Glass Manufacturers' Federation (AIGMF) is accepting entries for the fifth AIGMF Awards for outstanding achievement to the Indian glass industry, supported by *Glass Worldwide*. The C K Somany Award for Innovation and Technology will recognise an individual who has made significant contributions to the glass industry in the field or fields of manufacturing, product development, environmental factors, business performance/growth, research and development and/or science and technology. Separately, the Balkrishna Gupta Award for Exports will be given to an individual/company who has contributed to the identification or growth of glass exports.

The jury for the awards will comprise of: Dr. K. Annapurna, Chief Scientist, Glass Division, CSIR-Central Glass & Ceramic Research Institute (CSIR-CGCRI); Dave Fordham, Publisher, *Glass Worldwide*; Sanjay Somany, Former AIGMF President and CMD HNG Industries Ltd; P K Kheruka, Former AIGMF President and Chairman of Borosil Ltd; and Vinit Kapur, AIGMF Secretary.

Applications from within India from all those connected with the glass industry should include a brief write-up/CV in support of their candidature and be emailed to [info@aigmf.com](mailto:info@aigmf.com) by 25 July 2022. It is anticipated that the 2022 awards will be presented at the AIGMF's annual general meeting in August or September.

Separately, the AIGMF has launched its first Poem/Essay Writing Contest, themed 'Green as Glass' and supported by ICG, IYOG and CSIR-CGCRI. Entrants aged between 7–24 years from anywhere in the world are invited to submit entries by 25 July that demonstrate the salient features of glass. Winners will be announced on International Youth Day on 12 August.

[www.aigmf.com](http://www.aigmf.com) ●

### Visy to invest AUD 700 million in recycling and re-manufacturing

Australian packaging provider Visy has announced it will invest AUD 700 million on a massive expansion of its Queensland recycling and re-manufacturing operations.

Under the plan, the company will invest AUD 500 million to build a new glass food and beverage container recycling and manufacturing facility in Yatala; a new AUD 150 million corrugated box factory at Hemmant; and invest AUD 48 million in major upgrades to the company's Material Recovery Facility (MRF) on Gibson Island, enabling up to an additional 30,000kt of material to be diverted from landfill.

"This is the largest investment Visy has ever made in Queensland," said Executive Chairman Anthony Pratt, "and is part of my pledge to invest AUD 2 billion in Australia over the decade" – a cash injection for the country's recycling and clean energy infrastructure with the potential to creating thousands of new green collar manufacturing jobs.

Visy will relocate its current glass re-manufacturing operations from South Brisbane to Yatala, expected in 2025 (paving the way for the site along the Brisbane River to be used as the International Broadcasting Centre for the 2032 Olympic Games). The new factory will help towards increasing the recycled content in Visy's glass packaging to 70% as well as reducing landfill and decreasing the use of natural resources, explained Mr Pratt. Set to produce circa one billion glass containers a year, the facility will support Queensland's beverage manufacturers.

[www.visy.com.au](http://www.visy.com.au) ●

### SORG marks 150th anniversary with a mission to slash emissions

Furnace maker SORG has long been a vocal supporter of electric melting technology in the glass industry to reduce energy consumption and emissions and to boost efficiency. To mark its 150-year anniversary, the company has announced a 'message of intent' to the glass industry.

MISSION BY SORG is a commitment to develop the next generation of sustainable melting technologies that will slash emissions and help glassmakers to produce net zero glass at volume within the near future. To support this journey, SORG is investing heavily in research and development over the coming decades with the objective

of working alongside glass plants to achieve large scale sustainable melting.

A global pioneer in glass melting and conditioning, SORG has already started paving the way for sustainable melting with the recent launch of its hybrid furnace, the CLEAN Melter, which can reduce energy consumption and carbon emissions by as much as 80%.

[sustainablemelting.sorg.de](http://sustainablemelting.sorg.de) ●

### HFT to upgrade Owens Corning facility in Utah

Specialty engineering contractor HFT has been commissioned to upgrade Owens Corning's 300,000ft<sup>2</sup> fibreglass production plant in Nephi, Utah. The focus of the project is to expand the plant's capabilities to facilitate a broader range of building insulation in the future and include modernisations and upgrades throughout the production line. The project is scheduled for completion in the first half of 2023.



HFT is taking on a significant upgrade of the Owens Corning fibreglass production plant.

Work on the Nephi facility will include furnace, forming, civil/foundations, buildings, offices and utilities, as well as the relocation of production equipment from another Owens Corning facility to the Nephi site. In addition to equipment integration, the project will include structural, mechanical, electrical, and building upgrades.

HFT's experience in both the insulating fibre process line, as well as site/civil, buildings and MEP, mean the company can provide a single-source fully integrated project solution, reducing risk and increasing efficiency.

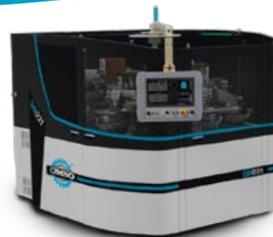
"This partnership with a company of Owens Corning's stature highlights the quality of work HFT is known for throughout the industries we serve," said HFT President and CEO Mark Piedmonte. "The range of plant upgrades we're undertaking is broad. When we finish, Owens Corning's production capabilities at the site will be significantly expanded and modernised."

[www.hft.com](http://www.hft.com) ●

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## AMETEK Land develops refractory deterioration monitoring system

Manufacturer of non-contact temperature measurement solutions AMETEK Land has developed the LWIR-640 monitoring system to survey the exterior of a glass melt tank and identify any hot areas that may indicate refractory damage. The system also gives an early warning of potential glass breakouts.

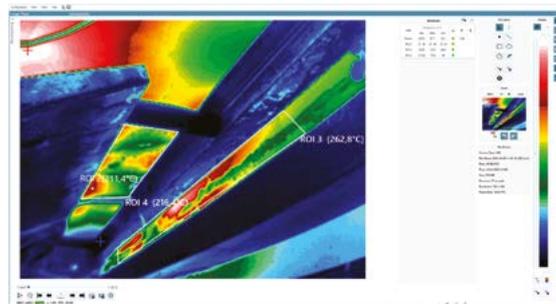
Combining high-resolution radiometric camera technology with data processing and powerful software support, the long-wavelength thermal imager provides temperature measurement from -20 to 1000°C with a choice of different optics and lenses. The LWIR-640 camera allows a continuous view of the entire target at any distance, with thermal data presented in real-time.

Continuous thermal imaging can also be used for accurate interior monitoring using the NIR-B-2K borescope thermal imaging system, establishing temperature trends throughout the furnace. It also detects cooler spots, which may indicate refractory damage.

LWIR-640 and NIR-B-2K thermal imagery can be combined within AMETEK Land's advanced thermal imaging software, IMAGEPro, to show a view into the furnace for thermal distribution and batch coverage functions, as well as monitoring the outside of the furnace for hot spots.

"Around 70% of container glass production costs come from energy, so preventing cracks and lost heat produces significant savings," stated Philippe Kerbois, Global Industry Manager – Glass. "Early detection of glass breakouts enhances plant safety, so using thermal imaging solutions from AMETEK Land ensures fast detection of glass breakouts, allowing for early maintenance, increased safety, and longer lifespan of the tank."

[www.ametek-land.com](http://www.ametek-land.com)



The LWIR-640 delivers detailed thermal images and data, enabling the scheduling of corrective maintenance.



AMETEK Land's NIR-B-2K borescope thermal imaging system can detect cooler spots indicative of possible refractory damage.

### Saint-Gobain makes world's first zero-carbon flat glass

By using 100% recycled glass (cullet) and 100% green energy, produced from biogas and decarbonised electricity, Saint-Gobain has become the first manufacturer in the world to achieve zero-carbon production of flat glass. The pilot operation was implemented for one week in Saint-Gobain's flat glass manufacturing plant in Aniche, northern France.

Mobilising a network of partners developed by Saint-Gobain, focus was placed on circularity, with the use of 100% cullet from end-of-life glass from renovation or demolition sites and from production offcuts. The Group's industrial and research teams were able to adjust the furnace's technical parameters to this dual challenge of operating with 100% recycled material and 100% biogas, while ensuring the right optical quality of the glass.

Demonstrating Saint-Gobain's capacity for innovation throughout the value chain, the achievement reflects the Group's commitment to reach carbon neutrality by 2050.

[www.saint-gobain.com](http://www.saint-gobain.com)



Saint Gobain's float glass production plant in Aniche-Emerchicourt.



# FINALLY!

Finally, you can get back into the spirit of this special world-leading trade fair. Meet everyone in the world of glass face to face. Discuss the latest developments in high-tech material glass with the best in the industry. From energy generation, reducing CO<sub>2</sub>, effective production and processing technologies to innovative glass products and applications. Make the most of the unique accompanying programme with many highlights and talks by leading experts from around the globe. Look into the future of glass today with pioneering exhibits. glasstec – let's go!

#glasstec2022

### Camera inspection specialist launches new website

Dr Günther Inspections has launched a new website featuring the latest information about camera inspection machines for container glass, tableware and specialty glass, as well as an overview of the company's competence in developing customer-specific solutions.

Linda Günther, Commercial Director, commented: "In addition to personal contacts, digital information platforms like company websites and social media platforms such as LinkedIn are becoming more and more important in the sales cycle. Of course, the Günther team also looks forward to welcoming personal visitors to the company headquarters in Meerane, Germany!"

[www.optical-inspections.com](http://www.optical-inspections.com)



Website visitors can browse Dr Günther's latest camera inspection machines.

### France's first electric furnace for luxury bottles

Packaging specialist Groupe Pochet (the Pochet Group) has announced the electrification of a furnace at its Pochet du Courval – Guimerville plant in Northern France. Scheduled to be operational at the end of 2024, the new electric furnace project, supported by the Group's private family shareholding, represents major investments and is part of a global decarbonisation plan to reduce CO<sub>2</sub> emissions and fight against global warming.

The Pochet Group has reduced its CO<sub>2</sub> emissions by 32% and aims to halve its 2014 emissions figures by 2033. By switching to an electric furnace, the company will be able to offer perfume, skincare and make-up brands a considerably carbon-free glass that is less polluting for the planet.

"This electric furnace will be the very first French [facility] dedicated to luxury bottles. It will allow us to drastically reduce our CO<sub>2</sub> emissions by producing a highly carbon-free glass that will guarantee the beauty of tomorrow," said Benoit Marszalek, Pochet du Courval's Director of Operations.

[www.groupe-pochet.fr](http://www.groupe-pochet.fr) ●

### Student travel grants for 83rd GPC

The Glass Manufacturing Industry Council has announced student travel grants for the 83rd Conference on Glass Problems, which is scheduled to take place in Columbus, Ohio, USA on 31 October – 3 November 2022.

As well as receiving complimentary conference registration and a reduced price for lodging, eligible students are awarded \$500 grants to offset travel expenses. GPC supporter Air Products has provided a generous grant towards the programme.

Travel grants are available on a first come, first served basis, provided applicants meet eligibility requirements. For more details, contact Donna Banks: [dbanks@gmic.org](mailto:dbanks@gmic.org)

The Conference on Glass Problems is organised by the Glass Manufacturing Industry Council and Alfred University. It is endorsed by The American Ceramic Society and *Glass Worldwide* is official journal (full conference programme to follow in the September/October issue).

[www.glassproblemsconference.org](http://www.glassproblemsconference.org) ●



Air Products is a supporter of GPC and the student travel grants programme.

### O-I Brockway receives ENERGY STAR certification

On 19 May O-I's Brockway glass manufacturing plant in Pennsylvania, USA, was awarded ENERGY STAR certification for 2022 by the US Environmental Protection Agency (EPA).

Manufacturers must meet strict EPA energy efficiency performance levels to earn the ENERGY STAR certification, which recognises superior energy efficiency and signifies that O-I's Brockway glass manufacturing plant performs in the top 25% of similar facilities across Northern America.

To achieve the certification, O-I Brockway increased energy efficiency by improvinglehr curves, increasing cullet use, and reducing energy during peak periods. Improving furnace energy stability, incorporating forehearth burners and adding energy-efficient motors were also factors. The glass facility earned the ENERGY STAR certification in 2021, also appearing on the EPA's list for '2021 Most Energy Efficient Manufacturing Plants'.

Pennsylvania State Senator Cris Dush, who presented the ENERGY STAR Certificate to O-I's Brockway facility at a press conference in Brockport, Pennsylvania, commented: "O-I Brockway is one of only 93 US manufacturing plants that earned the EPA's ENERGY STAR certification in 2021, and it has demonstrated its dedication to cutting energy waste and becoming a sustainable manufacturing facility with a concern for its environmental footprint and impact. Their commitment is saving energy costs while making sustainable glass packaging products, which is good for the company, consumers and our world."

[www.o-i.com](http://www.o-i.com) ●

*ENERGY STAR is a registered trademark*

### German MP tours HORN headquarters

HORN Glass Industries invited Uli Grötsch, Member of the German Parliament; Marcus Fritsch, Market Councillor, Market Plößberg; and Hans-Dieter Dietl, Chairman of the Local SPD Association to visit the company's site in Plößberg, south-east Germany. The visitors were welcomed by the HORN management team led by CEO Stephan Meindl and taken on an exclusive tour of the company buildings and HORN's manufacturing department.

Project Manager Markus Zant gave a presentation on HORN's field of activity. Mr Meindl then detailed the company's development from furnace maker to a leading supplier of glass melting technology and explained how HORN is now optimally equipped in terms of energy supply, not least through the acquisition of the melting technology business unit of JSJ Jodeit GmbH. The topics of recruiting trainees and the shortage of skilled workers were also addressed.

"We can be proud to find such a solid industry in the market town of Plößberg," stated Mr Fritsch. Mr Grötsch also offered positive feedback, saying that "HORN Glass Industries AG is playing right at the top." He reportedly welcomed the exchange between politics and business and assured those present that the German economy was receiving special attention, especially in the current situation. "The continued existence of the companies and the safeguarding of jobs is priority [number] one," he maintained.

[www.hornglass.com](http://www.hornglass.com) ●



Uli Grötsch (third from right) with Stephan Meindl (second from right) and other members of the HORN management team.

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# People & posts

Do you have a company appointment to tell the world about? Email us at [news@glassworldwide.co.uk](mailto:news@glassworldwide.co.uk)

## O-I Glass board changes



Andres Lopez.

Following its Annual Meeting of Share Owners, O-I Glass announced two retirements from the company's Board of

Directors: Anastasia Kelly, who had served since 2002, and Peter Hellman, who served as a director from 2007.

Additionally, 11 director nominees were elected to serve for one year: David Clark, II (a new member of the Board), Samuel Chapin, Gordon Hardie, John Humphrey, Andres Lopez, Alan Murray, Hari Nair, Joseph Rupp, Catherine Slater, John Walker and Carol Williams.

"On behalf of the Board and everyone at O-I, we thank Peter and Stasia for their many years of dedicated service and extend our gratitude for the impactful and enduring contributions they both have made to O-I," said Andres Lopez, O-I's CEO. "We welcome David to the Board and look forward to working together as we continue the positive transformation of O-I."

Mr Clark is a seasoned executive with nearly 31 years of experience between General Mills, Inc. and Cereal Partners Worldwide S.A., a joint venture between General Mills and Nestle S.A., of which he is the current President and Chief Executive Officer.

O-I.com ●

## René Meuleman to finish glass career at Schneider-Electric



René Meuleman.

Despite reaching retirement age on 5 May, René Meuleman has decided to stay active in the industry for a couple more

years. He was asked by Schneider-Electric to come back to support and shape the landscape of the electrification of the glass industry.

"I will remember the time I

spent at CelSian as one of the highlights of my career," said Mr Meuleman, who joined the company in March 2021 as Business Development (and Customer Support) Director. "It's for sure a great team in Eindhoven. They really make a difference in helping the glass industry be more productive and profitable. CelSian has been, is, and will continue to support the global glass industry by successfully reducing its carbon footprint and much more. [...] Leaving CelSian was very emotional for me but knowing that we stay connected now that I am at Schneider made it easier. Thanks a lot and Godspeed CelSian!"

"We have asked René to come and help us with his deep knowledge of the market, the players and his understanding of the glass process," explained Bas Mutsaers, Global Strategy, Technology and Marketing Lead, Schneider Electric. "René will come to help us create a suitable new business model with the MMM [mining, metals and minerals] segment specific to our glass clients and partners. With this new model, specific architecture design in Power and Process elements and the right partner support we want to devise customer-efficient solutions that we can repeat so that they are cost-efficient for the glass factories and their clients like the construction, consumer packaged goods and the medical world. We want to actively support the growing demand for green glass.

"We believe René has the right mindset and relationships to bring the industry one step closer to full decarbonisation and look forward to working with him," he added.

CelSian CEO Harmen Kielstra commented: "In his short stint at CelSian, René has contributed a lot and we are grateful for this. I'd like to highlight our new Electric Melting Systems training and his support to numerous customers with upgrading their process control, be it with sensors or software. I look forward to continuing working with René as part of the CelSian and Schneider Electric partnership."

[www.celsian.nl](http://www.celsian.nl) / [www.se.com](http://www.se.com) ●

## Usmania Glass appoints managing director



Shahidul Islam.

Kh. Shahidul Islam has been appointed Managing Director & CEO of Usmania Glass Sheet Factory Ltd. (UGSFL), Chattogram, in Bangladesh, India. Prior to joining the company on 3 February, 2022, he was the General Manager (Operation) of Chittagong Urea Fertiliser Limited (CUFL), Rangadia, Chattogram.

As its 27th managing director, Mr Islam expressed his wish for "support and co-operation from all the internal and external stakeholders to accelerate the status of this historical company."

After completing a B.Sc. (Hons) and M.Sc. in Organic Chemistry from the University of Chittagong, Mr Islam started his career at Jamuna Fertiliser Company Limited, Tarakandi, Jamalpur under Bangladesh Chemical Industries Corporation (BCIC) as Assistant Chemist in 1994. He then worked at Jamuna Fertiliser Company Limited (JFCL), Usmania Glass Sheet Factory Limited (UGSFL), Polash Urea Fertiliser Factory Limited (PUFFL) and Chittagong Urea Fertiliser Ltd (CUFL). He is a life member of the Bangladesh Chemical Society.

[www.ugsflbd.com](http://www.ugsflbd.com) ●

## SMI names Senior Vice President of Sustainability and Corporate Affairs



Laura Hennemann.

North American glass recycler Strategic Materials, Inc. (SMI), has appointed Laura Hennemann as Senior Vice President of Sustainability and Corporate Affairs, the first position of its kind for the company.

Ms Hennemann has been with the company for six years, most recently as the VP of marketing and communications. She also sits as an executive board member of the Glass Recycling Foundation. In her new role she will lead the company's sustainability, supply, communications and government affairs departments, and will report to President and CEO Chris Dods.

"Laura has been critical in moving the company forward. With a fresh approach, she is continuously pushing boundaries in terms of what we need to do to better align with the ever-evolving market," said Mr Dods.

"I am honoured to step into this position. I've been passionate about sustainability and mission-driven work since a very young age," said Ms Hennemann. "Although the company is arguably one of the first environmental leaders in the US, the level of importance given to these initiatives today is inspiring."

[www.smi.com](http://www.smi.com) ●

## Vitro appoints National Architectural Manager

American flat glass manufacturer Vitro Architectural Glass has appointed Trevor Hall National Architectural Manager for Southern California, Las Vegas, Arizona, New Mexico and Hawaii.

In this role, Mr Hall will focus on delivering product, technology and service solutions to architects, specification

writers, glazing contractors, façade consultants and Vitro Certified fabricators for the commercial construction market in his territory, which is an especially dynamic region for sustainable and energy-efficient architecture.

"We are very excited to welcome Trevor to our team and are especially impressed by the network of valuable relationships he's built in his region," said Glenn Davis, Vice President, International Sales And Business Development, Vitro Architectural Glass. "Trevor is a talented young salesman who knows how to connect architects and developers to the right materials for their projects and maintain an excellent rapport with his customers, which we know can help turn good designs into great buildings."

Mr Hall holds a Bachelor's degree in Business Administration and Marketing from California State University in Long Beach, California. His previous experience includes serving as an architectural sales representative for Daltile, a

manufacturer of ceramic and porcelain tile, and as a sales representative for MicroMed Inc./Arthrex in southern California.

[www.vitroglazings.com](http://www.vitroglazings.com) ●

### HEGLA mourns company founder



Siegfried Glaser.

Siegfried Glaser 1949 – 2022 was one of the leading founders of HEGLA as well as being the company's longstanding Managing Director and Executive Board Member.

In a joint statement of condolences, the Executive Board, Company Management, Works Council and Employees of HEGLA and LEWAG paid tribute to Mr Glaser: "His drive, commitment and ingenuity [which] played an essential role in the success of the business. Under his leadership, the original workshop business grew into a global, high-tech company.

"His vision and passion for glass and window handicraft laid the long-term foundation for a successful future.

He built a lasting, industry-wide reputation with his tireless work for 'Forum Glastechnik', the Glasstec trade fair and the VDMA, among other things.

"We will always remember Siegfried Glaser with respect and thanks. We send our deepest condolences to his wife and family members."

[www.hegla.com](http://www.hegla.com) ●

### Mascot appoints third generation Director



Raahil Lalvani (top left) with Mohit Lalvani and Mohan Lalvani.

University of Westminster (UK) graduate Raahil Lalvani has been inducted into Mascot Engineering, which represents international equipment and materials suppliers for the Indian and Sri Lankan glass manufacturing industry. Mr Lalvani is the son of Mohit Lalvani who joined Mascot Engineering

in 1992, and the grandson of Mohan Lalvani, who founded the company in 1968 and continues to be its Chairman.

[www.mascot.in](http://www.mascot.in) ●

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### Gerresheimer expands production in India

Pharmaceutical glass manufacturer Gerresheimer has ramped up glass and plastic production capacities at its site in Kosamba, west India. Glass production at the location benefits from a new state-of-the-art and sustainable furnace, and a modern plant has been built to produce high quality plastic containers and closures. The expansion is intended to ensure consistent supply for critical pharma and healthcare facilities supporting increased packaging demand and public health.

Gerresheimer has installed the latest Type I Borosilicate melting furnace for flint and amber glass production using cross-fired oxygen technology and an increased portion of electric heating to melt a new barium-free Type I glass formulation. The furnace is equipped with sensitive inspection equipment to ensure the standard of Gerresheimer's moulded glass production. "With this technology, we will substantially enhance our product quality and address additional market segments," said Stefan Rieder, Global Senior Vice President Commercial Moulded Glass.

[www.gerresheimer.com](http://www.gerresheimer.com)



Gerresheimer management at the celebratory commissioning of new facilities in Kosamba. L-R: Ravikumar Ummadisingu, Khasim Saheb, Stefan Rieder, Andreas Kohl, Volker Rekowski, Jari Tevajarvi and Niels Düring.

### Furnace rebuild underway at Stoelzle Częstochowa

On 9 May the Stoelzle Glass Group's Polish production site in Częstochowa began emptying its flint furnace ready for demolition and rebuild over the next two and a half months. The new furnace will reach a capacity of 480tpd and include the installation of three production lines.

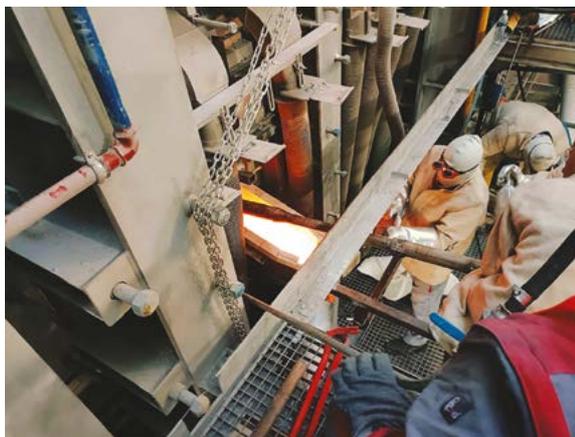
Construction of the new furnace is the third stage of Stoelzle's development strategy. Stage one was opening a new Logistics Centre to help avoid complications in global supply chains and prepare for the implementation of the next stages of the sales and operational strategy. The next step was the launch of a new high-speed spray line in the decoration area. The furnace rebuild and modernisation of associated infrastructure at Częstochowa will be the company's third milestone.

"This investment has been a huge challenge for Stoelzle; above all, the timing of the project, which has been planned in detail over the past two years," said Artur Wołoszyn, CEO of Stoelzle Częstochowa. "Being 140 tonnes larger than the old one, the new furnace will allow more efficient and faster production lines. This investment will help increase the

product portfolio for current customers, as well as to acquire new ones and meet their purchase expectations efficiently."

The Częstochowa glass container furnace will be one of the biggest in Europe and the largest in the entire Stoelzle Glass Group. Contractors for the project are mainly Polish, regional companies such as: TechGlass, Kobnext, Zremb, MAKO, Alpinet, El-Logic, Tech-Met and Forglass.

[www.stoelzle.com](http://www.stoelzle.com)



The Stoelzle Częstochowa furnace is opened to drain the glass prior to rebuild.

### Tiama creates hot end business unit with new director

In order to develop its range of hot end sensors and to reinforce its impact on the market, at the beginning of 2022 inspection and quality control solutions provider Tiama decided to restructure and create a hot end business unit with a new director, Michel Carpentier, coming from the glass field.

The company also doubled its dedicated hot end team and will 'keep developing their skills in this area of expertise to focus even more on customers' needs and problems solving'.

Mr Carpentier, who is also a Tiama board member, has many years of experience as Production manager and Plant manager. "Glass quality has always been a hot end process consequence; that is the reason why we think it is so important to invest all our energy and competences in providing efficient hot end sensors, equipment and software, helping our customers in their daily production life," he commented.

The creation of this new business unit is in line with Tiama's general strategy. All the company's hot end systems are participating in the development of Industry 4.0 and will also provide data to the software developed in the Bottero-Tiama joint venture called GlassFORM.ai launched in March 2022 [see *Glass Worldwide's* coverage in the May/June 2022 issue].

[www.tiama.com](http://www.tiama.com)



Tiama's Hot End Business Unit Director, Michel Carpentier.

### Forglass addresses breaking news in conference for glass producers

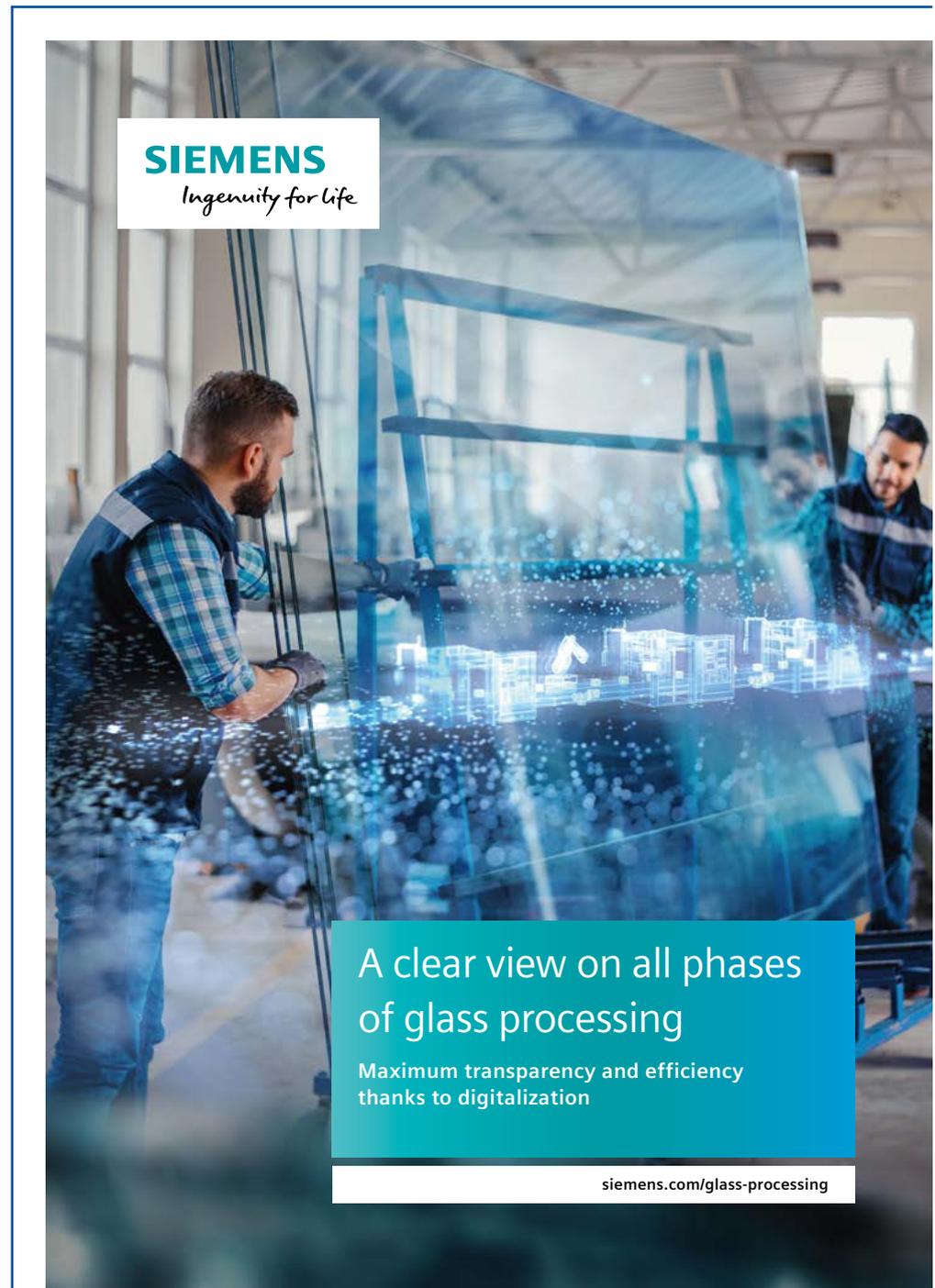
Two critical challenges facing the glass industry 'Alternative energy sources for melting glass' and 'Lowering energy consumption in glass furnaces' were discussed at a conference for glass producers organised and hosted by technology company Forglass on 26-27 April.

Forglass invited its clients and suppliers to look at the options that already exist in terms of alternative fuels for combustion furnaces – an issue that has become particularly urgent in the face of war in Ukraine and the risk of cutting off the supply of gas from Russia. The day wasn't even over when the news of Russia's decision to drastically reduce the delivery of gas to Poland and Bulgaria was announced by the media, and the conversation quickly turned from considering production options to ensuring that furnaces don't freeze when gas supply is suddenly cut off.

The second day of the conference was dedicated to looking at technologies for lowering energy consumption in glass furnaces – an area in which Forglass has already made significant progress via its R&D programmes and the company's own experimental furnace. Invited guests shared their experiences with a variety of solutions, the open dialogue format allowing everyone to be heard.

Following the success of this conference, Forglass is keen to continue the format and encourage more glass producers to participate in upcoming editions.

[www.forglass.eu](http://www.forglass.eu)



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The ASEAN Glass Conference was last staged in Thailand in Hua Hin and Cha-am in October 2016.



# On the Spot... Somporn Temudomsomboon

With *Glass Worldwide* as its official journal, the 44th ASEAN Glass Conference will take place on 31 October – 3 November in Pattaya, Thailand. Somporn Temudomsomboon, Chairman of the Organising Committee, a member of hosting body GMFTI, and CEO of Kabinburi Glass Co., Ltd. (a Bangkok Glass business), outlines plans for the event and prevailing conditions in Thailand’s hollow and flat glass markets.

**GW: How is the container glass sector performing in Thailand?**

After two years of the Covid-19 pandemic, Thailand’s situation is continually improving and the government plans to declare Covid-19 as an endemic by the middle of 2022, allowing people to return to a normal life. Thailand’s container glass market seems to have recovered to an almost normal situation. Container glass producers expect to utilise their production capacity up to 90% this year.

Demand for container glass has increased in the first quarter of 2022. Local manufacturers plan on fulfilling this demand for the next few years by considering new investment or maintenance to address the situation of the pandemic and supply chain disruption caused by the [Russian-Ukraine] war crisis. In summary, we believe the growth of the Thailand container glass market is sustainable. The majority of supply is mainly for the

domestic market but the export market [is also forecast] to increase this year.

**GW: And the tableware sector?**

Thailand has been the leading regional manufacturer and distributor of tableware products for several decades and houses significant glassware, ceramicware and flatware

companies. In the past two decades an increase in demand for tableware has been led by growth in travel and tourism, thus, major regional economies like China and India increased [their own] supply lines to seize business opportunities. More recently, Covid-19 has caused travel restrictions, curbs on ‘wining and dining’ out, and intermittent closure of marketplaces. Consumers therefore started to adopt new ways of living that reduced the overall consumption of traditional tableware, and one-time use ▶



Somporn Temudomsomboon (second from right) with GMFTI and AFGM dignitaries at the 42nd ASEAN Glass Conference in 2018 in Yogyakarta, Indonesia.

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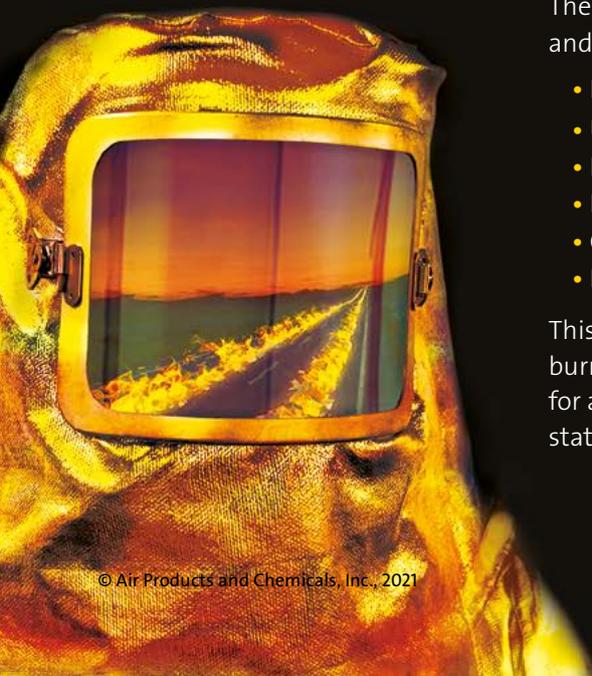
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#### Regional industry association

The ASEAN Federation of Glass Manufacturers (AFGM) is a 45-year-old regional industry association, consisting of the national industry associations from the ASEAN member countries. Current Chairman is Harris Hendraka and Secretary General is Sanjaya Susanto.

Member associations include:

- Indonesia: Indonesia Glass Manufacturers Association (IGMA).
- Malaysia: Glass Manufacturers Association of Malaysia (GMAM).
- Philippines: Glass Manufacturers' Association of the Philippines (GMAPI).
- Thailand: Glass Manufacturers Industry Club, The Federation of Thai Industries (GMFTI).
- Vietnam: Vietnam Glass Association (Vieglass).

In recognition of its leading status in South East Asia, *Glass Worldwide* is exclusive official journal of the AFGM.

Harris Hendraka commented: "The AFGM is blessed to have a lot of supporters, one of the most important being *Glass Worldwide* as the official journal of the AFGM. It provides the AFGM with a platform to inform everyone in the glass industry about every year's event from the preparation phase until the post event, as well as the papers presented during the event. I am sure I speak for everyone in the AFGM that we are very grateful to have this partnership with *Glass Worldwide* throughout the years."

In the AFGM online library of articles on *Glass Worldwide's* website, over 60 articles previously published in the magazine are available for free download, including exclusive reproduction of conference papers, market reports covering Indonesia, Malaysia, Philippines, Thailand and Vietnam and exclusive interviews with leading players in the region such as Asahimas Flat Glass, Asia Brewery, Bangkok Glass, BJC, PT Culletprima Setia, The First National Glassware, Guardian, Kemasindo Ampuh, L Lighting Glass, Muliaglass, Myanmar Golden Eagle, O-I, PT Culletprima Setia, San Miguel, Siam Fiberglass, Siam Glass Industry, Thai Glass Industries and Thai Malaya Glass.

Further information: [www.glassworldwide.co.uk/afgm-articles](http://www.glassworldwide.co.uk/afgm-articles)



disposable tableware gained the market share. During 2020 there was an acute demand reduction of approximately 40% but the market has started to pick up gradually since 2021.

The first half of 2022 as well as the rest of the year and 2023 is expected to have higher demand [for tableware] considering that domestic and international tourism will continue to gain momentum.

The current geopolitical crisis is causing pressure on supply chains due to significantly high energy prices and freight charges, which will deter growth as the cost of raw materials exceeds double digit percentages. While this could work as a barrier for import and export, the domestic players in Thailand will continue to cater to the local demand that will steadily grow in the coming time.

It is important that tableware producers in Thailand continue to stay competitive compared to European and Chinese counterparts in order to hold on to the market share until tourism comes back in full swing. ▶

Visit the AFGM library of articles:  
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Your Dreams, Our Challenge



Somporn Temudomsomboon is Chairman of the 44th ASEAN Glass Conference Organising Committee and CEO of Kabinuri Glass Co., Ltd. (a Bangkok Glass business).

**GW: How is the Thai flat glass industry faring?**

In 2021, the overall construction sector started recovering and increased by 2.5% compared to 2020, mainly supported by public construction that grew 4.7%. Meanwhile private construction was still negative in line with a 1.7% drop in municipal construction permitted areas compared to the previous year. For the automotive sector in 2021, total car production increased by 18.1% compared to 2020, despite a lower total of domestic car sales which decreased by 4.2%. Overall, Thailand's flat glass market grew by only 1.3% compared to 2020, almost the same as the latest economic (GDP) growth of 1.6% forecast by NESDC [Thailand's Office of the National Economic and Social Development Council].

For 2022, Thailand's flat glass market is projected to expand by 3.8%, mainly supported by the automotive sector, which expects to produce 1.80 million units and the private sector, which expects to recover in response to the opening of the country in the second half of 2022 (including glass installation on mega projects).

**GW: Hosted by the Glass Manufacturers Industry Club, The Federation of Thai Industries (GMFTI), what can visitors expect from the 44th ASEAN Glass Conference in Pattaya, eastern Thailand this October?**

We expect the 44th ASEAN Glass Conference will be a productive venue for connecting new networks, new partnerships and updating [attendees] on new technologies. GMFTI proudly

and warmly welcomes our AFGM [ASEAN Federation of Glass Manufacturers] members and guests to join the 44th ASEAN Glass Conference.

**GW: Following an absence since 2019 due to the global Covid pandemic, does this edition of the conference take on particular importance?**

Due to the Covid-19 pandemic which has affected the world since 2020, this conference is going to be held for the first time in three years. It will be a great opportunity for all AFGM members and suppliers to meet, reinforce networks and exchange business and regional information; the technical sessions, business connect sessions and other activities will certainly bring us together to share all this again. Over the past years, there have been changes and adjustments in the glass sector and other industries and it is clear to see that business sustainability is playing an important role. That is why, this year, the conference theme will be 'Glass: Sustainable World Solutions'.

I hope that all participants will be impressed with a warm welcome, fruitful discussions, nice atmosphere and a good memory of the events that we can uniquely provide.

I would like to invite to the conference all those involved in the glass industry, business partners, and anyone who is interested in building a network and creating new business opportunities.

**GW: What more can you tell us about the 'Glass: Sustainable World Solutions' theme?**

The theme was created by my GMFTI colleague Yanattha Ovuthithum of L. Lighting Glass Co., Ltd. who commented: "Undeniably, the environment is a major concern throughout the world. People are looking for ways to make it a better place. Therefore, Zero Waste has been introduced to raise awareness about excessive litter. In this matter, it is an opportunity to communicate that glass products are one of the solutions to reduce waste by reuse and recycling."

**GW: How beneficial will the technical conference presentations be to attendees?**

The AFGM technical sessions are always a good venue for both suppliers and customers to meet and discuss the latest trends, technologies and opportunities in the glass industries. Lately, sustainability has been the most discussed topic for our future. Being one of the few sustainable materials due to its intrinsic recyclability, glass manufacturers are striving for excellence in sustainability. The 44th ASEAN Glass Conference is therefore the ideal venue for attendees to explore the next frontier in glass manufacturing.

**GW: How important will the networking opportunities be during the event?**

For many years, networking between AFGM members has empowered glass manufacturers in the ASEAN region. AFGM conferences have provided opportunities for members and suppliers around the world to meet and discuss business, including recent technological development and global changes. This has enabled us to move forward together as a strong regional player in world glass industry.

**GW: What will the location of Pattaya bring to the conference?**

Pattaya is a modern city located on the eastern Gulf of Thailand coast, just 150km [93 miles] south-east of Bangkok. Internationally-known as a beautiful beach resort, Pattaya is an important tourist destination in ▶



The 44th ASEAN Glass Conference will attract attendees from the container, flat and tableware sectors.

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Somporn Temudomsomboon (centre) believes networking opportunities are one of the great strengths of AFGM conferences.

Thailand and there are superb convention and exhibition centres for hosting conferences, as well as a wide range of accommodation, dining options and nightlife. The main activities in this city include relaxing on the beach, water sports, extreme sports, golf courses, local attractions and numerous restaurants serving fresh seafood and authentic international cuisine.

**GW: What role does the GMFTI play in the glass industry in the ASEAN region?**

The GMFTI was formed by manufacturers of container glass, flat glass, tableware, light bulbs, glass blocks, fibreglass, etc. Covering many kinds of glassmaking in Thailand allows members to continually exchange knowledge and ideas to successfully operate their glass businesses. We serve the domestic glass demand as well as glass exports to international markets.

We have also actively participated in AFGM activities for more than 45 years to build and strengthen our networking to promote the glass business in this region and globally.

**GW: What does it mean to you personally to be Chairman of the 44th AFGM Conference Organising committee?**

It is, of course, a great honour being Chairman of the 44th AFGM Conference Organising committee. Our decision to host the event was made quite late when compared with the past conferences, in order to ensure that attendees are not at risk from the pandemic. This has given us a shorter period of time to make all the arrangements. However, with support from GMFTI members, I am confident that we will run the event as successfully as it has been held for the previous 43 times.

**GW: In your opinion, how important is the overall AFGM organisation in ensuring that the region remains a cost-effective manufacturing hub for glass production?**

AFGM Chairman Harris Hendraka commented: "Throughout the years, the South East Asian region has always been known as one of the major manufacturing hubs for glass production, in flat glass as well as hollow glass, because of its strategic location, abundance of raw materials, the sizeable local markets, competitive energy prices and moderate labour costs. As the leading glass association in the region, the AFGM always strives to ensure that the industry maintains its competitive edges compared to other parts of the world by continuous information and market sharing. The ASEAN Glass Conference is the AFGM's most important [tool] in achieving this goal, as glass producers,

processors and suppliers gather at this annual event [where] we can provide the industry with cost-effective technology sharing through various technical sessions during the conference."

**GW: Glass Worldwide is exclusive official journal of the AFGM. How does this benefit proceedings?**

Glass Worldwide is widely circulated among AFGM members, informing them of activities in the international glass industry. This is beneficial not only for AFGM members but also for readers in the rest of the world to catch up with technical and business movements in global glass. Having Glass Worldwide as the AFGM's partner is, therefore, a great opportunity to promote the AFGM and the businesses of our members to wider audience.

**GW: To summarise, what are the main challenges and opportunities facing glassmakers in Thailand?**

The recovery from Covid-19 has resulted in high inflation and disruption in the supply chain where there is a shortage of some products and

freight costs are high. In addition, the European war crisis is making the price of oil and commodities even higher. The impact of this is a threat to all countries. The glass industry in Thailand is facing the challenge of managing its manufacturing costs in the face of a big increase in the cost of raw material and supplies as well as the prices of natural gas and electricity. In the near future, labour cost increases are also unavoidable. This challenge has indirectly forced us to be competitive in manufacturing costs by all means.

Among the threats, there are also opportunities: e.g. the depreciation of the Thai Baht, which makes the export price higher, and there are glass industry sectors experiencing price and volume gaps, allowing their sales volumes and prices to grow in both the domestic and export markets.

**GW: Finally, are there any recent developments at Bangkok Glass Industry Co., Ltd that you are particularly pleased with?**

Bangkok Glass Group places a great emphasis on business innovation development for not only technical [advances] but also society and the environment, which is what we have always strived for. As part of our successes, we have been continuously developing new glass packaging designs and lightweight glass, which have added value to our products and are environmentally friendly, allowing us to differentiate ourselves from other businesses... following the concept of the 44th ASEAN Glass Conference! ●

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# The glass industry in Indonesia

Indonesia has by far the largest economy in South East Asia. In recent years steady progress has been made in terms of addition of new capacity and total output in both major sub-segments of the glass industry. Sunder Singh presents an overview of the latest developments in the country's production of flat and container glass.

Catered for by two flat and four container glass producers, the Indonesian glass industry is slowly emerging out of the shadows of Covid-19-induced slowdown. There has been a significant capacity increase (actual and on the cards expansion) in the country's flat glass production capacity. In addition to the two established flat glass producers, the entry of South Korean flat glass producer KCC Corporation is expected to make [Indonesia] one of the largest flat glass producers in the South East Asia region by the beginning of 2024.

In the container glass sector, PT Muliaglass and PT Schott Igar Glass have undergone capacity expansion exercises over the last three years. PT Muliaglass increased its installed capacity by nearly 40%, while PT Schott Igar Glass added a new machine to increase its installed capacity of vial production.

At more than 278 million, Indonesia's population is greater than the combined total of inhabitants in Thailand, Malaysia and Vietnam – the three other major economies in the region. A population of this size offers immense opportunities for Indonesia's glass producers. Low per capita consumption in the container glass sector is both a concern and opportunity for the Indonesian container glass industry.

On the economic front, there was good news in the first quarter of the current year for Indonesia. The country's economy grew by 5.01% in the first quarter of 2022 year-on-year (YOY), compared to the same period in 2021, due to the recovery in economic activities, according to Statistics Indonesia (BPS – Badan Pusat Statistik – the Central Bureau of Statistics).

However, in April 2022 the World Bank has lowered its projection for Indonesia's economic growth to 5.1%, from the previous estimate of 5.2% in October 2021, due primarily to the ongoing Russia-Ukraine conflict. In addition to this war, the slowing of Chinese growth and America's

monetary tightening will weigh heavily on this year's growth prospects in all the major economies, including Indonesia.

## Flat glass industry

Flat glass consumption, production and exports from Indonesia have been robust over the last few years. There has been huge domestic consumption in the construction and automotive sub-segments, while a significant part of Indonesia's flat glass output is exported to other ASEAN countries, Australia and India.

Barring 2020, the Indonesian construction sector has been the major driver of float glass demand. The country's construction sector is the third-largest contributor to the economy, providing around 11.6% of GDP in 2021, having grown from 6.5% in 2013 and 9.96% in 2016. This growth was likely triggered by the promotion of infrastructure development by the government under President Joko Widodo, who tripled Indonesian infrastructure project funding in 2015. In 2018, the Ministry of Housing, which is responsible for providing affordable housing for low-



Indonesia's population of more than 278 million offers immense opportunities for the country's glass producers.

income households, received 26% of the infrastructure budget. Around 820,000–920,000 new housing units are needed annually in the country to meet the demand of a growing population. Each year 500,000 units are built by the private sector and 220,000-260,000 are built through public sector initiatives, leaving a deficit of about 160,000–200,000 units per year.

The construction industry in Indonesia is expected to record a growth of 7.2% in real terms in 2022, surpassing



Flat glass consumption in Indonesia has been boosted by the construction and automotive sectors.



pre-pandemic output levels. This would be a notable increase compared to the growth rate of 3.1% recorded in 2021, when large-scale social restrictions and pandemic-related uncertainty deterred new construction investment – which consequently impacted construction progress, according to GlobalData, a leading data and analytics company.

The emergence of Indonesia as a major automotive manufacturing hub has resulted in a steady demand for automotive glass in the country. This sector is expected to play a key role in total flat glass consumption in the coming years. Car sales in 2021 exceeded 850,000 units; a significant increase compared to 2020's sales. The Association of Indonesian Automotive Manufacturers (Gaikindo) predicts car sales in 2022 to reach 900,000 units, supported by a stronger economic recovery. Domestic car sales plunged by more than 51% YOY, to around 532,000 units in 2020 and were far lower than average sales of 1 million units sold in the last four years.

### PT Multiaglass

PT Multiaglass is the second-largest producer of flat and container glass in Indonesia. In March 2020 the company completed expansion of its production facility for container glass and glass blocks. Multiaglass installed a new furnace with 155tpd capacity for container glass and increased its installed capacity of glass blocks by 80tpd, taking installed capacity to 220,825 tonnes per annum (p.a.) for container glass and 96,725 tonnes p.a. for glass blocks. By June 2020, the company's glass block capacity was at 100% while its new container glass furnace was operating at 50% capacity. The remaining 50% capacity was hindered by the Covid-19 induced lockdown, which delayed the arrival of technicians tasked to install a specific machine. In November 2020, the machine was successfully installed.

Commenting in the company's 2021 annual report, Eka Tjandranegara, President Director of Mulia Industrindo, stated, "Net total sales of glass products in 2021 was [...] IDR 4.45 trillion, increasing from IDR 3.73 trillion in 2020. Gross profit grew from IDR 823.83 billion to IDR 1.54 trillion. The gain in gross profit was a result of the efficiency strategy implemented by the company, which consistently managed to stabilise costs of sales at IDR 2.91 billion."

Domestic sales amounted to IDR 3.32 trillion, a sharp increase from IDR 2.73 trillion in 2020. Export sales increased from IDR 1.09 trillion to IDR 1.27 trillion. This accomplishment indicated the property sector revival amidst the ongoing yet subdued Covid-19 pandemic.

Flat glass accounted for total sales of IDR 2.80 trillion, while container glass and glass blocks registered total sales of IDR 1.46 trillion. In 2020, flat glass generated total sales of IDR 2.36 trillion, while container glass and glass blocks sales was IDR 1.25 trillion. Value-added glass accounted for total sales of IDR 175.79 billion as compared to IDR 115.34 billion in 2020.

### New entrant in float glass

Leading South Korean flat glass producer KCC Glass is constructing a new flat glass plant in Indonesia with an installed capacity of 428,000 tonnes p.a., with a completion target of 2024.

Spread over an area of 49 hectares in Batang Industrial Park, Central Java, this is the first overseas venture by the South Korean glassmaker. At a ground-breaking ceremony for the new plant held in May 2021, CEO of KCC Glass Ne-Hwan Kim stated that the Rp 5 trillion investment will be made until 2028.

A press release from KCC Glass announcing the Indonesian plant reads, "The establishment of glass factory in Indonesia is expected to serve as a turning point for KCC Glass to leap into a global glass company. The construction market in Southeast Asia is a lucrative market recording nearly two times higher growth rate than that of the world construction market. KCC Glass will sell ▶



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Company	Location	Installed capacity	Remarks
PT Asahimas	Cikampek (2 lines) and Sidoarjo (2 lines)	720,000 tonnes p.a.	
PT Mulia Glass	Bekasi	620,500 tonnes p.a.	
PT KCC Glass Indonesia	Batang Industrial Park, Central Java	428,000 tonnes p.a.	Under construction
PT Tossa Shakti	Kendal	900tpd	Currently closed (declared bankrupt and put up for auction)

Flat glass producers in Indonesia

architectural float glasses produced from its glass factory in Indonesia to the local and Southeast Asia markets and [will] expand the factory in stages to develop it to an integrated glass cluster for overseas market. Upon commercial start, the new plant would generate flat glass sales of around 150 billion South Korean Won (flat glass basis). In the second stage of operations, KCC will produce coated glass and automotive glass using the flat glass produced at the plant.”

**Overcapacity?**

With both steadily expanding capacity from existing flat glass producers and the entry of South Korea’s KCC Glass, Indonesia will have a huge excess capacity in flat glass segment.

Demand for flat glass in the country is growing steadily, but it will be difficult to absorb the sudden spurt of production output when KCC Glass will commence its commercial production. Overcapacity in the domestic market will lead to pricing pressures in the domestic and export markets.

**PT Asahimas**

PT Asahimas is the largest flat glass producer in Indonesia, operating four float glass lines across a plant in Cikampek (West Java) and two in Sidoarjo. In January 2019 the company closed its 120,000 tonnes p.a. facility in Jakarta and installed a new 210,000 tonnes p.a. capacity furnace in Cikampek. With the commercial start of this new furnace, PT Asahimas’s total flat glass capacity has increased from 630,000 to 720,000 tonnes p.a..

In April 2019, the company commenced operations of a new mirror line and magnetron sputtering coater at the Cikampek plant. The new magnetron coater with AGC-Interpane Europe technology has a total installed capacity of 3.6 million m<sup>2</sup> per year and facilitates products for solar control, high performance and spectrally selective glass up to 6m in size.

PT Asahimas has a licensing agreement with AGC Glass Europe, Belgium under which the company manufactures and sells CVD [chemical vapour deposition]-coated glass products. Under this agreement, the company pays royalties at 1% to 4% of total net sales. This agreement will expire in January 2023.

The new mirror line is a big step forward for AMG as it enhances its product line-up with the launch of Mirox MNGE (Mirox New Generation Ecological Mirrors), manufactured with patented AGC Europe technology.

Manufacturing plant	Location/ Region	Installed capacity	Products
Cikampek	West Java	420,000 tonnes p.a.	Float glass
Cikampek	West Java	3,600,000 m <sup>2</sup>	Coated glass
Cikampek	West Java	5,800,000 m <sup>2</sup> of tempered and laminated glass	Automotive glass
Sidoarjo	East Java	300,000 tonnes p.a.	Float glass

PT Asahimas’s flat glass manufacturing locations

Company	Location	Installed Capacity
PT Mulia Glass	Bekasi	220,825 tonnes p.a.
Owens Illinois Indonesia	Cakung	2.4 million bottles/day or 131,400 tonnes p.a.
PT Iglas Presario	Surabaya	340tpd (will be liquidised by mid 2022)
PT Schott Igar Glass	Bekasi	576 million vials; 775 million pieces of ampoules and 50 million pieces of pipettes per year

Leading container glass producers in Indonesia

With its integrated float glass furnace, magnetron coating line and mirror line, PT Asahimas posits itself as a single source for a wide variety of specialty glass products and solutions across the Asia-Pacific region.

PT Asahimas is also the dominant automotive glass producer and processor in Indonesia. The company’s automotive glass factory in Cikampek produces both tempered safety glass and laminated safety glass. Current total annual capacity is 5.8 million m<sup>2</sup> – equivalent to 1.7 million cars sets.

**Container glass**

The container glass industry in Indonesia has registered modest growth in comparison to the vibrant growth of the flat glass sector during the last few years. Global container glass manufacturer O-I has not increased its installed capacity recently. As previously mentioned, Mulia Glass added a new container glass furnace in early 2020, which become fully operational by the end of 2020. Ailing state-owned company PT Iglas (Presario) received a nod from Indonesian authorities to wind down its operations. An email sent to the company by the author was not answered. The Indonesian government has decided to liquidise PT Iglas by mid 2022.

**PT Schott Igar Glass**

In 2019 pharmaceutical glass producer PT Schott Igar Glass invested US \$100 million in equipment to raise its production capacity for vials by 36 million pieces per year.

“Our vial production capacity has increased from 540 million pieces per year to 576 million pieces per year,” said PT Schott Igar Glass President Director Abelardo Rafael Riveron Mora during the inauguration of the new



Over the last few years container glass production in Indonesia has registered modest growth in comparison to flat glass.

production line. PT Schott Igar Glass has a production capacity of 775 million pieces of ampoules per year, while its installed capacity for dropper pipette products is 50 million pieces per year. The company has a more than 60% share in the domestic pharma glass market. Schott imports about 4,800 tonnes of glass tubing annually for processing into vials and ampules at its Indonesian plant.

**Acknowledgement**

Thanks are extended to the Indonesia Glass Manufacturers Association (IGMA) for its review of this article. ●

**About the author:**

Sunder Singh is a freelance correspondent

**Further information:**

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# Industry stalwart with a vision for the future

In an exclusive interview Graziano Marcovecchio, President of flat glass manufacturer Pilkington Italia S.p.A. and President of Assovetro, Italy's national association of glass industrialists – for which *Glass Worldwide* is the preferred journal, discusses his 34-year career in glass and shares his insight into some of the challenges and objectives driving progress for NSG Pilkington and glassmakers across Italy.



Graziano Marcovecchio, President of Pilkington Italia and Assovetro.

It would later prove phenomenally productive that as a student living and studying in Vasto (central Italy, on the Adriatic coast), Graziano Marcovecchio focused his political economics dissertation on the nearby industrial area of San Salvo. The role of SIV (Societ Italiana Vetro – founded in 1962, then privatised to become Pilkington Italia, before being acquired by the NSG Group in 2006), was afforded a “central chapter in the dissertation,” explains Mr Marcovecchio, “given that this large glass manufacturer, which started up in the 1960s, was crucial in the development of the area.” Upon graduating the young Graziano was perhaps not surprisingly taken on by Pilkington Italia, where he joined the company’s administration, finance and control department. By 1998 he had worked his way up to the position of

Chief Financial Officer and in 2003 he took on the additional role CFO in Spain.

“In 2006 I had my first experience as General Manager in charge of Pilkington’s business in Spain, where I spent 18 months of my life,” recalls Mr Marcovecchio. “Back in Italy, in 2009 I became responsible for Pilkington’s European business with the motor industry. In 2012 I became Country Manager of all Pilkington’s business and became Chairman of Pilkington’s Board, as well as Human Resources Manager for the Group in Southern Europe, positions I still retain.

“Making a career in a company of this size, of this importance, in the place where I was born and where I live, was undoubtedly a positive outcome to all my expectations,” he remarks. ▶



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### Environmental challenges

Being a key part of the European market for industrial glass (architectural, and automotive), Pilkington Italia is subject to the EU's timetable for carbon neutrality as part of its 'Fit for 55' programme, requiring greenhouse gas emissions to be reduced by 55% by 2030 and for Europe to become climate neutral by 2050. "We are a high-impact industry in terms of reducing CO<sub>2</sub> emissions, and one of the eight industries described as 'hard-to-abate', concedes Mr Marcovecchio.

"Significant goals still need to be achieved to secure the future of the industry and to meet the new 2030 and 2050 European decarbonisation targets, but the journey, which started some time ago, is ongoing, with determination," he states.

"The primary glass production process is characteristically energy-intensive and cannot be 100% electrified, for technological reasons associated with the high temperatures required (up to 1,600°C) and the need for high energy density," he continues. "The melting process, starting from raw materials and recycled glass cullet, takes place at temperatures in the region of 1,500–1,600°C and accounts for more than 50% of the overall energy consumption of the entire production process. Nowadays the main energy vector powering this phase of the process is natural gas. The predominant technology, even for large furnaces, is hybrid technology, using an electric booster. In this scenario, in 2021 some companies in the industry launched a project to help reduce glass industry emissions by using hydrogen. Among the initiatives to increase the use of renewable energy sources we should also mention some companies' use of energy from biomass-fuelled thermoelectric power stations, where the fuel is exclusively uncontaminated plant material from the agricultural and forestry sectors, especially waste, as well as that originating from forestry work and riverbed maintenance."

### Carbon neutrality goals

NSG Pilkington has been conducting ongoing research into improving the lifetime energy efficiency of its glass furnaces, reducing CO<sub>2</sub> emissions, SCR for controlling NO<sub>x</sub> emissions, and developing and using plants in accordance with 4.0 technologies,



Three Italian flat glass companies are members of Assovetro as well as a number of flat and hollow glass processors.

which can provide increasingly innovative mechanisation and technological aspects to develop new products that are technologically much more advanced, "as required by the automotive market in particular," notes Mr Marcovecchio.

Approaches to decarbonising the industry currently range from the "more conventional" – such as revising production processes to reduce the need for thermal and electrical energy for the same level of output, and the reuse of production waste/recycled materials – to "more innovative" methods; e.g. using green fuels (hydrogen, biomethane), electrification, and the capture, transport, storage and possible reuse of carbon dioxide from production processes, he surmises.

"Research is something very important in Italy," Mr Marcovecchio underlines. "We are part of a Group network where all research projects are shared worldwide (we have a presence in more than 20 countries). In Italy we have R&D units at San Salvo, where all the focus is on automotive glass, although the share of R&D dedicated to construction is not neglected."

A key indication of the glass industry's commitment to increasing the sustainability of all production activities in the industry is the expenditure and investment made in the Environment and in worker Health and Safety, believes Mr Marcovecchio. "[This is] not only to ensure continuing compliance

with current legislation, but also to specifically and fully implement [the industry's] own continuous improvement objectives." Such investment to improve the safety of production facilities and reduce environmental impact includes: "measures to reduce and optimise water consumption, measures to reduce diffuse emissions and noise, expenditure on certification in the field of HSE, measures to reduce energy consumption and emissions from melting furnaces, as well as measures to protect against spillages."

### Strategic partnership and investment

Two significant investment projects at Pilkington Italia took place between 2018 and 2020, with a major revamp of the automotive glass production facilities at the San Salvo plant and the re-starting of the furnace at Marghera. "These were plans that involved a financial commitment of more than €70 million," says Mr Marcovecchio.

"It is important that our automotive suppliers should also be looking to optimise these technological products," he adds. "The aim of our partnership with them is to increase their loyalty and make a joint search for new industrial solutions for product feasibility."

However, "The pandemic has since led to a general slowdown in investment," notes Mr Marcovecchio, "particularly in the automotive market, which has been severely impacted by recent economic events" [resulting from Russia's attacks on Ukraine].

The main challenge that NSG Pilkington is currently facing in Italy, according to Mr Marcovecchio, centres on alternative energy sources. "I'm referring to the development of hydrogen, to the development of the whole gamut of renewable energies, which will be part of the challenge facing us," he clarifies. "In Italy in particular, it is a particularly hard challenge, bearing in mind the gap that still remains between us and other European countries in energy policies, despite the fact that something has been done. The real challenge will be to have competitive products to fill this yawning gap."

"The confrontation in the world of governing institutions continues and Assovetro [Italy's trade association for ▶



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glass manufacturing and processing companies], our reference point for these joint activities, has the task of promoting what we seek and our willingness to change. The aim is to have products allocated here, to Italy, and to try to convince multi-nationals that our country remains an important place to invest.”

### Assovetro Presidency

Assovetro represents 100% of Italian glass packaging manufacturers and currently three flat glass companies, as well as a number of flat and hollow glass processing companies and some companies in the lighting and display sectors – around 70 companies in all. The Association is a member of Confindustria – the Italian employers’ federation and national chamber of commerce – and has relations and contacts with national authorities on specific topics of interest to the glass industry. “It is the reference within the European industry organisations (FEVE, Glass for Europe, Glass Alliance),” says Mr Marcovecchio. “It is also signatory to the national collective agreement for the industry, which regulates the employment conditions of over 29,000 workers in Italy, not all of whom are employed by member companies.

“Extensive attention is given to the topics of energy, carbonisation, energy transition, the circular economy and environmental issues such as atmospheric emissions and waste management,” continues Mr Marcovecchio. “It monitors and contributes to national and European technical standards, and promotes market research into flat glass and the building industry. It maintains relations with industry trade unions, with which it signs the national collective employment agreement.”

Mr Marcovecchio has a 20-year history with the Association, having held various roles since 2002 when he was Vice-President of Industrial Relations. In 2018 he took office as President of Assovetro for a four-year term (his successor will be elected in July). “Being President of Assovetro is a position that is both prestigious and a great responsibility,” he acknowledges. “There are many issues facing the Association, and representing it in front of national institutions and other economic, political, trade union and social organisations requires a constant presence. As President, I have tried to pass on my vision for the industry,



Assovetro represents 100% of Italian glass packaging manufacturers.

projected into the future, making sure that everyone is aware of their contribution to achieving these objectives.”

### Aims and activities

“Sadly, part of my term of office occurred during the Covid-19 health emergency,” recounts Mr Marcovecchio. “[During] the first phase, particularly, all the Association’s efforts were concentrated on both assisting companies and making the government and the authorities aware of the needs of the industry in such a difficult period. This was also done in conjunction with the trade unions, with which we signed a number of national agreements and sent two jointly-signed open letters to the government.”

Throughout and post-pandemic, Italy’s hollow glass market has proved most robust, being an essential industry linked to the food and pharmaceutical industries; indeed, hollow glass output in Italy in 2021 recorded a significant increase of 6%, reports Mr Marcovecchio. “In general it is a sector that has really experienced no crisis in comparison with the more vulnerable flat glass sector and, especially, automotive glass,” he adds.

More recently the Association’s commitment and concerns have been directed towards the energy price hike which, “after the shock caused by the pandemic, and now the Russia-Ukraine war, is seriously

undermining the competitiveness of the industrial system,” says Mr Marcovecchio. “Beyond the current situation, Assovetro continues to engage with all the issues relating to ecological transition, in view of the new 2030 and 2050 European decarbonisation objectives and the circular economy, and the development of technical regulations for the building industry.”

In terms of co-operation with other hollow and flat glass regional bodies, Assovetro has an “ongoing relationship of useful collaboration” with FEVE (the European Glass Container Association). “Every year we take part in the European communication campaign, achieving good results in terms of performance, contacts, new alliances and partnerships (the one with Legambiente came out of a FEVE campaign),” notes Mr Marcovecchio. “The Friends of Glass platform continues to generate new content and the social channels are very active. The co-operation with Glass For Europe (the trade association for Europe’s flat glass sector) is also beneficial, with regular participation in the various working parties.”

Assovetro is planning a number of activities to support the UN International Year of Glass 2022, including an event on energy transition to be held in Rome at the end of the year. “For the occasion we will create a small glass sculpture to pay homage to our hosts, which will help them remember this year, which coincides with another notable anniversary,” reveals Mr Marcovecchio: “In 2022 we will be celebrating the 75th anniversary of the founding of Assovetro. A double birthday that deserves to be remembered.” ●

#### Further information:

Assovetro, Rome, Italy  
tel: + 39 06 48 71 130  
email: [assovetro@assovetro.it](mailto:assovetro@assovetro.it)  
web: [www.assovetro.it](http://www.assovetro.it)

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San Salvo / Venezia, Italy  
tel: +39 0 41 533 4911  
email: [direzionecommerciale@nsg.com](mailto:direzionecommerciale@nsg.com)  
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# On the Spot... Andrea Lodetti

Since he joined as CEO in 2018, Bormioli Pharma has made good use of Andrea Lodetti's 25 years of cross-industry experience. Having already taken great strides to achieving ambitious sustainability goals, Mr Lodetti illustrated his broad approach to responsible company management in an exclusive *Glass Worldwide* interview.

**GW: How is Bormioli Pharma differentiating itself in the field of pharmaceutical packaging?**

Bormioli Pharma produces primary packaging for pharmaceutical use in glass and plastics, along with a wide range of accessories – such as closures, seals and stoppers. Our offer width is one of our differentiating elements, making us the one-stop shop for the pharma industry, along with a focus on innovation and sustainability, thus ensuring the maximum quality required by our clients.

Innovation is a key element in our differentiation strategy. At Bormioli Pharma, it means developing new packaging solutions together with the client, enabling the establishment of concrete win-win partnerships. On one hand, indeed, the client can trust in 100% tailor-made solutions; on the other hand the packaging manufacturer can count on a product that could be scaled to different formats and sizes, and proposed as an already-industrialised solution to the industry.

**GW: Having doubled the use of sustainable raw materials in production last year compared to 2020, what are the key corporate goals?**

Bormioli Pharma's corporate goals are to boost growth by increasing



The Bormioli Pharma plant in Bergantino has been the subject of significant investment in recent years.

the company's penetration into the parenteral [input of drugs or medications into the human body without involving the digestive system – typically injected directly] drugs packaging segment, together with the consolidation of the presence in the oral drugs market and the increasing adoption of sustainable options by the pharmaceutical industry. This represents a key commitment for the industry, as we set the target to use 50% of sustainable raw materials in production by 2025, with the recent launch of the EcoPositive

label gathering all the packaging solutions featuring a more responsible environmental impact.

We are also actively investigating and working on the creation of a distributed innovation model that is open to contributions from start-ups and incubators and an even stronger focus on end users, thus establishing a link between the pharmaceutical industry and packaging manufacturers. More generally, we are proposing a brand-new approach to pharmaceutical manufacturers that we call 'co-responsibility', that is in our opinion key to better serving patients and health professionals, and to advancing quality, efficiency and resilience in pharma operations.

**GW: How has Bormioli Pharma performed in recent times?**

In 2021, the company produced more than seven billion pieces overall, and reported annual sales of approximately 260 million euros. Just to give you an idea of our glass production, we produce about 1.8 billion pieces per year in our Bergantino plant, while in our German district annual production amounts to more than 200 million pieces.

**GW: What reach does the company have in terms of manufacturing?**

Bormioli Pharma features a production platform across Europe, with 10 plants in three countries – Italy, Germany and France – specialising in the production of primary packaging for pharmaceutical uses and accessories. Our glass production sites are located in North-Eastern Italy (Bergantino, San Vito al Tagliamento), constituting one of the biggest European districts for moulded glass container production. Our glass offering also features industrial excellence [centres] in Germany, with plants in Bad Königshofen and Altenfeld specialising in tubular glass vials. ▶



Bormioli Pharma has doubled the use of sustainable materials in production compared to 2020.



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Bormioli Pharma also has a consistent platform for plastic container production, including plants in Castelguelfo, Rivanazzano (Italy), Hinternah (Germany) and Saint-Sulpice (France), with the latter featuring consistent production of more environmentally-responsible solutions. Finally, Bormioli Pharma has plants specialising in closures and seals, like the recently acquired one in Vasto, Italy, and in high-precision dosage systems, such as the facility in Pavia (Italy).

**GW: What are the latest highlights of investment at the different plants?**

The focus has been on the expansion of our parenteral products range that in the last few years has proved an essential business for the industry, both for vaccine production and to ensure the continuity of therapeutic treatments. That's why we invested a lot in the expansion of our production capacity in tubular glass vials, and to complete our offer with a wide closure and seals range.

Moreover, the company strengthened its presence on oral drops for the nutraceutical and pharmaceutical industry, thanks to a diligent expansion in accessories and high-precision dosage systems.

Additionally, Bormioli Pharma has carried out a general enhancement of its production capacity in its glass manufacturing sites, in order to ensure business continuity and to guarantee deliveries in any operating condition.

**GW: How important is adopting the latest manufacturing technology to achieving the company's goals?**

Investing in the latest manufacturing technologies is key to ensuring the highest quality products, combined with processes standardisation and repeatability, two elements highly required by the pharma industry. Last but not least, it is a way to ensure a more responsible production, thanks to more efficient manufacturing processes.

**GW: How is Bormioli Pharma investing in the workforce?**

Bormioli Pharma currently employs more than 1,400 employees and invests considerably in its human resources, with about 9,000 hours of training split between HSE topics – beyond any industry standard – and technical specialisation, also relying on satisfaction survey initiatives to allocate training programmes properly throughout the company. We value our people and support their long-term



Bormioli Pharma is an international leader in the production of containers for pharmaceutical use.

success by seeking opportunities for them to grow and develop professionally and personally. This reinforces strong succession and ensures we maintain an engaged workforce.

**GW: In your opinion, what are the long-term prospects for glass as a pharmaceutical packaging material and what are the key factors in securing increased market share?**

Glass has been used as a pharma packaging material since the beginning of twentieth century, thanks to its physical and mechanical performances, and I do not truly believe it could be easily replaced in the future. The recent experience of 2020, when glass production went into global shortage due to the Covid-19 pandemic spreading, is an example we do not have to forget.

That said, this does not mean that glass manufacturing processes

will remain the same, with innovation efforts to make its performance better in terms of chemical and mechanical resistance, and to make its manufacturing – currently energy-intensive – more environmentally responsible.

**GW: What was the motivation for Bormioli Pharma to recently join Glass Futures?**

Bormioli Pharma decided to join Glass Futures to provide a more sustainable option to a market need, while ensuring the same performances and quality of 'traditional' glass. Thanks to the partnership signed with the UK-based NGO, Bormioli Pharma will be involved in industrial research into new low-emission methods for glass production, giving the company privileged access and strengthening Bormioli Pharma's standing as a player acting concretely to reduce the impact of the industry on the environment.

**GW: To summarise, what are your hopes and expectations for Bormioli Pharma in the short, medium and long term future?**

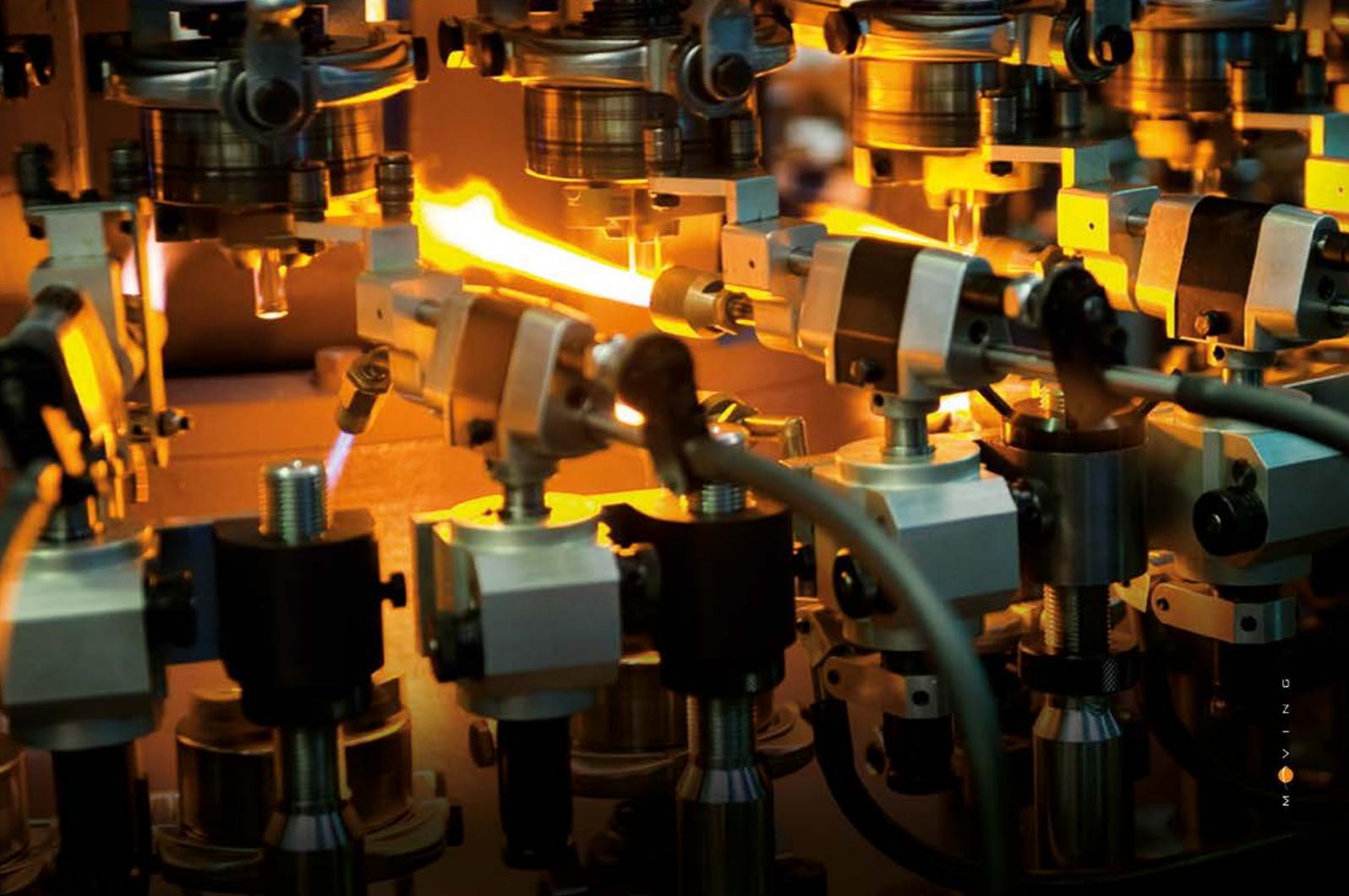
We are focusing on priorities such as the strengthening of the core business and the constant improvement of the service. That said, even though we are mostly focusing on organic growth, we are evaluating the possibility of continuing to grow externally, with possible new acquisitions that might take place in the future. ●

**Further information:**  
Bormioli Pharma S.p.A, Parma, Italy  
tel: +39 0521 362620  
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Specialising in tubular glass vials, the Bad Königshofen production plant in Germany was acquired in 2020.

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## On the Spot... Ahmet Kirman

In an exclusive *Glass Worldwide* interview, Şişecam Chairman and Executive Member of the Board Professor Dr Ahmet Kirman details the construction of the company's first glass packaging facility in Europe and summarises its latest activities in the flat glass, glassware and glass packaging sectors.

**GW: What is the current status and timetable for the construction of the greenfield glass packaging facility in Kaposvár, Hungary?**

We disclosed our investment plans at the beginning of June last year. We held the groundbreaking ceremony for our investment in March this year. We plan to commission our Hungarian glass packaging facility in 2023. It is scheduled to reach its full annual production capacity of 330,000 tons in 2025.

**GW: What is the motivation for Şişecam to construct its first European glass packaging plant?**

Known as a long-term investor in all its markets, Şişecam [has a] holistic and inclusive development vision that supports its stakeholders. The European market accounts for a quarter of the total global glass packaging market. This fact offers

major opportunities for the rapid development of the industry and for the expansion of our company's current production footprint.

**GW: What are the key elements of this investment and what benefits will Şişecam achieve as a result?**

With a €255 million investment, this major facility, which will be our first glass packaging production facility in Europe, will enable us to introduce our quality glass packaging products to the European market more easily.

**GW: What products will be manufactured in Kaposvár and what sectors and regions will the plant serve?**

With its high-quality and high value-added glass packaging products, Şişecam will provide inputs to many different sectors, including the food, alcoholic, and non-alcoholic beverage

segments. The production site will respond to the glass packaging demands of both Hungary and other markets across a wide geography while also boosting Hungary's exports.

**GW: Why was Kaposvár chosen as the location?**

Şişecam operates in the glass packaging industry with 10 production facilities located in four countries and holds market leadership in Turkey, Russia and Georgia. Our total annual production capacity in glass packaging is 2.6 million tons. A sizeable portion of our international sales in glass packaging is directed to the European glass packaging market. Increased awareness of health and hygiene during the pandemic accelerated the demand for glass packaging globally. As a result, Europe offers great potential for further growth of the industry as well as providing ground for the holistic expansion of our company's current production footprint. When we set out to capitalise on these opportunities, we decided to invest in Hungary.

**GW: How supportive has the local Hungarian community been?**

Şişecam's business activities in Hungary started with an acquisition in 2013. Şişecam's positive experience in ►

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the country played a major role in prioritising Hungary when planning a glass packaging production facility investment in Europe. Knowing that Şişecam is a long-term investor committed to developing the region in every geography it operates, the Hungarian community and the government have always been very welcoming to Şişecam.

**GW: How many people will the plant employ?**

This new glass packaging production facility will create direct employment for over 330 employees. Once the facility is commissioned, Şişecam's total employment in Hungary will be approximately 650 people, and a further employment of about 1,000 people via sub-producers is expected. The volume of trade that our production operations will create in the region will also spur the development of many industries along the glass packaging value chain.

**GW: How will the new plant fit into Şişecam's model of sustainable manufacturing?**

Our facility will make a difference not only with the economic value it will create, but also with its environmentally friendly and state-of-the-art technology features. In line with our sustainability

approach, we [positioned] furnace efficiency, carbon footprint, recycling and circular economy at the core of our operations while planning our glass packaging investment in Hungary. The facility will rely on the most advanced applications of glass melting technology. Electrical melting technology will be used to minimise the carbon footprint of the project. This special technology, developed by Şişecam with its superior innovation capability, will also serve our sustainability activities and carbon footprint reduction targets. The facility will be technologically advanced with industry 4.0 applications and the entire operation will be carried out with [a strong focus on] resource efficiency and the protection of natural resources.

**GW: Will any other plants in the group be the subject of major investment in the near future?**

With the goal of being one of the largest three players globally, Şişecam continues to evaluate risks and opportunities in its whole business areas and accelerates investments that create sustainable value for its stakeholders. With this perspective, Şişecam strengthens its position in global markets gradually. Accordingly, Şişecam continues its unabated

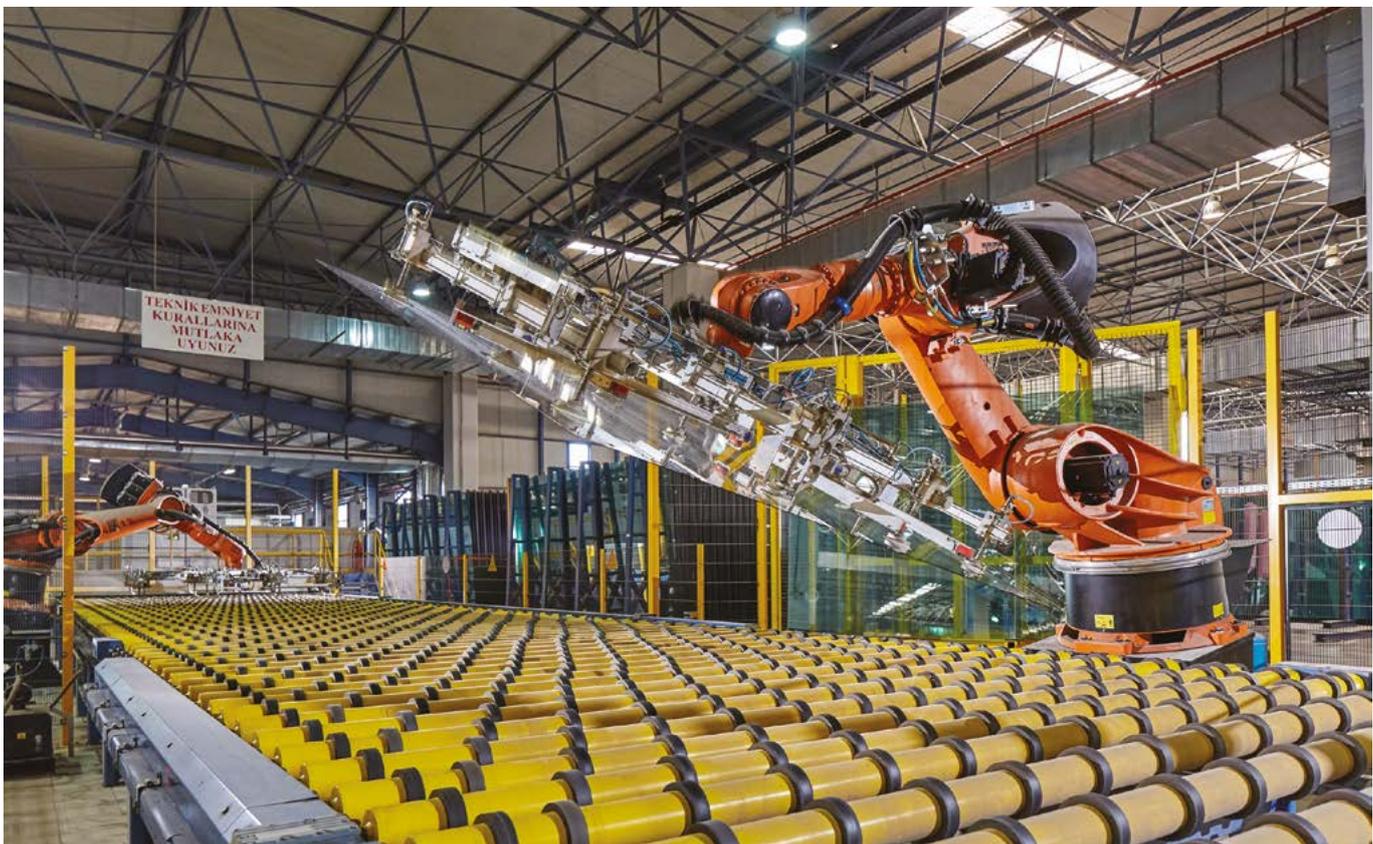
growth with investments in two float lines and one glass packaging furnace in Turkey, its first European glass packaging plant in Hungary and the Pacific and Atlantic Soda investments – the largest Turkish investment ever carried out in the USA.

Şişecam continues to invest decisively in order to create sustainable value for all its stake holders and sectors into which it provides input. In this context, the number of cold repairs, technology harmonisation, acquisitions and new investments Şişecam made in the last five years reaches almost 11 billion TL [Turkish Lira]. We also have big strategic investment plans in the pipeline which we have already announced. Our US Soda investment (US \$4 billion), Hungarian Glass Packaging facility investment (€255 million), Eskişehir Glass Packaging investment (1 billion TL), architectural and automotive glass investments in Turkey (4 billion TL) will lead the way to achieving our targets.

During the uncertainty and out-of-the-ordinary conditions [experienced] globally due to the pandemic, Şişecam announced an investment of over 4 billion TL in two float lines for architectural and automotive glass in order to meet national glass demand and create value in the Turkish economy. With this investment, the current annual flat glass production capacity in Turkey will increase by 30% and reach to 2.6 million tons. As well as meeting the Turkish glass demand, the float line investment will contribute to increasing the exports of Şişecam and glass processing companies.

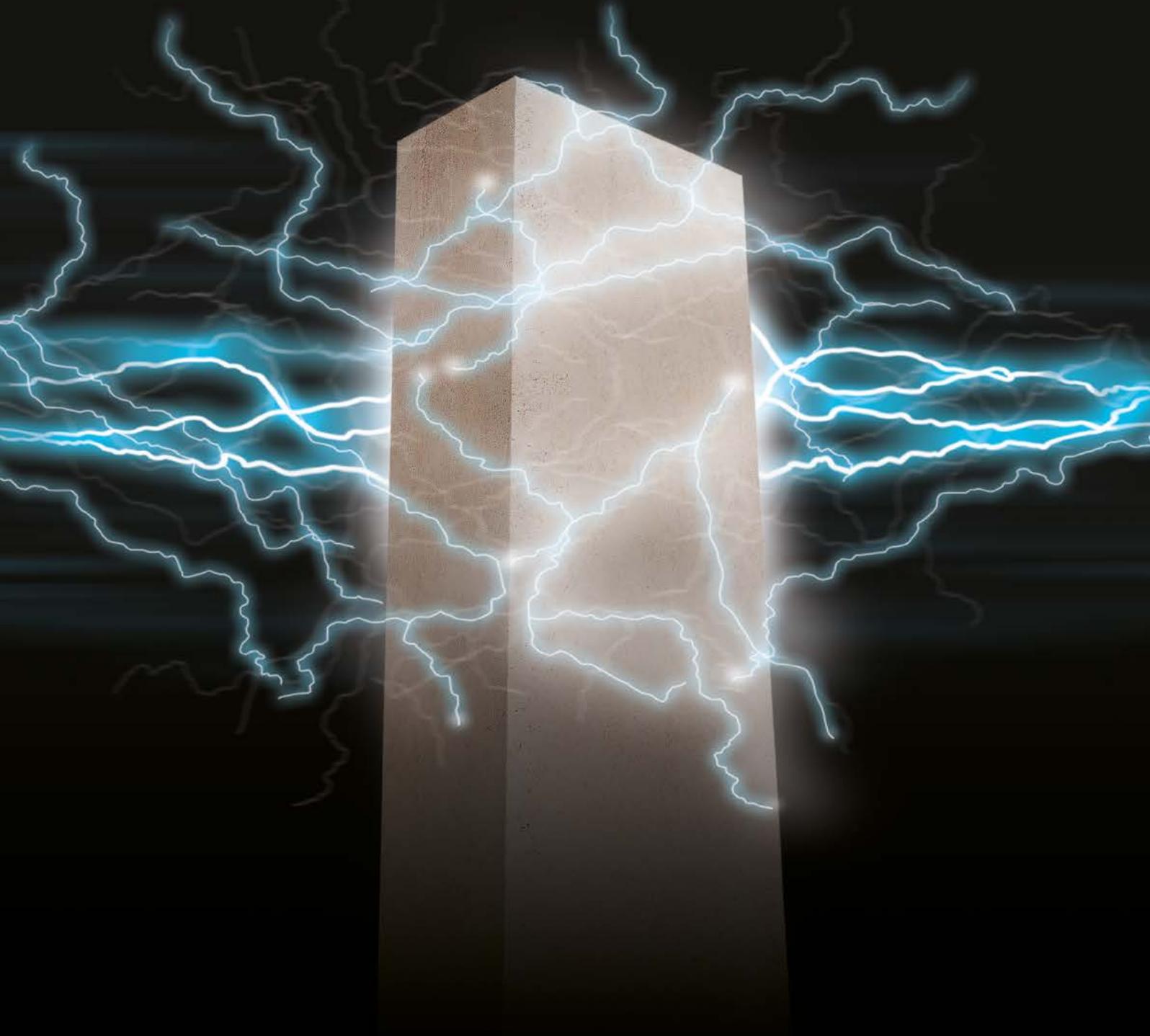
Other than its investments in Turkey, Şişecam continues to invest continuously in various regions of the world. In this context, the first glass packaging production facility investment in Europe will be made in Hungary.

Keeping sustainability at the core of its activities and operations, Şişecam decided to invest in Basalia Technology. This is an important Turkish invention in the bio-economy ▶



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field which converts all kinds of waste into harmless substances. With this investment, Şişecam will play a key role in the global spread of this technology.

Lastly, Şişecam acquired Italian company Refel – one of the world’s leading refractory materials manufacturers – in the first quarter of this year. Refractory materials are used in the construction of glass melting furnaces and are crucial for the timely commissioning of such investments in accordance with planned schedules. With this acquisition, Şişecam aims to eliminate risks related to supply chain disruptions and secure its refractory supply in order to [guarantee that] glass manufacturing investments [remain] on schedule. While caring deeply about the high quality AZS refractory requirements of existing and prospective customers, Şişecam intends to maintain Refel’s competitive position through continuous high-quality service at a global scale. We believe the Refel acquisition will further bolster Şişecam’s strategic position in the global glass industry.

**GW: What were the main features of Şişecam’s latest reported annual performance in an era of global economic geopolitical uncertainties?**

2021 was a year filled with major challenges. However, hopes were raised around the world that the global pandemic might finally subside. Demand recovered accordingly, and production struggled to keep pace with ever-growing demand. Meanwhile, Şişecam successfully concluded another year filled with positive developments and major investments. Şişecam differentiated through digitalisation, transformation and recorded positive results from its merger to carry its 86 years of know-how and experience into the future, making us all proud. The lean and agile structure of ‘One Şişecam’ enabled risks to be effectively managed with a proactive approach and strategic opportunities to be evaluated prudently. Despite the difficulties we faced last year in a challenging economic climate, we took great pride in our successful financial and operational performance. Şişecam achieved successful results well above its targets thanks to these competitive advantages.

Şişecam is a strong global player with its 45 facilities in four continents and 14 countries, and sales to more than 150 countries. Today, we are amongst the two largest glassware, five largest glass packaging and flat glass producers in the world. While we

are amongst the top three players in the field of soda ash, we are the world leader in the field of chromium compounds. We are moving forward in line with our goal of being one of the top three global manufacturers in all the main areas in which we operate.

No matter how volatile the economic atmosphere was, we continued our growth journey throughout the year. Our functional structuring and multidimensional digital investments ranging from production to sales, from logistics to supply chain management, made it possible for us to grow without slowing down. Our cost optimisation practices, effective production planning, healthy supply chain management and successful crisis resolution helped us to achieve a consolidated net profit of 9.2 billion TL in this challenging year. In 2021, we produced 5.6 million tons of glass, 2.3 million tons of soda and 4.5 million tons of industrial raw materials. As of the end of the operating period, we increased our consolidated net sales to 32.1 billion TL and our international sales amounted to 19.2 billion TL. These achievements also reflected positively on our share value. At the end of 2021, the BIST-100 index gained 26%, the BIST -30 index gained 24%, the BIST industrial index gained 45% and the BIST holding index gained 23%. In the same period, Şişecam stocks outperformed the index with 87% gain in value.

Şişecam’s financial performance for the first quarter of 2022 was also above our targets. As of the end of the period, we increased our consolidated net sales to 17 billion TL.

**GW: What can you tell us about the group’s 2022–2030 sustainability strategy?**

Şişecam considers sustainability efforts not as an obligation to be fulfilled in order to comply but rather an important responsibility from the heart. For Şişecam, the dynamic between yesterday, today, and tomorrow is a cause-and-effect relationship. We see the concept of a ‘Sustainable Future’ as a top priority. We aim to expand this vision of building a better world, so that it covers all our stakeholders and processes in the value chain, from raw material supply to production, from sales to our customers.

Şişecam’s sustainability platform ‘CareforNext’ is integrated with the United Nations’ Sustainable Development Goals and undertakes responsibilities along its entire value chain in order to achieve strong global transformation goals boldly.

CareforNext’s mission is to add positive value globally with sustainable products and services that address the changing needs of the planet and societies. Within the scope of this mission, we have determined the targets to be reached in 2030 under three main pillars: ‘Protect the Planet’, ‘Empower Society’ and ‘Transform Life’.

Under ‘Protect the Planet’ pillar, Şişecam defines its goals in minimising the negative impact on nature caused by its activities. We aim to reduce the amount of waste and use our resources in the most efficient way. Within the scope of this pillar, Şişecam’s priority areas are ‘Climate Change’, ‘Water Usage’ and ‘Circular Production’. Our target is to switch to a low-carbon business model by 2030, to increase installed capacity of renewable energy by eightfold, to reduce consumption of clean water by 15%, to reduce the packaging waste by 50%, and to reach 35% of the outer glass cullet used in production.

Şişecam aims to create a positive impact on all its stakeholders. In particular, Şişecam cares [for] local people and communities in its fields of activity, Şişecam employees, users and suppliers of Şişecam products, ▶



Prof. Dr. Ahmet Kirman is the Chairman and Executive Member of the Şişecam Board.



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The groundbreaking ceremony in March in Kaposvár was attended by Hungarian Minister of Foreign Affairs and Trade Péter Szijjártó, Kaposvár MP Attila Gelencsér, Kaposvár Mayor Károly Szita, Şişecam Chairman and Executive Member of The Board Prof. Dr. Ahmet Kirman, and Şişecam CEO Görkem Elverici.

within the scope of the 'Empower Society' sustainability pillar. The priority areas under this pillar were identified as: 'Corporate Heritage', 'Equality, Diversity and Inclusion', 'Talent Acquisition, Development and Management' and 'Occupational Health and Safety'. The objectives include disseminating glass culture on a global scale, reaching 25% female employment by 2030, creating a multi-national workplace environment, establishing a mentorship programme to strengthen the position of women in employment, increasing functional and personal competencies through training, boosting employee engagement rate, and achieving zero work accidents by 2030.

The 'Transform Life' sustainability pillar reveals Şişecam's vision for forward-looking improvement through research, development and digitalisation efforts. Priorities within the scope of the pillar were identified as: 'Sustainability across the Value Chain', 'Digitalised Value Chain', 'Sustainable Products' and 'Value-Added Partnerships'. The objectives on this pillar include committing all suppliers to the Şişecam Supplier Code of Conduct by 2030, strengthening the digital infrastructure and making it traceable, digitising the workplace, boosting the number of sustainable product patents, ensuring a percentage increase in the ratio of value-added products in turnover, implementing the innovative Basalia process, boosting the number of collaborations and partnerships for sustainable innovation.

'Protect,' 'Empower' and 'Transform' are the main pillars identified within the scope of Şişecam's 2022–2030 Sustainability Strategy, while 'Continuous Development' is recognised as a cross-cutting pillar attributed with sustainability targets which are planned to be internally monitored. Areas covered under the cross-cutting pillar are 'Operational Excellence', 'Communication and Awareness' and 'Risk Management'.

**GW: In general, how would you summarise prevailing and future market conditions in the flat glass, glassware, glass packaging and auto glass sectors served by Şişecam?**

The glass industry recorded 5% growth during 2021 with the positive knock-on effects from the easing of pandemic restrictions and higher demand from the sectors to which it

provides input. Let me evaluate each field individually in detail.

**FLAT GLASS:** Despite the fact that 2021 was a difficult year due to the Covid-19 closures and raw material, freight and [computer] chip crises for the white goods sector, exports increased throughout the year with the accumulated demand and loosening of restrictions. The global freight crisis increased the demand for the Turkish market.

Despite the negative impacts on domestic sales such as fluctuations in the exchange rate and increase in raw material prices, production did not decrease. The European white goods sector grew by approximately 7% in 2021 compared to the previous year, and the Turkish white goods sector grew by 22%.

The increase in demand continued exponentially in 2021, and when there was lack of supply in the European market, demands from the Italian and Bulgarian factories were managed within the capacity potential through customer segmentation.

Although many flat glass manufacturers postponed their shutdowns and cold repair decisions in order to meet increasing demand in international markets, these efforts were not enough to meet the demand fully. China's flat glass supply reduction also caused this on a global scale. In 2022, this strong demand is expected to continue along with favourable market conditions. However, it is predicted that supply difficulties will continue until the end of 2022, while sales of high value-added products will maintain an upward trend to a varying extent in all markets.

**GLASSWARE:** The glassware sector was mainly affected by pandemic-related supply chain disruptions at global scale, and subsequently increased cost of raw materials and energy in manufacturing. Many players in the sector changed their supply strategies in the short term, shifting from a just-in-time approach to more 'just-in-case' by holding greater inventory. Abrupt cost increases in various manufacturing factors forced companies to use flexible pricing strategies that limiting contract validity to as little as quarter-based. As risks and costs at every level are increasing, profit margins are decreasing accordingly.

Glassware is expecting the demand to come back to pre-pandemic levels before the end 2023. The hotel and catering industry is

expected to keep its trendsetting, growth-boosting roles. Asia-Pacific regions will continue to lead the demand intensity by increasing both in population and urbanisation. Westernisation of developing countries is expected to have a positive effect on glass consumption through the growing trend of visiting pubs and cafes. Şişecam Glassware considers HoReCa [hotel/restaurant/catering] a strategic market in which success depends on wide range, strong distribution network and corporate strength in technological innovations and design, all of which Şişecam demonstrates. Household consumption habits that rose during the pandemic (e.g. eating and drinking more at home) are expected to continue, which in turn will increase glassware retail business.

In order to reach its targets and lead the industry Şişecam Glassware is looking both to minimise its risks in portfolio management and to get feedback from a wide range of customers.

In the glassware sector rivalry among competitors is high, not only through competition in the market for more shelf space, but also by implementing strategies such as mergers, acquisitions, new product launches and collaborations. Şişecam took advantage of such an opportunity with its acquisition of the glassware manufacturer Pearl of Glass Manufacturing in Egypt in 2017

**GLASS PACKAGING:** The last two years in the shadow of the global pandemic have proved the importance of integrating sustainability into every aspect of our businesses, to be constantly prepared for potential risks, and most importantly to develop a culture of collaboration with all stakeholders. Without a doubt, glass packaging is the best choice for human health and the environment. The rise of health awareness during the pandemic made glass consumers' first choice for packaged food and beverages. Şişecam continued to be a reliable glass packaging supplier in all sectors served, with a broad product range, production flexibility, and effective capacity management in all of its production facilities.

Elevated health awareness and current household consumption habits [for sustainable packaging] are expected to continue in the post-pandemic era, with a positive effect on glass packaging demand. Meanwhile, disruptions in the supply chain and ▶

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Turkey's largest automotive glass producer, Şişecam delivers world-class products to automobile manufacturers nationwide while serving as a supplier for Europe's leading auto manufacturers.

rising energy and input prices are projected to pose further downside risk in the coming year. On the other hand, risks on the demand side will be relatively limited as the use of glass packaging provides input to diverse sectors, such as food, beverage and pharmaceuticals. A decline is expected [regarding] Chinese manufacturers in the USA market, while further growth is projected in Europe. As one of the preferred suppliers in Europe, Şişecam sees a bright outlook in this market.

**AUTOMOTIVE GLASS:** Despite the negative impact of the computer chip crisis on this sector, the automotive industry rebounded after the pandemic. Auto glasses posted a robust growth during 2021. With supply chain constraints, sub-part and energy price increases due to the pandemic and Russia-Ukraine war conditions, OEM and encapsulation demands fell to 70% level and spare capacity.

The post-pandemic era heralds new carline projects with more environmentally friendly vehicles. Şişecam Automotive is receiving more European-based RFQs [requests for quotes] and responds with various new product proposals. With acquisition news on Eastern Europe, Şişecam is keen to expand its business volume.

The main challenge with OEM customers is price adjustment. Automotive glass production costs are mostly based on energy costs. Sub-parts and raw material prices have been affected due to European zone inflation and excessive energy price levels, causing sales prices to be adjusted upward.

By its very nature the automotive industry reacts quickly and improves itself with new, trend-led R&D projects. Value-added concepts in automotive glass will be laminated side lites, AR-HUD [augmented reality; head-up display], HUD-coated windscreens, coated heated glass – and these will get more take-up in car manufacturers' RFQs.

#### **GW: Where is Şişecam at with its holistic Digital Transformation project?**

Şişecam carries out its comprehensive transformation effort with SAP [systems applications and projects] to have a globally integrated digital infrastructure. Our wide-ranging

initiative is ranked as the most complex SAP project worldwide. This effort bolstered Şişecam's 'Managing by Data and Numbers' capability. In addition to big data processing skills, Şişecam's digital transformation gave it the basic tools required to effectively use artificial intelligence analytics and advanced technologies.

In 2021, the development of the corporate data architecture continued, and the creation of Digital Twins started with the Balıkesir Elyaf and Yenişehir flat glass factories, while corporate data warehouse efforts continue. The company engaged in activities to improve data quality, clean and manage master data and create management cockpits. Work for the implementation of a single, integrated data warehouse for Şişecam also continued, and a very important step was taken in the transformation journey: the organisational structure was changed from activity-based to function-based.

After achieving most of its transformational goals in 2021, Şişecam aims to continue its digitisation and Industry 4.0 efforts with a lean management approach in 2022. Managed by a culture in which decisions are made only with supporting figures and data, Şişecam plans to invest in high automation and advanced production technologies with smart factory vision in the coming years as well. Standardisation of operations between facilities is another key objective in 2022.

#### **GW: Across the sectors, do any other recent or impending product launches particularly excite you?**

The transformation of the global economy to achieve net-zero emissions by 2050 would be a universal and significant target. The transition would prevent the build-up of physical climate risks and reduce the odds of initiating the most catastrophic impacts on climate change. By doing so, it would also bring growth opportunities, as decarbonisation creates efficiencies and opens markets for low-emission products and services. Together with us, the whole glass community is aware of the crucial role of glass in that journey and the need for a core competence in achieving energy efficient processes and products.

Şişecam is making a huge contribution to reducing [its] CO<sub>2</sub> footprint with innovative products serving different market requirements. For example, utilising Low-E [low-emissivity] glazing is a sustainable solution for energy-efficient buildings as it decreases thermal radiation, resulting in reduced energy waste. Şişecam puts a great effort into its R&D activities for improving the optical properties and thermal transmittance performance of Low-E coated glasses. To respond to different environmental conditions, aesthetic expectations and performance requirements, we are expanding our wide and versatile Low-E product portfolio, which provides U values down to 1.0 with different colour and transparency options.

Şişecam also supports the renewable energy sector with its innovative products. New generation glass fibre products produced with advanced fibre production technology and reinforced with nanomaterials are offered to wind turbine blade manufacturers. The high-performance single-end roving product, developed as a result of [one of] our long-term R&D projects, will be introduced to the market in the near future.

I would [also] like to share the news that Şişecam's extensive experience in E-glass fibre production will be used to produce fibres from other glass types with high mechanical properties. Şişecam will continue to implement long-term projects that will strengthen its essential position in the glass fibre business area globally. We have already started R&D studies to develop fibre products from different glass compositions. The fibres made ▶



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### FURNACE:

- Assembly of steel structure around furnace
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- Cooling water basins, tanks, manifolds
- Fans, nozzles, valves and ducts for cooling system

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from new generation glasses will be used in the aerospace, automotive and wind energy sectors.

Şişecam's most recent achievement in the renewable energy sector is the Şişecam solar mirror: an ultra-clear high reflectivity glass mirror appropriate for solar tower collectors. This highly qualified and environmentally safe product has a custom design composition that provides a very high chemical and mechanical endurance. The new generation of Şişecam solar mirror products offer good reflection values, a high degree of safety and excellent chemical resistance.

Şişecam's approach to low environmental impact products also extends to the mirror production unit. One of the most recent developments in terms of glass-silvering mirror is the new generation water-based mirror-protecting paint system capable of contributing to the production of high-quality, eco-friendly mirrors with outstanding reflective, safety and chemical resistance properties. Şişecam R&D labs have developed a lead-free, water-based glass-silvering mirror paint with extremely low VOC (volatile organic compounds) emissions and no chemical agents potentially detrimental to health and the environment. This, we believe, is a major innovation for processors and end users.

With our first biotechnology investment in the Basalia project, which we believe will contribute to our 2030 CareforNext strategy, a pilot application is being conducted at the Mersin Soda-Chromium Facility aiming to treat waste water, capture carbon from flue outlets, and achieve zero waste and zero emission gains.

**GW: How is Şişecam prioritising R&D efforts and what are the latest developments at the group's Science, Technology and Design Centre?**

Şişecam's corporate R&D strategies are prioritised by taking into account the global trends in the sector, the socio-economic changes experienced in the world due to the pandemic, and by following scientific and technological developments around the world.

Inevitably, energy-saving and circular economy topics come to fore and Şişecam scientists have included these topics in their main focus. Studies are being made in both production processes and value-added product development projects,

particularly for architecture, automotive and renewable energy sectors, and important practices have been implemented for efficient energy use and a reduced carbon footprint in all processes up to the end consumer. Şişecam scientists are also working on developing novel designs for next-generation glass furnaces in order to minimise and eventually phase out the use of fossil fuels.

In line with our mission to be a company adding value to life, we work to strengthen our position in the field of life sciences. It is a very special situation that glass, as a material touching people in all areas of life, can also be used to heal the human body. Therefore, R&D studies on innovative approaches to the healing effects of glass, especially its use for the destruction of cancer cells in the human body by radiation, gained momentum at Şişecam Science Technology and Design Centre.

There is also no doubt that storing pharmaceutical and medical products in glass packaging has many advantages over other materials. Şişecam is the only manufacturer in Turkey to produce Type 2 and Type 3 pharmaceutical glass packaging according to world standards and is the supplier of many national and international companies. We have recently accelerated R&D activities for the production of Type 1 pharmaceutical glass packaging. Glass belonging to the Type 1 class is crucial to ensure safe and efficient preservation of vaccines, due to its high hydrolytic, chemical and thermal shock resistance properties. The pandemic showed us how urgently glass could be needed for this use.

Automotive is one of the most demanding markets for high-tech products. In recent years, as Şişecam R&D, we have been closely following the latest developments and collaborating with OEMs to create smart solutions such as head-up display and smart glass systems used in automobiles.

In the focus of our sustainability vision, another important area is lightweight designs. Thin glasses, strengthened by chemical strengthening method based on ion-exchange process, create opportunities for significant reduction in the required glass thickness depending on the application. For example, thinner and lighter glasses

reduce the fuel consumption and CO<sub>2</sub> emissions of fossil fuel vehicles and increase the range of electric vehicles in the automotive industry, even reducing the static weight in architectural applications as well. In security applications, chemically strengthened glasses reduce the glass thickness required for relevant security levels and can provide a higher security level with the same glass thickness. All these reductions in thickness and weight lower the amount of raw material needed and the costs. Thus, Şişecam contributes to sustainability holistically with its suppliers and customers.

On the other hand, communication is a fundamental exigency in today's modern world. Technological developments in communication are breaking the boundaries and we all recognised the role of communication during the pandemic. In modern architecture, glass facades are getting more common and should be considered as part of the communication chain. In the 5G communication world, the considered radio frequency range extends far higher than before, including frequency bands from 0.6GHz to 95GHz. At the same time, building regulations demand better heat insulation, which leads to a widespread use of low-emissivity coatings in windows. Although Low-E coated glasses bring energy efficiency and thermal comfort, they cause signal losses in the radio frequency and microwave ▶



Şişecam meets glass packaging needs for a range of industries, including food, beverages, pharmaceuticals and cosmetics.



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bands used in telecommunication. Since this undesirable feature causes a loss of approximately 30–40dB in the 5G frequency band in telecommunication, the signal quality decreases considerably at 0.8GHz and higher frequencies, causing difficulties in communication and data transfer. It is possible to provide permeability to Low-E coated glasses in 5G communication frequency bands with the creation of frequency selective surfaces, which is an effective way to solve the signal attenuation through the coated glass. Similar to conventional analogue filters, frequency selective surfaces can be designed to offer a wide range of filter responses such as being transmissive to 5G communication and visible region but non-transmissive to the Wi-Fi range. As Şişecam R&D, we are co-operating with start-ups to develop such sophisticated designs on coated glass.

In summary, aligned with Şişecam's global strategy, R&D contributes to continuous expansion of new product portfolio, new, efficient and feasible technology developments and the identification of new business areas. Furthermore, in order to extend Şişecam's R&D capabilities, establishing an Incubation Centre in Turkey and a global R&D Branch is our next plan. With the incubation centre it will be possible to produce and sell high-tech, niche, value-added glass products such as special optical glasses, laser glasses, chalcogenide glasses and glass ceramics which are widely used in military and civilian applications and will increase our new product development competencies. Furthermore, the global R&D branch will bring the opportunity to establish an R&D network and an increased reputation within the global Materials Science community. Also, global collaborations with research institutes will allow Şişecam to use more advanced analysis techniques.

**GW: Following the appointment last year of Mustafa Görkem Elverici as CEO, how well-positioned is the management structure to oversee the group's objectives?**

Having its long-term goals and strategy set, Şişecam has a very clear roadmap. The company has always been managed by strategic plans and talented and visionary leaders. The new organisational structure of Şişecam, which is based on a function-based operational model, has been very successful so far. Since we more than achieved our targets for last year and the first quarter of the current year, we are more self-confident than ever. Şişecam, with the exemplary leadership of Mr Elverici and a most experienced management team, a talented work force, strong know-how, digital capabilities and wide global footprint aims to double its size in the next five years.

**GW: How is Şişecam supporting the UN International Year of Glass 2022?**

Glass has been supporting the economic, cultural and functional development of humanity for thousands of years and Şişecam has full faith that glass will contribute further to humanity at an increasing pace. The ever-developing glass industry and the ever-expanding usage areas of glass offer excellent opportunities for all of us on our journey to a sustainable future in harmony with nature. In order to better explain these opportunities and most importantly raise awareness among economic and social decision-makers, Şişecam played a leading role during the declaration process of 2022 as the 'Year of Glass' by the United Nations [see *Glass Worldwide* May/June 2022, p.38].

The glass industry aims to leave a better planet for future generations by producing solutions that protect the

environment and conserve energy in combating climate change. The International Year of Glass is crucial to underscore the role of the glass industry on a global scale. Şişecam, as a leading global player considers the International Year of Glass a major opportunity to create public awareness about glass and its key role into the future.

Ex-President of the International Commission on Glass Prof. Alicia Duran was one of the keynote speakers at the plenary session of Şişecam Glass Symposium last year and gave a speech about The United Nations International Year of Glass-2022. This year, I personally attended the opening ceremony of IYOG in Geneva, to make the closing speech. Şişecam will contribute to raising awareness with activities throughout the year and we are proudly taking the responsibility to co-ordinate many events in the region with our stakeholders.

**GW: How successful was the online 36th Şişecam Glass Symposium last November and is the next physical event already planned?**

Şişecam organised the 36th Şişecam Glass Symposium with the theme 'Glass is the Future' online last November and attracted 608 participants from 40 different countries. The world's leading glass industry representatives and scientists discussed the future of the glass industry, sustainability, and new technologies during the symposium.

Since this year is the 'International Year of Glass' we will use the symposium to increase awareness around this theme and call the 37th Şişecam International Glass Conference 'Inspiration for Tomorrow: Celebrating International Year of Glass'. The event will be a hybrid one and will physically be held in Istanbul, Turkey on November 17–18, 2022. We believe that the Conference will be an excellent opportunity to celebrate the International Year of Glass 2022 as well as to update and discuss the industry's latest developments on a global scale.

**GW: To summarise, what are the main opportunities and challenges facing the business in the next 12 months?**

In 2022 we expect to see an increase in our sales in parallel with the increasing demand. Despite the

effects of Covid variants and unstable exchange rate environment, we expect our exports to remain high. As a signal of our trust in our future performance and Turkey's economic strength, we have planned an intensive investment period.

The glass sector is a strategic industry with employment opportunities, production volume and exports potential. In the upcoming five years, we expect the market to grow around 5–6% CAGR and to reach approximately €200 billion. More importantly, with constant innovation and new product lines, glass creates long term value and contributes to a sustainable future.

The main challenges for the industry will be geopolitical uncertainties such as the war between Russia and Ukraine, global inflation and supply chain-related issues. Prospects for the global economy have darkened since the outbreak of war in Ukraine on 24 February, prompting WTO economists to reassess their projections for world trade over the next two years. World merchandise trade volume is expected to grow 3.0% in 2022 (down from 4.7% previously) and 3.4% in 2023, but these figures may be subject to revision due to uncertainties. We have been conducting effective crisis management [across all] functions within the organisation. We manage production and procurement plans, customer relations, agreements and investment plans carefully. Moreover, since the main portion of our production in Russia is to meet the Russian market demand, the negative effect of the crisis in our sales operations has remained limited. We have not faced significant revenue loss until now.

In terms of supply chain, 2022 will be a year of pivoting for companies seeking more reliable means of procurement. Whether that means reshoring, diversified suppliers or new carrier agreements will depend on the nature of that specific supply chain and the intent of the company. Leaders need to be decisive in recognising the need for change and be willing to break down and rebuild partnerships that are no longer reliable. ●

**Further information:**

Şişecam Headquarters, Tuzla/  
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A Stoelzle Oberglas employee at the new tandem IS machine.

## Revitalising rebuild for a prestige product

Established in 1871, the Stoelzle Oberglas facility in Köflach, Austria is today the headquarters of the Stoelzle Glass Group and has recently been upgraded with a new furnace. Georg Feith, CEO of the Stoelzle Glass Group speaks exclusively to *Glass Worldwide* about strategic investment, sustainability goals and the success of the company's Flint Prestige Recycling glass.



Georg Feith, CEO of Stoelzle Glass Group.

The history of the Stoelzle Glassworks dates back to 1805, when the first Stölzle glass factory (with the Austrian 'ö' still in the name) was founded in Bärnbach, in southern Austria. In 1871, a glass factory in Köflach (four miles away) was set up, initially dedicated to the production of flat glass. In the early 1880s this plant started to manufacture glass bottles, which soon became the focus of production. At that time, the Köflach team consisted of 18 glassmakers and 72 assisting workers. Raw materials such as quartz sand and lime were available nearby and the furnaces were heated with coal from regional mining.

In the 20th century the glass factory brought in semi- and fully-automated glass forming machines. The factory expanded and a decoration facility was added, offering sandblasting, frosting, screen printing and lacquering. In 1978 the two glass factories in Bärnbach and Köflach merged, becoming Stölzle Oberglas AG, which was then taken over by Dr. Cornelius Grupp in 1987, and laid the

foundation of today's Stoelzle Glass Group. Since then the Group has expanded to become a global glass network, comprising seven production sites (six European and one US plant), three decoration facilities and several sales companies.

### Products offered

Today, the Stoelzle Oberglas production site in Köflach is the headquarters of the Stoelzle Glass Group and is certified according to ISO 9001:2015, ISO 15378 (GMP) and BRC GS Packaging & Packaging Materials. "Stoelzle delivers its products to customers worldwide, reaching an export quota of more than ►

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All Glass robot palletiser aids quality control at the Köflach plant.

90%,” says Georg Feith, CEO of the Stoezle Glass Group.

The Köflach facility produces a full range of Type 3 pharmsglass (e.g. dropper bottles, syrup bottles, pill bottles, ointment jars, in amber and flint) as well as Type 2 injection and infusion vials. Besides high quality pharmaceutical products, the plant also manufactures glass packaging for food and beverages: food jars, wide and narrow neck bottles, mini spirits bottles and spice jars, as well as an extensive range of infinity jars – “glass jars that have a straight or slightly conical shape, allowing the entire contents to be dropped,” explains Mr Feith. “Our range includes infinity jars from 120ml to 545ml. These jars can be used universally and are ideal as jam jars, preserve jars, honey jars, dessert jars or yogurt jars.”

Mr Feith is particularly pleased with an innovative process that Stoezle Pharma has developed for the production of Type 2 Glass. The R&D team re-thought the treatment process by using liquid dosing for the inner surface treatment: “The so-called EcoSecur Type 2 vials are convincing in terms of safety, process stability, quality and environment,” he expounds. “This innovative technique enables reliable and precise dosing tailored to each bottle size, from the smallest 6ml vials to much bigger. With EcoSecur injection and infusion vials Stoezle Pharma offers Type 2 glass for parenteral [injected drugs or medications] and non-parenteral applications.”

### Workforce and local community

There are currently approximately 490 employees at the Köflach plant. The site has its own training centre with sections dedicated to mechatronics, electrical engineering and mechanical engineering. “Our technical apprentices and (new) employees attend specific trainings and refresher courses on real hot-end IS machines and cold-end inspection machines,” says Mr Feith. “We are proud that we have many employees, where the passion for glass has been passed on from parents to children. Parents have been with us for more than 30 years for example, and the daughters/sons have started to work at Stoezle as apprentices...”

All Stoezle employees have access to an enviable ‘health/well-being programme’ that includes free gym training with sports instructors, massages, shiatsu treatments – “benefits aimed to improve work-life balance,

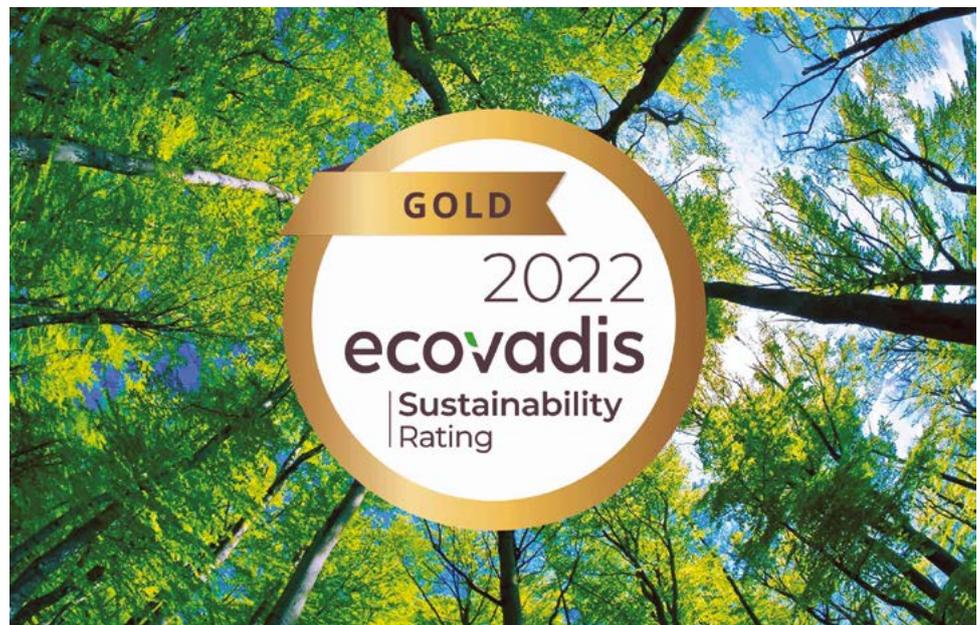
health and well-being,” underlines Mr Feith.

“The Western Styria region [a state in the southeast of Austria] has been characterised economically by coal and glass for a very long time,” observes Mr Feith. “The coal mines were closed many years ago, but the glass industry is still one of the largest employers. Many people from the region have one or more family members who have worked in glass industry and the Stoezle team comprises many families/generations, too.

“Stoezle does a lot of sponsoring, mainly focused on environmental issues, culture, sports and charity initiatives,” he continues. “We are the main sponsor of the local handball and soccer youth teams, and support also other sports associations. We have close co-operation with schools and universities, offering work during the summer holidays, for example, but also mentoring master theses for technical students. Last year we started a co-operation with a local beekeeper, financing three bee populations and obtaining hopefully a lot of Stoezle honey, which we will pass on to employees and customers. This initiative is a contribution to protect and promote biodiversity and the pollination via bees in our region.”

### Recent investment

To make the Köflach production site more efficient and more sustainable in terms of energy efficiency and CO<sub>2</sub> emissions, last year Stoezle Glass Group invested €22 million in the rebuild and expansion of its flint glass ▶



Stoezle was awarded EcoVadis Gold Status in 2022, the second year in a row.

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The Stoezle Oberglas production facility in Köflach, Austria.

furnace. The project was completed in early 2022 and the facility now reaches a daily capacity of around 270tpd. Featuring advanced melting technology from HORN, the new furnace reduces the amount of energy used in the melting process by an estimated 13% per ton of glass, while improved E-boosting allows more green electricity to be used, reducing consumption of natural gas.

To ensure that Stoezle Oberglas products are of the highest quality the Group also invested in a 12-section triple-gob tandem IS machine from Emhart, 10 Bottero IS section renewals on two lines, a new feeder, various cold end inspection machines and an All Glass dual packaging robotic palletiser. Suppliers of equipment and technology were chosen for their “eco-friendly approach and reliability in quality and delivery,” notes Mr Feith.

The Köflach plant’s manufacturing capabilities now extends to 11 production lines, two furnaces (flint and amber), with the flexibility to switch one from amber to flint as demand requires.

“Demolition of the furnace started on 12 October 2021 by emptying the furnace,” Mr Feith reports. “First glass was produced again on 12 December 2021; with all lines in operation mid January. We were very lucky to complete the whole furnace rebuild in the scheduled time as we suffered from reduced personnel capacity due to the pandemic,” he confides. “Our team did a great job, being very flexible.”

Fortunately, being part of a larger Group with manufacturing plants in other countries affords Stoezle Oberglas the advantage of having “back-up plants” during significant construction programmes. “In the

case of furnace renewals or other issues, the production and supply of our products will be guaranteed,” confirms Mr Feith. Pre-planning ahead of scheduled furnace rebuilds ensures that stock levels never fall. “We take care to manufacture in advance larger stock of the items needed by our customers in order to compensate for times of low production,” he explains.

### Sustainability

Stoezle Oberglas’ new batch formulas based on the use of PCR glass and secondary raw materials have been examined and tested at the company’s in-house glass lab. The results show that Stoezle’s ‘Flint Prestige Recycling glass’ will reduce CO<sub>2</sub> emissions at the Köflach plant by 16%, along with a 4% decrease in energy consumption, without compromising on glass quality or colour.

“We are working on new batch formulas which will make our glass even more sustainable,” explains Mr Feith. “Our research focuses on substitution of primary raw materials by CO<sub>2</sub>-free secondary raw materials such as industrial soda, slag sand or ash from biomass. The new formulas are tested in our in-house glass lab. Our main target is to create CO<sub>2</sub>- and energy-saving formulas, whilst maintaining our high glass quality. Taking advantage of our dedicated R&D team and the in-house glass lab allows fast progress and reliable results.”

Areas of development include process and energy optimisation; green electricity and alternative fuels; and use of PCR cullet and CO<sub>2</sub>-free and alternative raw materials. Stoezle pioneers eco-friendly decoration with 100% heavy metal-free colours, the

use of recycled ink (screenprinting ink made from old tyres), and its Quali Glass Coat technique, which saves 77% CO<sub>2</sub> compared to liquid painting. Process and energy data management software has been implemented and energy is conserved by employing a batch preheater, recovering heat from furnace waste gas and installing photovoltaic [solar power] panels on the roofs of its buildings. In addition, the Group is conducting research on green fuels such as hydrogen, biogas, and syngas from waste gasification.

Stoezle’s main target is to reduce CO<sub>2</sub> emissions by 50% by 2030 and to reach climate neutrality by 2050. Focus on this objective and reducing energy consumption has been set at a Group level, with an emphasis on developing and re-thinking processes and techniques not only in production but also in the decoration of high quality packaging glass. “We have a defined CSR strategy to reach this goal,” including “being transparent in our communication,” says Mr Feith. Accordingly the Group is active on CSR platforms and “working closely with FEVE on the Close the Glass Loop project” to increase the quantity and quality of recycled glass available to the industry. In recognition of its commitments to sustainability Stoezle achieved EcoVadis Gold Status in 2022 – “the second year in a row,” notes a proud Mr Feith: “These internationally renowned awards reflect our efforts in the field of CSR and prove that measures and initiatives are working to constantly improve our CSR credentials.”

With the promising new batch formulas at Stoezle Oberglas and a furnace renewal planned for Stoezle Czestochowa in Poland in mid 2022, things are already looking promising for a hat-trick next year. ●



The bottle turner (inspection machine) at the cold end in Köflach.

### Further information:

Stoezle Glass Group, Köflach, Austria  
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# Optimising energy in electric boosting and melting systems

Mikael Le Guern from Eurotherm explains how installing power boxes close to furnace electrodes can help glassmakers to benefit from improved energy efficiency and reduced costs compared to traditional power system designs for melting.



Mikael Le Guern, Global Glass Business Development Manager at Eurotherm.

The path towards decarbonisation of the glass industry with the objective to attain carbon neutrality by 2050 is upon us. It is a trend that we saw coming a few years ago and we have been busy preparing for this transformation. Granted, this is primarily driven by European environmental policies and requirements, at least for now. On the opposite end of the spectrum, the USA – with lower gas costs and fewer incentives or societal pressures – has much less focus on this issue. However, many of our customers at Schneider Electric do have ambitious global corporate sustainability objectives to reduce their CO<sub>2</sub> emissions by dates stretching from 2030 to 2050. As a result, we see more and more requirements to significantly increase electrical boosting for facilities all over the world. Indeed, for large glass production companies, their total CO<sub>2</sub> emissions are the aggregate emissions of all their plants and facilities globally. With furnace campaigns lasting from a few years up to 10–18 years before the next rebuild/cold repair and with only a few upcoming greenfield projects, the opportunities for these companies to implement carbon-reducing solutions are limited between now and 2050. So, whenever a repair is due now,

many glass companies are already considering their options to reduce greenhouse gas (GHG) emissions, particularly by increasing electrical boosting.

The other trend we can see happening in the marketplace is that all types of glass producers are looking into these issues. Going back a few years, we started implementing boosting systems on container glass and pharmaceutical glass furnaces. The size of those furnaces and type of glass made it possible to implement small to medium size electrical boosting (2–5MW). Now, not only is the required size of electrical boosting systems growing from a few MW to over 10MW and beyond, but this trend is happening across most types of glass production, including float glass furnaces. I must say that it is quite striking to see the project sizes of these electrical boosting systems compared to just a few years ago.

## A proven technology

Currently, it is recognised that electrical melting and boosting are not the only technologies available to reduce GHG emissions. The other two main energy options being investigated by the industry are hydrogen and biofuel. There is already plenty of research on those and there are some very promising successful tests and industrial implementations on glass furnaces. Nevertheless, in terms on technology readiness, infrastructure, production capacity and ramp-up, hydrogen and biofuels are unlikely to be suitable short term or even midterm solutions for the glass

industry's energy and CO<sub>2</sub> challenges. Therefore, I strongly believe that the future systems will be based on a hybrid mix of solutions varying by regions and industries.

The benefit of electrical melting is that it is not only a proven technology, it is already available today for large scale glass furnaces in many regions all over the world. As such, we expect that by 2030–2040, electrical boosting, or shall we say melting, will represent more than 50% of the total melting energy for the majority of new and cold repaired glass furnaces, including for float glass. Indeed, for container glass, the share of electricity will in some cases be much higher, reaching from 80% to a full 100%. Undoubtedly, adoption will be uneven across companies, regions and countries: starting first in Europe followed by Asia Pacific.

## Power boxes

Now if we speak specifically about electrical boosting and melting, there are obviously different ways to implement this. A traditional solution ▶



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using large variable step-up/step-down transformers has been a very robust technique used for a long time, but we recognised a few years ago that it lacks flexibility. After carefully considering the design, we developed a new Eurotherm power solution in the form of power boxes (power skids), which we have been implementing successfully for over a decade. These power boxes bring new versatility and efficiency with much shorter lead-times and finer granularity of control, as well as easier installation (cables instead of large busbars). With power skids located close to the electrodes (or even underneath the furnace in a few instances, when possible), this solution keeps the voltage as high as possible for as long as possible. The main benefit is that it significantly reduces the line current and the corresponding heat losses. Plus, instead of very expensive copper busbars running over 20–40m or more to the electrodes, it is possible to use much smaller cables.

**Energy savings**

With a variable transformer design, there is usually a significant difference between the kW's needed to melt the glass and the kVA rating of the transformer, meaning that type of system must be oversized, typically by up to 50% – which increases cost. For example, for a 2MW at 200V system with three single boosting zones, the system would typically be designed at 3MVA (three 1MVA zones). For only 2000kW power needed to melt the glass, such a system instead needs to be designed at typically a minimum of 3000kVA, therefore with three

5000A at 200V busbar systems to the electrodes. That's a lot of amps and a lot of copper. With the Eurotherm power box solution, an alternative design using a much more standard medium voltage transformer with a secondary voltage between 400 and 480V is possible. Power skids can be placed as close as possible to the electrodes to control and step down the voltage to the desired operating range. Because of the higher voltage and a more efficient system, in this example, the line current from the medium voltage transformer to the three power skids would be less than 2000A, 2.5 times fewer amps than in the traditional design. The high amperage is only after the power skids and therefore on much shorter cable distances to the electrodes. The power skids include power controllers operating in automatic load tap changer mode (digital technology with no mechanical moving parts). As such it provides control of power on the full operating voltage range at very high power factor and without the traditional mechanical wear.

Other concerns to pay attention to when expanding electrical boosting systems are the hazards and costs of traditional oil filled boosting transformers. These can require the installation of expensive sprinkler systems and the construction of reinforced firewalls, plus the associated costly insurance. With the Eurotherm power skids solution, most of the time we can provide a combination of dry and water-cooled options instead, to alleviate those concerns.

Not only do we believe that electrical boosting and melting will play



Eurotherm's power supply solutions are based on the EPower SCR power controller.

a large role in the decarbonisation of the glass industry, but we also believe that our power skid design methodology – close to the electrodes, is the better way to go. ●

**About the author:**

Mikael Le Guern is Global Glass Business Development Manager at Eurotherm

**Further information:**

Eurotherm Ltd, Worthing, West Sussex, UK  
 tel: +44 1903 268500  
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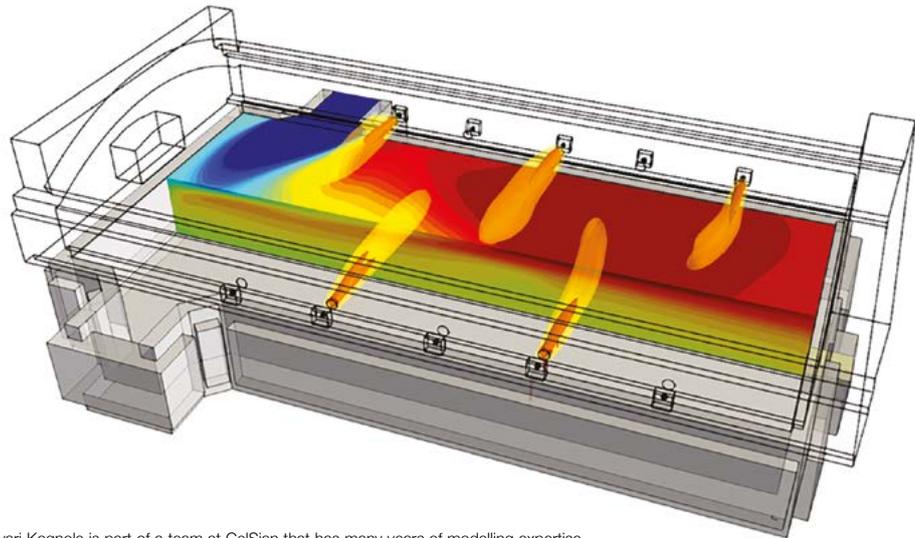


# Attracting talent with opportunities to learn and innovate

Savari Kognole shares her experience of joining CelSian as a Computational Fluid Dynamics Engineer and considers the glass industry's challenge of attracting the next generation of workers.



Savari Kognole is a Computational Fluid Dynamics Engineer at CelSian.



Savari Kognole is part of a team at CelSian that has many years of modelling expertise.

“Coming from a background in mechanical engineering and computational fluid dynamics, I have little knowledge of glass,” confides Savari Kognole, who started her post-graduate role at CelSian in February 2022. “Therefore, when I was first introduced to the glass industry, I was impressed with the amount of engineering involved in producing glass. As I go deeper and deeper, it just surprises me how complex, yet phenomenal glass manufacturing is.

“As a Computational Fluid Dynamics Engineer, my role in CelSian is carrying out CFD simulations of glass furnaces from generating grids for the furnace to post-processing the data according to the customer needs,” she continues. “This includes requests varying from the analysis of the behaviour of glass inside the tank, combustion process, emission of gases, improvement of the furnace design for maximum productivity, etc.”

According to Ms Kognole she was attracted to a career in the glass industry due to the scope of learning it offered as well as the opportunity to educate members of the glass industry about the importance of CFD and its application in the glass manufacturing process. Has her decision lived up to expectations? “Absolutely. With each passing day, there is something

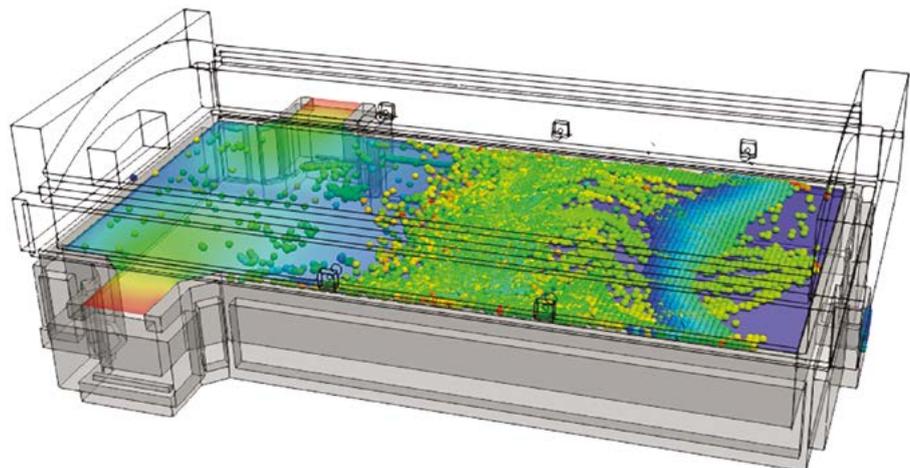
new for me to learn,” she confirms. “The most rewarding aspects are definitely acquiring knowledge from the most experienced colleagues in CelSian and striving to make glass in the most sustainable manner.”

## Future-oriented fulfilment

“My primary goal [at CelSian] is to grow in my role as a CFD Engineer,” says Ms Kognole. “In the long run, I expect to be able to be in a position to handle and eventually lead projects. When I see all the opportunities offered by the glass industry, I believe that there is definitely room for me to evolve.”

Considering the challenge of how the glass industry might go attracting the next generation of workers, Ms

Kognole cites a conversation she had with friends and family about working as a CFD Engineer in the glass industry: “At first, it was difficult for them to correlate my educational background with the industry. I assume the reason is that glass is seen by many as a traditional and conservative industry. Now that I am working in it, I realise it is really future-oriented as innovation is required to produce environment-friendly glass and therefore tackle some of the biggest challenges of tomorrow's world. So



CelSian's GTM-X is a CFD tool for detailed modelling of physical and chemical processes in complex shapes.

in my opinion, portraying this more innovative side of the industry may attract the younger generation to join.”

Emphasising glass’ sustainability credentials (e.g. with the recognition it receives from initiatives such as the International Year of Glass) is “a good first step to creating more awareness,” believes Ms Kognole, but one that needs to be developed “in order to create exposure out of the glass industry.”

It also seems that the glass recruitment process could benefit from playing up the holistic angle: “The younger generation is in search of a sense and meaning in their job,” states Ms Kognole. The glass industry’s commitment to achieving CO<sub>2</sub> neutral production is therefore a key asset – “producing glass in a greener manner can provide them this sense of fulfilment they’re looking for and therefore retain talent in the workforce,” she explains.

#### Working at CelSian

Ms Kognole’s place of work has a number of initiatives in place to retain its talented young team members, she reveals. “First of all, CelSian gives you

the room and time to get the skills required to become an expert in your role which helps build confidence especially when you’re new to the industry. Second, the company has a flat hierarchy which makes it easy to communicate between departments. Therefore, knowledge sharing and collaboration can be done in an efficient way. And last but not least, everyone’s opinion matters irrespective of your formal background which helps to feel valued and encourages everyone to bring new ideas to always improve our ways of working and serve our customers better.”

In a traditionally male-dominated manufacturing environment, inevitably the question of diversity arises. “From the start of my bachelor’s study, I have been in a male-dominated environment so diversity issue is a topic I’m familiar with,” acknowledges Ms Kognole. “I think it is really important to address. I strongly believe that women can perform and carry out tasks in the same manner as men, whether it is on the front line working in the manufacturing unit, to the R&D department. In my opinion, this topic is even more important to address in a mature industry like glass because skipping it may prevent companies from seizing the opportunity to have young and talented women join their teams and renew their workforce.”

Equal opportunity training is obviously another element of this, as well as for maximum employee productivity. “Training is the basis of understanding and acquiring the skills related to the work done in the company and how your contribution will help the organisation to attain its mission,” notes Ms Kognole. “At the same time, there is a lot of personal growth as there is a lot of new information to gather. Thus, good training = better productivity.”

Although Savari has only been working at CelSian for a few months, she has quickly picked up on what clients expect from the company. “I hear my colleagues speaking about customers wanting to move towards greener energy, having fewer carbon footprints, etc.,” she reports. “And that’s where we, as CelSian, come in with the capability of providing solutions as a whole from experimental to numerical solutions.” Problem-solving at its best. ●

#### Further Information:

CelSian Glass & Solar BV,  
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# The South African glass industry

One of Africa’s largest countries, South Africa is also a centre of glass manufacturing on the continent. Both consumer and commercial markets are expected to expand in the years ahead and recycling is anticipated to be a key part of that growth, reports Richard McDonough.

South Africa is one of the key economies in Africa. The glass industry in South Africa is one of the elements in growing consumer markets not only in the nation itself, but in several neighbouring countries as well. Glass packaging operations in South Africa focus on the beverage, pharmaceutical and cosmetic industries; bottles, jars and other containers are among the products produced.

Two large glass manufacturers operate facilities in South Africa: Isanti Glass acquired local glass operations from Nampak Glass in 2020, whilst Ardagh Group (hereafter denoted as ‘Ardagh’) completed acquisition of Consol Glass (hereafter denoted as ‘Consol’) in April of 2022.

“After the pandemic-induced contraction of 6.4% in 2020, South Africa’s economy started to recover in 2021, with GDP growth reaching 4.9%,” reported The World Bank in a statement dated 14 April 2022. “Growth was supported by favourable global demand and commodity prices, as well as the rebound in domestic economic activities from the 2020 recession... The pandemic shock has broadly weighed on social outcomes, with poverty rates, based on the poverty line for upper-middle income countries, estimated to have risen to levels of more than a decade ago.

“The South African economy was already in a weak position when it entered the pandemic after a decade of low growth,” the statement from The World Bank continued. “From 2021, the recovery is expected to continue in 2022, with GDP growth expected at 2.1% and to average 1.7% over the medium term. Longstanding structural constraints, such as electricity shortages, continue to be binding. Important steps have been taken last year towards addressing structural hurdles to growth over the medium term, including the increase in the licensing threshold for embedded electricity generation. Commodity prices remain important for South Africa, a major net exporter of minerals and net importer of oil, however, strengthening investment, including foreign direct investment, will be critical to propelling growth and create jobs.”

South Africa was ranked as the 50th largest importing nation of glass and glassware products in 2020. Its ranking as an importer may have been higher in 2021, though results for that year are not [yet] available, according to the International Trade Centre. Unless otherwise stated, statistics detailing imports and exports of glass and glassware products to and from South Africa are from reports issued by the International Trade Centre.

As with its ranking as an importer, South Africa was also ranked as the 50th largest country globally in exports of glass and glassware products in 2020. Based on limited results from other countries for 2021, the ranking of South Africa as an exporter may have been slightly higher or slightly lower in 2021.

## Imports

South Africa is an active importer of glass and glassware products from a number of countries. With the exception of a substantial dip in 2020, imports have increased annually



South Africa’s glass industry is expected to continue to grow as the country recovers from the pandemic. Photograph provided courtesy of Positive Images through Pixabay, 9 October 2019.

from 2017 through 2021.

In 2017, imports of these products amounted to (US) \$262,887,000; in 2018, (US) \$284,978,000; in 2019, (US) \$289,449,000; in 2020, (US) \$199,213,000; and in 2021, imports of glass and glassware products were valued at (US) \$295,913,000.

China has been the largest source of imports of glass and glassware products into South Africa from 2017 through 2021. The volume of these

imports has increased – with the exception of the dip in 2020 – from (US) \$99,008,000 in 2017 to (US) \$131,424,000 in 2021. Imports from China represented approximately 37.7% of all imports of glass and glassware products in 2017, and increased to 44.4% of all these types of imports in 2021.

Other large sources of imported glass and glassware products were Germany, France and the ▶



Aerial view of Johannesburg, the largest city in South Africa. Photograph provided courtesy of the United States Geological Survey, 2022.



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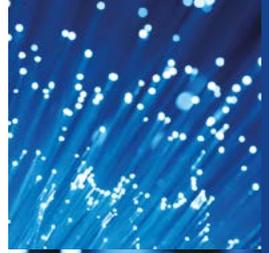
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See pages 20–26



USA. Together, these three nations represented about 19.9% of all imports of these products into South Africa in 2017; their portion of the import market for glass and glassware products decreased to 16.5% in 2021.

Both Germany and France saw their imports into South Africa increase from 2017 to 2021. Imports of glass and glassware products from Germany were (US) \$14,458,000 in 2017 and grew to (US) \$23,120,000 in 2021; imports from France were (US) \$11,922,000 in 2017 and grew to (US) \$13,162,000 in 2021. Imports of these products into South Africa from the USA decreased by more than 50% during this five-year period as imports from that country fell from (US) \$26,029,000 in 2017 to (US) \$12,547,000

Among the top 15 sources of imported glass and glassware products, beyond the USA, the UK, the United Arab Emirates (UAE) and Indonesia have also seen decreases in their levels of imports into South Africa.

Imports from the UK decreased from (US) \$9,220,000 in 2017 to (US) \$6,653,000 in 2021; from the UAE, (US) \$12,113,000 in 2017 to (US) \$6,429,000 in 2021; and from Indonesia, (US) \$5,334,000 in 2017 to (US) \$3,904,000 in 2021.

In addition to South Africa increasing imports from China, Germany and France during this five-year time period, the country also saw increases in imports from other top 15 sources of imported glass and glassware products. Increases in imports were reported from India, Italy, the Czech Republic, Turkey, Saudi Arabia, Poland, Thailand and Japan.

Imports from India increased from (US) \$6,483,000 in 2017 to (US) \$9,977,000 in 2021; from Italy, (US) \$4,901,000 in 2017 to (US) \$8,977,000 in 2021; from the Czech Republic, (US) \$5,984,000 in 2017 to (US) \$7,757,000 in 2021; from Turkey, (US) \$5,494,000 in 2017 to (US) \$6,881,000 in 2021; from Saudi Arabia, (US) \$3,729,000 in 2017 to (US) \$6,014,000 in 2021; from Poland, (US) \$3,640,000 in 2017 to (US) \$5,252,000 in 2021; from Thailand, (US) \$4,291,000 in 2017 to (US) \$5,045,000 in 2021; and from Japan, (US) \$4,512,000 in 2017 to (US) \$4,603,000 in 2021.

### Exports

The amount of exports of glass and glassware products from South Africa in 2021 was similar to the levels of

exports of these products in 2017; the valuations of exports varied during the intervening years. Glass and glassware products exported from South Africa were valued at (US) \$153,496,000 in 2017 and (US) \$153,180,000 in 2021. Exports were highest recently in 2018 when (US) \$178,295,000 in these products were exported, but then decreased in 2019 to (US) \$147,218,000 and to (US) \$113,590,000 in 2020.

Four neighbouring African nations – Botswana, Mozambique, Namibia, and Zimbabwe – plus Belgium were the five largest markets for glass and glassware product exports from South Africa. Exports to Namibia and Botswana decreased from 2017 to 2021, whilst exports to the other three countries increased during that five-year time period.

Together, exports to these five nations increased from (US) \$74,508,000 in 2017 to (US) \$82,489,000 in 2021. The five countries represented approximately 48.5% of all exports of these products from South Africa in 2017; their portion of the export market increased to 53.9% of all exports of glass and glassware products in 2021.

Specific amounts of exports of glass and glassware products to Namibia from South Africa were (US) \$28,442,000 in 2017, whilst they were (US) \$24,074,000 in 2021; to Mozambique, (US) \$12,827,000 in 2017 and (US) \$21,439,000 in 2021; to Zimbabwe, (US) \$12,475,000 in 2017 and (US) \$13,809,000 in 2021; to Belgium, (US) \$8,496,000 in 2017 and (US) \$12,257,000 in 2021; and exports to Botswana were (US) \$12,268,000 in 2017 and (US) \$10,910,000 in 2021.

In addition to the decreases in exports to Botswana and Namibia, there were also decreases to three other nations – the United Kingdom, Zambia, and Spain – among the top 15 export markets for glass and glassware products from South Africa.

Exports to the United Kingdom decreased from (US) \$8,892,000 in 2017 to (US) \$8,394,000 in 2021; to Zambia, (US) \$11,259,000 in 2017 to (US) \$6,694,000 in 2021; and to Spain, (US) \$5,361,000 in 2017 to (US) \$4,569,000 in 2021.

In addition to Belgium, Mozambique and Zimbabwe, exports from South Africa to other top 15 export markets for glass and glassware products also increased to India, Morocco, France, Eswatini, Lesotho, Germany and the Democratic Republic of the Congo.

Exports to India increased from (US) \$8,440,000 in 2017 to (US) \$8,516,000 in 2021; to Morocco, (US) \$3,166,000 in 2017 to (US) \$8,161,000 in 2021; to France, (US) \$4,621,000 in 2017 to (US) \$5,623,000 in 2021; to Eswatini, (US) \$4,529,000 in 2017 to (US) \$5,147,000 in 2021; to Lesotho, (US) \$3,681,000 in 2017 to (US) \$3,713,000 in 2021; to Germany, (US) \$900,000 in 2017 to (US) \$2,911,000 in 2021; and to the Democratic Republic of the Congo, (US) \$1,757,000 in 2017 to (US) \$2,006,000 in 2021.

### Consol Glass - Ardagh Group

Consolidation of the global glass industry continued this year with Ardagh Group (Ardagh)'s acquisition of the largest glass manufacturer in South Africa: Consol Holdings Proprietary Limited. Founded in 1944 and headquartered in Johannesburg, Consol was formally acquired by Ardagh on 29 April 2022. The acquisition was valued by Ardagh at (US) \$1 billion, including the assumption of debt.

A supplier of "infinitely recyclable metal and glass packaging for brand owners around the world," according to a statement from the business, Ardagh operates 65 metal and glass production facilities in 16 countries, employing more than 20,000 people with annual sales approaching (US) \$10 billion. With the acquisition, the Luxembourg-headquartered company has added four glass production plants in South Africa to its ▶

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Glass manufactured by Consol Glass, now part of Ardagh Group, in South Africa. Photograph provided courtesy of Ardagh Group.

global footprint. These facilities are located in Bellville, Clayville, Nigel and Wadeville in South Africa. In addition, Ardagh has also added other production facilities for Consol in Ethiopia, Kenya and Nigeria. According to Ardagh, these glass manufacturing sites supply "... a broad range of leading international, regional, and domestic customers, principally in the beer, wine, spirits, food, and non-alcoholic beverage sectors."

"We are delighted to have completed this strategic acquisition," stated Paul Coulson, Chairman and Chief Executive Officer of Ardagh. "By combining Ardagh's global reach with Consol's know-how on the African continent, we are very well-positioned to partner with our customers to meet the growing consumer demand in Africa for premium, sustainable glass packaging."

Beyond the acquisition price, Ardagh also indicated that the company will invest an additional (US) \$200 million in expanding operations in South Africa.

"Ardagh Group's acquisition of Consol will enable further opportunities for future investment in glass manufacturing in Africa," detailed a news statement from Ardagh on 29 April 2022. "To this end, Ardagh is committed to a third furnace investment at its Nigel facility in Gauteng which will add to the existing N2 expansion project due for start-up in May 2022. These combined investments will total (US) \$200 million and create more than 250 direct jobs, with significant ancillary supply-chain expenditure resulting from these projects."

Personnel changes were also announced in the news statement.

Mike Arnold stepped down as Chief Executive Officer of Consol; he was named a director of Ardagh Glass Packaging Holdings Africa (Pty) Limited (hereafter denoted as 'Ardagh Africa') and will be part of the Ardagh executive team responsible for growing Ardagh's presence in Africa. Paul Curnow, previously Chief Executive Officer Designate, succeeded Mr Arnold as Chief Executive Officer; he also became a director of Ardagh Africa. Bruce MacRobert, former Chairman of Consol, was named Chairman of Ardagh Africa.

"Ardagh's investment in Consol and in the expansion of glass production in Africa is testament to Ardagh's faith in the Consol team and in Africa's potential," said Mr MacRobert.

In the year to 30 June 2021, Consol reported consolidated revenues of (US) \$566 million. According to a news statement dated 29 November 2021, "South Africa represented approximately 90% of revenues, with the balance represented by smaller production facilities in Kenya, Nigeria and Ethiopia. Glass consumption in Consol's markets is projected to continue to increase, driven by long-term trends, including population growth, rising income levels, and shifts to premium one-way sustainable glass packaging."

"Virtually all of Consol's multinational customers are also customers of Ardagh," Mr Coulson noted in the 2021 news statement.

The Competition Tribunal [an independent adjudicative body that has jurisdiction throughout the Republic of South Africa] announced

on 29 April 2022 that it had approved, with conditions, the acquisition of Consol by Ardagh. This followed a news statement dated

19 April 2022 from the Competition Commission of South Africa (hereafter denoted as 'CCSA'). Referencing a meeting held on 11 April 2022, the CCSA stated that "The Commission found that the proposed transaction raises significant public interest concerns. In addition, the Commission was concerned about the effect of the merger on the market for food jars and wide mouth [jars]. To remedy this concern, the merging parties agreed to a condition that merged entity will continue to supply food jars or wide mouth jars."

The news statement from mid-April noted that "with respect to the public interest concerns, the Commission and the merging parties agreed on the following conditions:

a) the Merging Parties will establish a new Employee Share Ownership Programme which will hold 7% of the shareholding in Consol; b) Ardagh will incur all reasonable capital expenditure, including raising necessary debt funding required to finalise the construction of the glass manufacturing facility planned by Consol; c) Ardagh will invest in the construction of a new glass manufacturing facility; [and] d) Ardagh shall procure recycled glass or cullet for use in its operations in the ordinary course, and will favour historically disadvantaged persons in such procurement."

Continuing with that statement: "e) within a specified time frame, Ardagh shall expand Consol's existing Cullet Owner Driver Scheme; f) Ardagh undertakes to support small, medium, and micro enterprise customers through a reduction of minimum order quantities; g) Consol shall increase its pre-merger procurement of cullet from small/ historically disadvantaged person vendors; [and] h) Ardagh undertakes to use reasonable endeavours to introduce new production line of glass-related products. The Commission is of the view that the proposed remedies or conditions adequately address the public interest concerns resulting from the proposed merger."

### Projections for the future

The Covid-19 pandemic hit South Africa hard. The glass industry has been affected as has the overall society. Government action to contain the impact of the pandemic included restrictions on the sale of alcohol beverages for much of the past two years. Lockdowns of work sites and other locales were implemented. Expansion plans within the industry were put on hold. Glass bottle shortages developed as the demand for these products exceeded the supplies available.

Leaders within the glass industry anticipate that as South Africa recovers from the pandemic and as new furnaces are built and manufacturing capacity is expanded, the glass industry will continue to grow in the years ahead. ●

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#### About the author:

Richard McDonough is a civic journalist based in the USA. He writes on a variety of topics in the glass industry.

#### Further information:

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# Bankruptcies likely in Czech glass industry

The Czech glassmaking sector may face serious difficulties this year, as possible restrictions on gas supplies from Russia will lead to a significant growth of production costs for the majority of manufacturers operating in the local market, reports Eugene Gerden.

Traditionally, the Czech glass industry has consisted of small and medium-size producers, for many of whom the cost of energy resources has been a crucial factor in ensuring stable operating activities. In general, however, Czech glass has established a strong position in the world, both for industrially-produced utility glass, as well as handcrafted glass and art glass.

Prior to 24 February, 2022, most of the Czech glass industry's energy requirements had been met by supplies of generally cheap Russian gas. Now, there is serious uncertainty over further supplies of gas to the Czech Republic following Russia declaring war on Ukraine and measures taken by the Russian state regarding payments (in roubles) from its EU customers.

In an interview with the Czech newspaper *Parlamentní listy*, Ivan Noveski, a well-known Czech analyst in the field of energy and finance, advised that the Czech Republic's glass sector continues to be heavily dependent on Russian gas supplies, and possible restrictions on its further supply and the imposition of the total embargo will lead to a serious crisis in the industry. The precariousness of this situation is confirmed by data from Europe's statistics office: in 2020 the Czech Republic imported almost 86% of its natural gas from Russia.

As an added complication, the Czech glass industry is still (at time of writing) experiencing consequences of the Covid-19 pandemic which led to a serious decline in the volume and variety of its output during 2020–2022.

## New opportunities

Still, despite some doom-laden forecasts, many leading local producers (along with global players operating in the local market) remain generally optimistic regarding the future prospects of the Czech glass market. New opportunities have arisen following the suspension of glass supplies from rivals in Russia and Ukraine due to ongoing military action. In an exclusive interview for this article, Dana Švejcarová, Sales Director at Vetropack Moravia Glass – one of the biggest glass packaging manufacturers in the Czech



Architectural developments offer growth possibilities to local flat glass producers.

Republic commented: "At the moment, the suspension of supplies from Ukrainian and Russian glassworks is showing a strong effect. We [have been] approached by new customers interested in deliveries due to this situation."

According to the United Nations COMTRADE database on international trade, Czech exports of glass and glassware in 2021 amounted to US\$2.13 billion and there is a possibility that these figures will grow significantly this year. Czech analysts and glass producers are particularly hopeful for growth in the container glass sector.

"The container glass market will grow," affirms Ms Švejcarová, "since more and more processing companies from the food and beverage industry consider glass to be a healthy container. With sufficient resources, growth of 2–3% per year can be expected."

Analysts also believe that the decorative glass sector, which accounted for about 27% of jobs in the Czech glass industry, has a good chance of stable growth rates this year, and that specialised glassmaking will remain one of strong points of the industry.

## Global interest

The Czech glassmaking industry continues to be within the sphere of interest of global glass producers. For example, representatives from Saint-Gobain believe that the ongoing implementation of large-scale development projects in the country will be one of the major drivers for growth for the Czech glassmaking sector over the next several years. According to them, the current demand for glass in the Czech Republic remains high, providing additional opportunities producers.

An official spokesperson for Saint-Gobain commented exclusively for this interview: "Demand is higher and higher, but we are able to deliver. The development in Glassolutions is satisfactory, especially the prediction

for bigger development projects, where we deliver façade glass, is good. On a separate note, in [the] case of automotive market, we have to adapt to the potential changes in orders from our customers."

Saint-Gobain's spokesperson added that current demand in the Czech glass market is higher than the market offer, which provides good opportunities for growth for market players. However, the company believes that further active growth of the market will be prevented by the current high level of uncertainty. According to Saint-Gobain and other interviewed producers, the military conflict in Ukraine and associated consequences for the whole European continent (such as refugee flows, economic stagnation etc) has also had a negative effect on the Czech glassmaking sector and producers, both domestic and foreign. In addition to rising production costs, there is a lack of truck drivers as well as workers for many glassmaking factories throughout the country. ▶



Czech exports of glass and glassware in 2021 amounted to US \$2.13 billion.



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### Investment activity

Despite geopolitical uncertainty and tough business conditions, most of the producers interviewed for this article plan to continue developments in the Czech glass market this year. In recent months, many of them have made serious investments in the expansion of their local operations and are planning further investments this year. For example, O-I Glass completed a €40 million reconstruction of one of its melting furnaces at its Nové Sedlo manufacturing facility in the Czech Republic. The Nové Sedlo plant produces green and amber containers from two furnaces and is one of the two large-scale glassworks that O-I runs in the country – the other produces flint containers in Dubí near Teplice. Another global player, AGC Glass Europe, inaugurated a renovated float glass line at its nearby plant in Retenice at the end of last year.

### Post-Covid developments

Most independent Czech analysts in the field of glass business believe that the country's glassmaking sector, although seriously affected by the Covid-pandemic, still has great potential for growth this year. These analyses indicate that the pandemic has brought about some structural and consumer changes – trends that will continue to be observed in the second half of the current year.

Petr Mazzolini, President of the Association of the Glass and Ceramic Industry of the Czech Republic ASKP ČR comments: "The Covid period surprisingly brought a positive mood to companies producing container, flat glass and fibre glass. This period proved less successful for domestic glass. At present, large companies that operate large glass melting

tanks face the effects of increased energy prices and the risk of energy availability and security of supply. This is especially true for natural gas, which plays a significant role in melting and costs. This plays into the sales prices for construction products. The increase is felt by customers who decide between reducing demand (because [...] the price of glass is rising) or consider shopping outside Europe. Unfortunately, this situation has already led to the closure of a number of production plants or a radical reduction in production. This applies especially to those companies that export to non-European markets and where competitors enjoy more stable energy prices."

In terms of Czech glassmakers' overseas investment activities, the ongoing war between Russia and Ukraine will result in the suspension of investments in both countries. Prior to the war, Crystalex, the largest Czech glass manufacturer, planned to invest about 2 billion RUB in the localisation of production at its plant in Tikhoretsk in Kuban, southern Russia. The enterprise was set to make Crystalex the first manufacturer



For the automotive market, Czech glassmakers are adapting to potential changes in orders from customers.

of Bohemian glass in Russia; however, implementation of the project will be probably suspended.

Most Czech glass producers have also said that ever growing costs of energy, raw materials, packaging, transport, etc will force them to increase prices for their domestic ranges. ●

**About the author:**  
Eugene Gerden is a freelance correspondent

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# Fuelling the global solar power revolution

With the founding of Grenzebach Envelon, the Grenzebach Group has entered a new business sector focused on sustainability. The ENVELON brand will supply photovoltaic facades and building envelopes that can generate electricity directly on site, writes Andrea Steigerwald.

Founded in October 2021, Grenzebach Envelon GmbH is a system supplier for photovoltaic facades and building envelopes. A provider of solar-active facades, ENVELON specialises in architecturally advanced and aesthetically-pleasing sources of power for commercial and residential properties as well as public buildings. The ENVELON system offers the ability to efficiently generate distributed electricity directly on site. The linchpin of the company's activities is a flexible 360-degree approach that includes not only manufacturing in Germany but also customised planning for the respective location and turnkey installation. ENVELON



An integrated photovoltaic facade on a building from a project in Europe. Photo courtesy of Grenzebach Envelon GmbH; photographer: Marc de Winter (Beng Products)

solutions support different paths to carbon neutrality and the search for alternative renewable energy sources.

As part of the Grenzebach Group, the ENVELON brand marries years of solar and facade experience with Grenzebach's engineering skills and expertise in the glass industry.

"Here at Grenzebach, we've been working on sustainable solutions and cutting-edge technologies for years," says Dr. Steven Althaus, CEO of the Grenzebach Group. "We view this and our collaboration with ENVELON as a major step towards greater sustainability, which will be important not only for people today, but also for future generations."

## Cutting-edge technology

Demand for sustainable power generation and carbon neutrality is on the rise and a major concern for many companies. In addition, in many European countries the amount of facade and building surfaces that can be used for photovoltaic systems is

twice as large as the amount of roof space available.

Germany and Europe have been suffering from an exodus of cutting-edge technologies and high-tech exports for years. ENVELON is doing its part to counter this trend, with one of Grenzebach Envelon's focal points and priorities being the production and customised planning of cutting-edge photovoltaic technology that is 'Made in Germany'. For this reason, the company is expanding its manufacturing operations in Germany and supporting local innovation and development projects. By producing locally, the company is not only fuelling the solar high-tech industry, but also a global solar power revolution.

## Aesthetically efficient

In contrast to conventional solar panels on roofs, Grenzebach Envelon is focusing on architectural solutions on a building's facade, combining the highest aesthetic standards with maximum efficiency. In order to meet customers' demands, ENVELON modular facades consist of frameless, high-quality glass elements that are available in a variety of colours. This makes it possible to give buildings an aesthetically pleasing exterior – and help to combat climate change in the process. The company's approach is to supply custom-designed facade kits or turnkey solutions together with high-quality and reliable installation from a single source. ●



The Envelon team in March 2022. Photo courtesy of Grenzebach Envelon GmbH

### About the author:

Andrea Steigerwald is Head of Corporate Marketing & Communications at Grenzebach Envelon

### Further information:

Grenzebach Envelon GmbH.,  
Asbach-Bäumenheim/Hammlar,  
Germany  
tel: +49 906 982 2000  
email: [envelon@grenzebach.com](mailto:envelon@grenzebach.com)  
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# Meeting demand for the new generation of IS machines

Headquartered in the UK, Lattimer designs and manufactures IS mechanisms and components for glass plants in all parts of the world. Mark Hailwood explains how the company's products continue to set standards in the glass container forming industry.

Supplying IS variable equipment to over 70 countries every year from its manufacturing sites in the UK and the USA, Lattimer has become one of the most recognisable names in the glass container manufacturing industry. Founded in 1941, the company has extensive knowledge and experience in the design and manufacture of both standard and bespoke IS variable equipment, with many products becoming industry standards.

As an increasing number of servo controlled machines are introduced, Lattimer's challenge is to ensure it meets the demand for faster, lightweight, versatile products that are suitable for the new generation of IS machines and demonstrate significant added value.

## Neck ring mechanism

Over the past year Lattimer has introduced a number of new products. The company's best-selling item is its neck ring mechanism, manufactured with a number of almost invisible but essential differences from those supplied

by other brands. A hardened and ground piston and rod delivers a closely tolerated, low backlash, synchronised, controlled opening and closing of the flights; a heavy duty spring ensures that the flights return quickly to their home position once the compressed air is released. Roller bearings on the shaft ensure a smooth, resistance-free rotation during the inversion of the neck ring arms, all coupled with a simplified design for ease of maintenance. The mechanism is available in a limited number of variants to suit a variety of machine types.

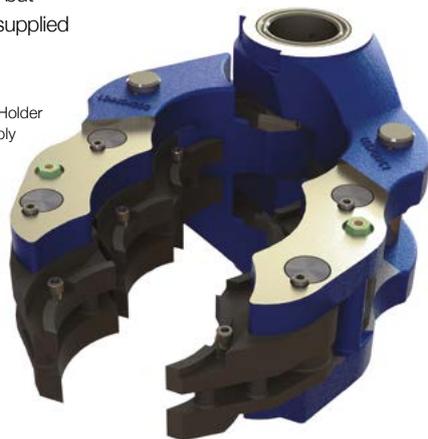
## Blowhead

The Lattimer quick-change aluminium blowhead is available in single, double, triple and quad-gob configuration; it delivers strength and stiffness as well as interchangeable wear areas, prolonging service life and reducing lifetime operating costs.

## Mould holders

Lattimer manufactures a wide range of ductile iron mould holders (blow and blank) each year, industry standards as well as customer specials. It is increasingly evident that many of the standard holders have limitations on speed and mould closing pressures. The company's design team is currently working through the current range of popular holders, incorporating design changes to increase strength and durability, whilst maintaining accuracy and parallelism of the arms.

Mould Holder Assembly



QC Blowhead Arm



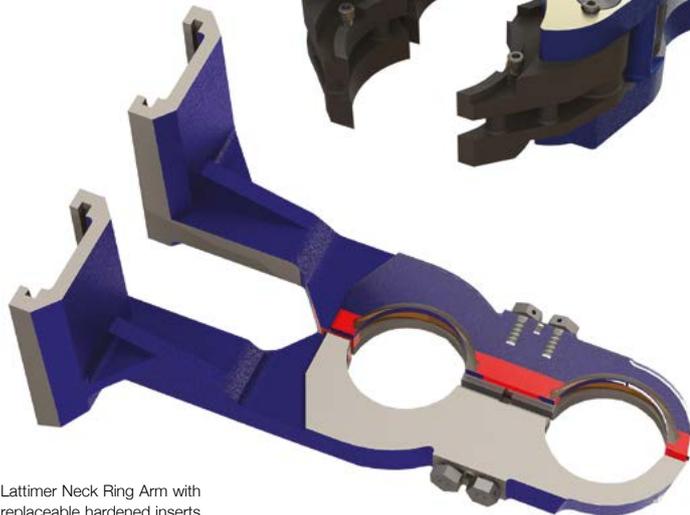
Servo Takeout Arm



Lattimer Neck Ring Mechanism



Lattimer Neck Ring Arm with replaceable hardened inserts



### Neck ring arms

The process of manufacturing neck ring arms has undergone a complete review to reduce costs and optimise product quality and accuracy. New style castings have been commissioned and purchased, and revised manufacturing methods have been introduced, reducing the number of operations to produce the finished part. Variants have been developed that enable the wear areas of the arms to be easily replaced in minutes rather than undertaking time-consuming grinding and rewelding. Lattimer also has variants of its neck ring arm available with a new 'wishbone' flat spring which self-centres the neck rings and applies the closing pressure in four positions on each of the two neck ring halves.

### Take out arms

A product line that has received a total redesign for the new servo machines and that is now available on the market is Lattimer's take out arms. This new range of arms has been designed specifically to deliver a unit that is compact, robust, maintenance-friendly and is available with both belt and chain drive.

Forces generated in the repeated cycling of the take out arm can, if the shafts are not fully supported, result in the total failure of the arm and so the Lattimer design ensures that the input and output shafts are fully supported and securely located. Drive belts are, of course, available from alternative manufacturers to satisfy the standard part requirements of different customers.

### Checking fixtures

Many readers will already be aware that Lattimer supplies the full range of IS variable equipment, both standard parts and those specific to a machine, company and/or a container. Baffle arms, blowhead arms, tong heads and cartridges, inserts and lock rings are all available. Less well known is the range of Lattimer checking fixtures, which allows plants to check the condition and accuracy variables such as tong heads, neck ring arms, inserts and mould holders prior to their installation on a machine. These fixtures are produced to order and are manufactured to suit the specific parts to be checked.

### UK upgrades

Now that the global pandemic is easing, it is once again possible for customers to visit the UK and view the updates at the Lattimer manufacturing facility. The company has improved equipment layouts in the manufacturing departments, installed of a number of new machines and reorganised the assembly department, including the introduction of a dedicated neck ring mechanism assembly and testing area. All these changes have been made to streamline the manufacturing processes and increase productivity and efficiency.

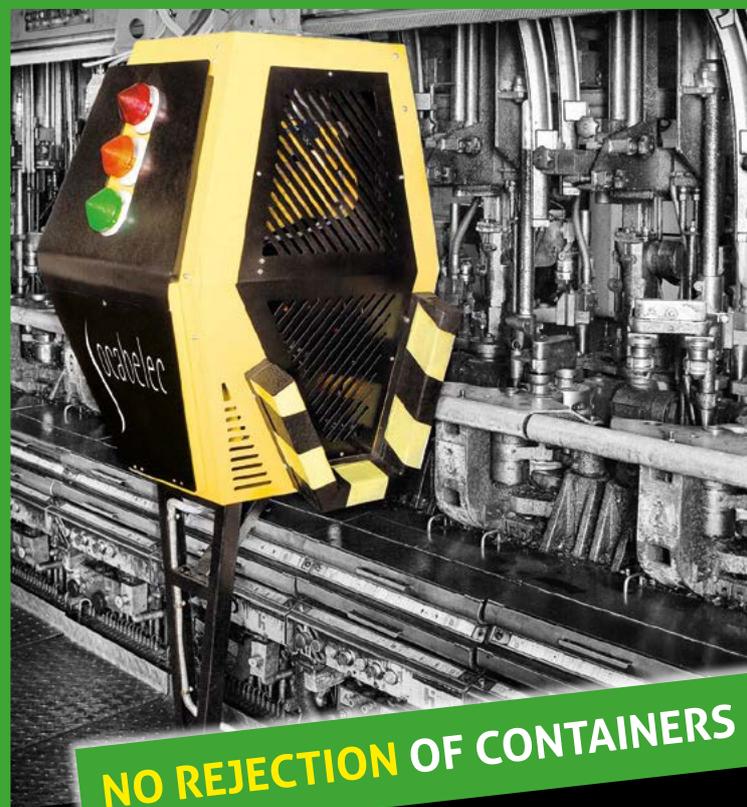
Constantly striving for excellence in every area of the business, Lattimer is aware that it operates in an increasingly competitive environment and recognises that to remain successful it must continue to demonstrate that it can be trusted to support customers in the achievement of their own goals. ●

#### About the author:

Mark Hailwood is Managing Director of Lattimer

#### Further information:

Lattimer Ltd., Merseyside, UK  
 tel: +44 1704 535040  
 email: sales@lattimer.com  
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# Glass furnace operation using alternative energy systems

On behalf of the glasstec 2022 organisers, Marc Everling and Daniel Krauss explain their belief that carbon neutrality can only be achieved by shifting to new key technologies and sustainable raw materials to avoid process-related emissions.

It is not just advancing climate change and the need to reach carbon neutrality by 2045 but also our current dependency on fossil fuel imports that make it clear there is no alternative to switching to renewable energies and new technologies. How can the energy-intensive float glass industry so far heavily dependent on natural gas become carbon neutral by 2045? The energy efficiency of glass production is already close to what is physically-technically feasible today.

According to current surveys by the Federal Association of the German Glass Industry (Bundesverband Glasindustrie e.V. – BV Glas), up to 7.4 million tons of glass are produced annually in Germany. The final energy consumption required for this stood at 19.1TWh in 2020, of which 15.1TWh were generated by means of fossil fuels, especially natural gas, and the remaining 4TWh by electricity. Every year 3.9 million tons of CO<sub>2</sub> are emitted by systems subject to Emissions Trading, i.e. by glass melting and downstream combustion processes. An additional process-related million tons of CO<sub>2</sub> are generated by the thermal decomposition of the carbonate raw materials. The energy efficiency thus achieved is remarkable nonetheless: some 100 years ago the production of one ton of glass still required 6,000kWh, today less than 1,000kWh suffice. While in former times approximately three tons of CO<sub>2</sub> were emitted per ton of glass, it is less than 500kg today. There is not



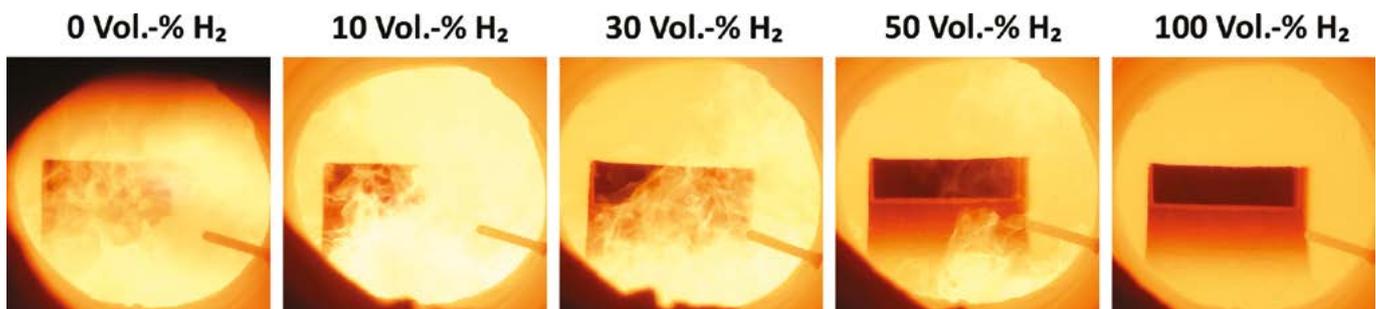
Float glass production at Saint-Gobain, furnace control. Photo: Saint-Gobain

a lot more to be saved here, which is why carbon neutrality requires a consistent shift to new technologies and renewable energy. According to BV Glas, the glass industry currently covers some 75% of its total energy demand by natural gas.

In Europe float glass, for instance, is mostly produced in cross-fired regenerative furnaces where the batch is molten at constant process temperatures of around 1,650°C over the complete life of the furnace, ideally at least 15–20 years.

## Sustainable transformation projects

Many of the major glass producers and associations are already conducting in-depth studies into sustainable transformation options, such as Saint-Gobain, for instance. This company is currently examining – and will continue to do so until 2025 – how its production at the Herzogenrath site in west Germany might become carbon neutral. It sees the highest potential in using regeneratively produced, green hydrogen for glass manufacturing. Energy savings could still be achieved in processing as well as by energetically optimised energy use and supply at the site. The project is being modelled in co-operation with the city of Herzogenrath, neighbouring communities and numerous institutes such as the Gas- und Wärme-Institut



Flames with varying admixture degrees of hydrogen. L-R: 0%, 10%, 30%, 50%, 100% (H<sub>2</sub>, volumetric). Photo: GWI Leicher, J., Islami, B., Giese, A., Görner K., Overath, J.: Climate-friendly process-heat generation by hydrogen in the glass industry: the 'HyGlass' Project. 3rd Aachen Furnace Construction and Thermo-Process Colloquium, 2021.

Essen e. V. (Gas and Heat Institute), the Institut für Technische Thermodynamik (Institute for Technical Thermodynamics), the Institut für Industrieofenbau und Wärmetechnik (Department for Industrial Furnaces and Heat Engineering) as well as the Institut für Stromerzeugung und -speicherung (Institute for Power Generation and Storage) of RWTH Aachen. If the model test is successful, the site could be climate-neutral starting in 2030.

Another project that gives hope: last August the NSG Group Company Ltd (Pilkington Glass UK) reported successful float glass production with the help of hydrogen as a fuel. The trial was run at Pilkington's furnace in St. Helens (nominal load of approx. 800 tons of glass per day) in two stages: in the first stage, one part of the furnace was fired with 100% hydrogen, replacing 20% of the natural gas volume in total. In the second stage, hydrogen was admixed to the natural gas in all burners of the furnace. Due to the limited hydrogen supply, its total share was limited to 15% in this stage of the trial.

A permanent shift could only be realised based on a comprehensive network of hydrogen pipelines – otherwise the road transport would counteract the desired climate neutrality. Pilkington's initiative forms part of the 'HyNet Industrial Fuel Switching-Project' to decarbonise industrial processes in the North-West of Great Britain.

### Key technologies being researched

Existing manufacturing processes in the glass industry are already highly optimised to manufacture glass in a consistent quality and with low pollutant emissions. In view of the targets agreed in the Paris Climate Agreement and growing social pressure, the glass industry is doing in-depth research across its entire process chain. The option that seems obvious would be the 100% use of green power (also to avoid conversion losses), but for physical reasons not all types of glass can be melted electrically and electric furnaces are still limited in size. The furnaces usually operated in the float glass industry cannot be fully electrified at present. BV Glas estimates that it is more probable for furnaces of this size to focus on hybrid technologies that additionally rely on green hydrogen as a fuel.

There are two key technologies on the horizon that might replace the existing base by 2045:

- Fully electric melting furnaces that melt the batch by introducing electric energy via electrodes. The use of regenerative power alone does currently not suffice to fire bigger melting units.
- Hybrid furnaces also using hydrogen could get up to 80% of the energy required for melting electrically via electrodes and get the remaining energy by burning hydrogen. Questions regarding the supply, availability and economic viability of green hydrogen are still unanswered at the moment.

Despite all roadmaps, the aforementioned key technologies are still under research, but the possible effects of a successful shift can already be calculated for the float glass industry as follows, according to BV Glas:

- Decline in absolute CO<sub>2</sub> emissions by 75%.
- The share of process-related CO<sub>2</sub> emissions from the thermal decomposition of so far non-CO<sub>2</sub>-neutral raw materials would remain unchanged. The possible use of CO<sub>2</sub>-neutral raw materials must therefore become the subject of research. The potential savings achieved by using more cullet is very limited in the float glass industry in Germany. Contrary to widespread opinion, float glass cullet in Germany is recycled almost completely, but only 11% in float glass production. The greater part is reused in the container glass and glass wool industry. BV Glas is currently preparing a publication on this topic.
- The specific energy consumption decreases slightly but with an altered mix of regeneratively produced power and green hydrogen.
- Manufacturing costs will rise by 70% because energy costs are expected to triple compared to 2020 – the effects of the Ukraine crisis have not been factored into this estimate yet. In the long term, the successful installation of a circular material ►



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## Optical non-contact measurement technology for the glass industry



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Production of glass bottles. Photo: BV Glas e.V.

economy that functions cradle to cradle would offer savings potentials – the buzzword here being buildings as ‘material banks’.

### Production processes and quality

As part of the ‘HyGlass’ project the Federal Association of the Glass Industry (BV Glas) and the Gas and Heat Institute (Gas- und Wärme-Institut Essen e.V. – GWI) are studying the impact of using hydrogen as a fuel on the extremely sensitive process of glass production, product quality and pollutant emissions. This study includes both a view of all processes when increasing amounts of hydrogen are admixed to natural gas and the 100% use of green hydrogen along the entire glass production chain.

The HyGlass Project here focuses on studying the impact of hydrogen on regenerative melting furnaces and the downstream combustion processes, for instance in the feeders used in the container glass industry. This makes sense since the European gas industry plans to directly feed a rising percentage of hydrogen into the natural gas grid in addition to building dedicated hydrogen infrastructures in future. Then the production plants in the glass industry will also be supplied with a mix containing significant amounts of hydrogen and therefore featuring combustion properties different to natural gas – producing an impact on product quality, pollutant emissions and possibly on the plant lifecycle.

The impact of all this is specifically studied by HyGlass – especially in terms of combustion, which plays an important role in many process steps, in melting and in the so-called feeders which transport the molten glass and where it is homogenised for moulding. The melting process is the most energy-intensive part of glass production and the feeder is often decisive for high product quality. One anticipated difficulty here is that melting furnaces and feeders will differ substantially in technical terms and also in terms of size and energy needs.

### Roadmap: Which technology is expected when?

#### By 2025:-

- 100% operation of conventional melting furnaces.

#### Late 2020s:-

- Installation of first hybrid furnaces with hydrogen firing.

#### From 2030:-

- Shift to hybrid furnaces with hydrogen firing.
- Use of fully electric melting furnaces.

#### By 2045:-

- Complete replacement of natural gas-fired melting furnaces.

Roadmap for the complete replacement of natural gas-fired melting furnaces.  
Source: BV Glas.

While in the melting furnace burner systems with non-premixed flames and high air pre-heat temperatures or oxy-fuel burners are used, feeders use numerous small burners with premixed flames mounted to the side walls. Accordingly, the effects of higher hydrogen contents in natural gas need to be assessed differently. While with feeders, process control and possible flame flashbacks are especially relevant questions, the priority aspects for melting furnaces are efficiency, heat transmission and nitrogen oxide emissions (NOx).

The necessary product quality is influenced both in the feeder and in the melting furnace. Initial results of the studies indicate that the effects of hydrogen on combustion are manageable but that previously fine-adjusted measuring and control technologies are required. The thermal nitrogen oxide emissions (NOx) can rise with a higher hydrogen content, but the proven measures for NOx reduction should continue working once adapted.

In the light of these studies it would make sense to bring these two key technologies – fully electric and hybrid melting furnaces with hydrogen – to market maturity as soon as possible – in co-operation with plant and component manufacturers already operating in Germany and Europe whose expertise should be incorporated into a national strategy.

A global challenge is our consistent departure from fossil energies and the speedy installation of infrastructure for regenerative power along with the connection of glass industry sites to a hydrogen infrastructure yet to be created. Here, political foresight and planning are also an imperative – also in view of the long investment cycles. To achieve full carbon neutrality plenty of research in sustainable raw materials is still needed in addition to this and the creation of a reliable circular economy. ●

*glasstec 2022 will take place on 20–23 September 2022 in Düsseldorf, Germany.*

**About the authors:**

Marc Everling is owner of Marc Everling Nachhaltige Kommunikation and Daniel Krauss is Senior Manager Press Department at Messe Düsseldorf.

**Further information:**

Messe Düsseldorf GmbH, Düsseldorf, Germany  
 tel: +49 211 4560-598  
 email: kraussd@messe-duesseldorf.de  
 web: www.glasstec-online.com

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# Pneumatic vacuum pumping for increased efficiency and sustainability

Correct vacuum helps to speed up the moulding process by optimising the pneumatic performance of the IS machine. Daniel Hilfiker explains how Pneumofore's vacuum pumps for the hollow glass industry have benefitted a glassworks in Mexico.

US-headquartered global packaging company Crown Holding has historically relied on Pneumofore's vacuum equipment for its metal packaging solutions – the manufacturing process of cans is dependent upon vacuum to hold the aluminium cans during various production stages. However, the Crown Sivesa facility in Orizaba (Mexico) is quite different. This factory was part of Empaque, a leading Mexican manufacturer of aluminium cans and glass bottles, which was acquired by Crown about 10 years ago from Heineken. Nowadays, the Orizaba plant produces hollow glass containers.

A Swiss engineering company based in Italy, Pneumofore specialises in air compressors and vacuum pumps for industrial applications. Vacuum is very important in glassworks: it contributes to speeding up the moulding process by increasing the glass containers' quality, thus reducing the rejection rate and improving productivity. The precise setting of vacuum raises the performance of the IS machine.

## Satisfied customer

The first Pneumofore UV16 vacuum pump (pictured) was installed in Orizaba in 2018, where it has run non-stop with constant efficiency. Maintenance performed internally by the Crown service team is facilitated by the ease of accessibility from all sides of the pump. The 1,220m<sup>3</sup>/h vacuum system is integrated with a DVF Demister Vacuum Filter and receiver to prevent lubricating oil mist from the IS lines from reaching the vacuum pump.

Following the satisfactory results of this first unit, Crown Sivesa ordered a much larger pump from Pneumofore. The first UV70 vacuum pump, a twin unit with 110kW nominal power and 4,320m<sup>3</sup>/h flow, was installed in 2020. A second UV70 was delivered in March 2022 and will supply vacuum to most of the IS lines installed in the plant. The total available vacuum capacity now exceeds 10,000m<sup>3</sup>/h.

## Third UV70 unit

There are large root blowers still running in some areas of the plant, but their high noise levels and considerable costs for overhauling motivated Crown Sivesa operators to ask for a third Pneumofore UV70 unit. With this additional system, all vacuum in the plant will now be supplied by rotary vane vacuum pumps. In the long term, Pneumofore is the preferred solution for the vacuum required in this glassworks.

## Reducing environmental impact

Pneumofore is aligned with Crown's sustainability approach, which has seen the company implement a 'Twenty by 30' programme to accelerate the reduction of its carbon footprint. Glass is a highly recyclable material, like aluminium, and there are minimal environmental concerns regarding the disposal of these products. The challenge is more on the production



Pneumofore UV16 Vacuum Pump from 2018 with DVF and Receiver installed at the Crown Sivesa glassworks in Orizaba, Mexico.

side, where investment in machines and equipment should take into consideration total cost of ownership.

Vacuum pumps and compressors consume a large quantity of electrical power, therefore the preference should go to machines with constant efficiency over time and without unexpected and frequent maintenance needs or costly overhauling. When a pneumatic machine is efficient, durable and reliable over time, it is a great opportunity for the round-the-clock operation in can factories and glassworks. Every kW saved results in lower electricity bills and reduced CO<sub>2</sub> emissions. The preferred choice should be a machine designed with rigorous criteria to reduce

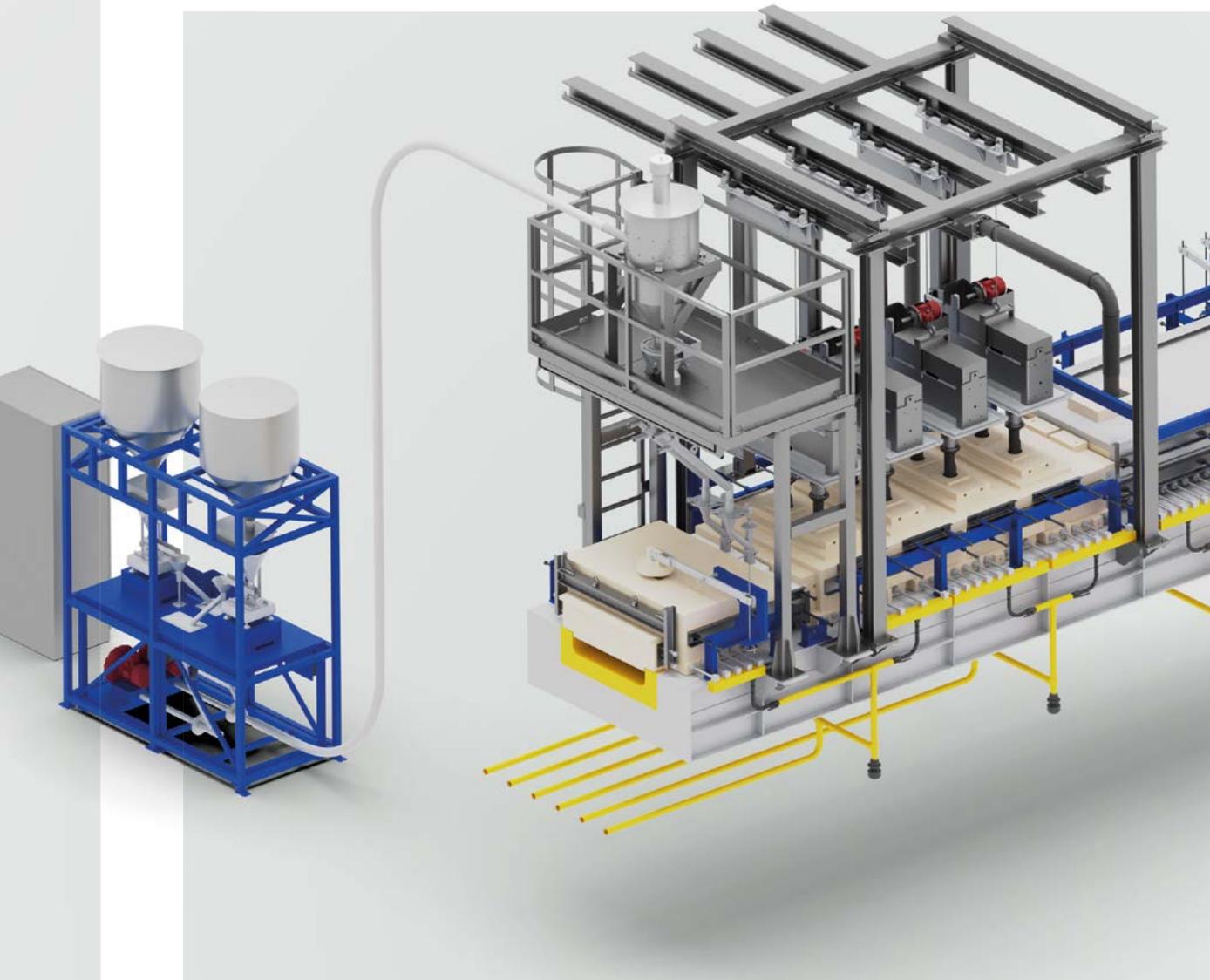
its environmental impact, avoid programmed obsolescence and minimise its total life cycle cost – as Pneumofore demonstrates. The shared progressive values of Pneumofore and Crown in economics, engineering and sustainability have ensured an environmentally sound solution. ●

### About the author:

Daniel Hilfiker is President of Pneumofore

### Further information:

Pneumofore, Rivoli, Italy  
tel: +39 011 950 40 30  
email: [info@pneumofore.com](mailto:info@pneumofore.com)  
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# Glass container knurling study

Dr. Wenke Hu, PhD from American Glass Research shares the results from a study on tensile stress generated for different ridges (knurls) on the base of a glass container.

Knurls, located on the bearing surface of glass containers, typically consist of four configurations: bar, crescent, dot or chain. Bar and crescent-shaped knurls are commonly used on beverage containers while bar, crescent and dot knurls are used on food jars. Chain knurls are sometimes found on liquor and still wine bottles but their use is limited because of the tendency to result in the creation of micro-cracks (checks) during the bottle-forming process.

Questions often arise concerning the stresses that are generated in the bearing surface of glass containers for various knurl configurations. In this study, finite element analysis models (FEA) were utilised to evaluate the distribution and magnitude of stress in the bearing surface for internal pressure and impact loads. An impact that is directed at the heel contact was included in this study because of the creation of tensile hinge stresses at the bearing surface.

## Experimental procedure

A generic 330ml bottle (see Figure 1), was used in this study and 3D models for each knurl configuration were created using Solidworks (Figure 2). The Solidworks files were then imported into Autodesk Simulation. A quarter model with a mesh refinement technique at the knurl region was used in order to improve accuracy and efficiency. The knurls (66 total) were spaced uniformly around the



Figure 1: FEA model of a generic 330ml bottle.

circumference of the bearing surface with a knurl height of 0.43mm. Both the number of knurls and the knurl height are typical for most glass containers.

All studies were undertaken with the same bottle profile in the bearing surface region and the same glass thickness, knurl height and number of knurls. Stress indices, which provide the amount of principle stress generated by a unit of applied load, were obtained from the FEA models for the area between the knurls and at the tip of the knurls.

Results from the current analyses are related to the specific bottle and knurl dimensions. However, it is anticipated that the trends in these analyses will be applicable to other container designs and glass thicknesses although the stress magnitudes may vary.

## Summary of results

Stress magnitudes associated with the various knurl configurations are summarised in Tables I and II. The stress distribution patterns for the various knurl shapes are illustrated in Figures 3 through 6. For all knurl shapes, similar trends were observed – tensile stresses were reduced at the tip of a knurl and were elevated in the area between the knurls compared to the magnitude of stress in the absence of knurling.

**Internal Pressure:** Stress indices at the tip of bar, crescent and dot knurls ranged from 0.25 to 0.59 MPa/bar, values that were considerably less than the stress index in the absence of knurls (1.51 MPa/bar). Stress indices at the tip of the diamond and round chain knurls were considerably higher (1.04 and 1.39 MPa/bar) than the stress for the bar, crescent and dot knurls but still less than the stress index in the absence of knurls.

Stress generated in the area between the bar, crescent and dot knurls ranged from 1.96 to 2.15 MPa/bar. These values were greater than the stress index in the absence of knurls. Tensile stress in the corner of the chain knurls, both within the link and between the knurl link connections, was even higher (2.36 and 2.86 MPa/bar). As shown in Figure 4, the location of these elevated tensile stresses is very close to the tip of the knurl.

**Heel Impact:** For the bar, crescent

and dot knurls, stress indices at the tip of the knurl ranged from 0.05 to 0.10 MPa/cps, considerably less than the stress indices in the absence of knurls (0.21 MPa/cps). Stress indices at the tip of diamond and round chain knurls (0.17 and 0.14 MPa/cps) were greater compared to the bar, crescent and ▶

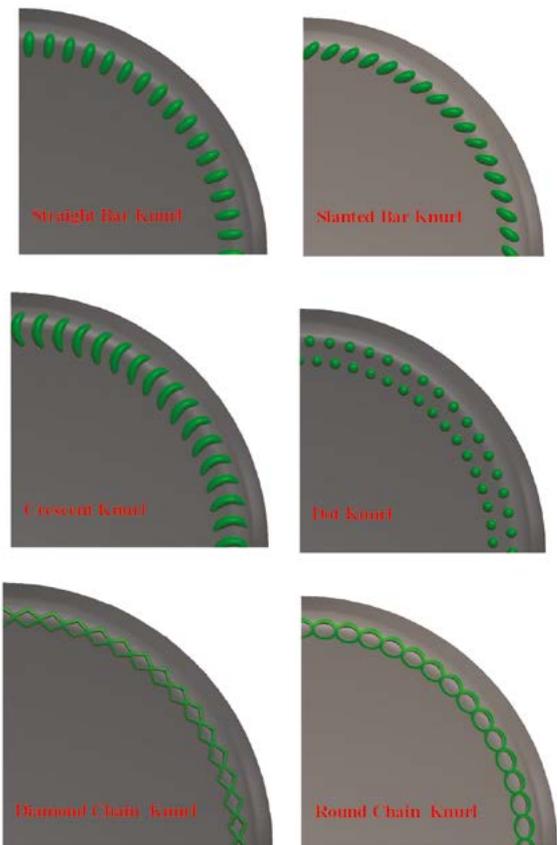


Figure 2: Bar, crescent, dot and chain knurl

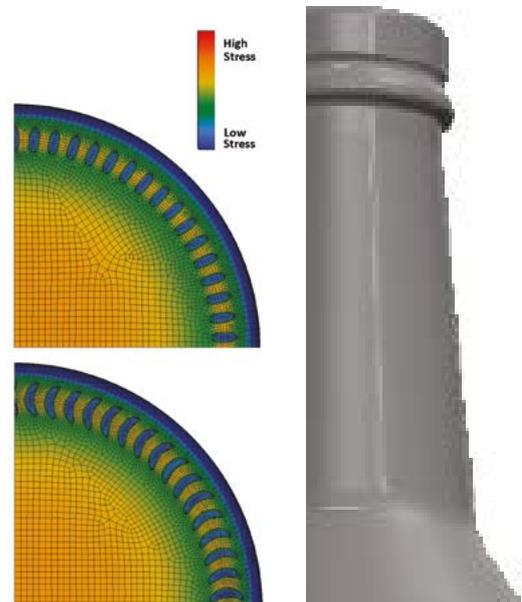


Figure 3: Internal pressure stress distribution bar, crescent and dot knurls.



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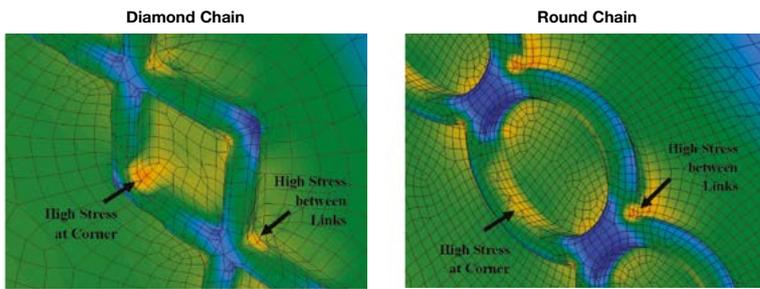


Figure 4: Internal pressure stress distribution diamond chain.

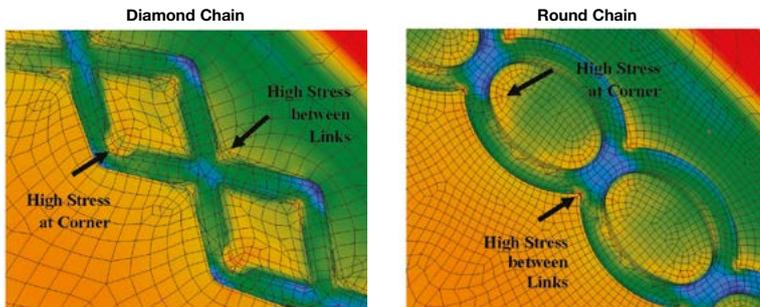


Figure 5: Heel impact stress distribution bar, crescent and dot knurls.

dot knurls but still less than the stress indices in the absence of knurls. Stress generated in the area between the bar, crescent and dot knurls ranged from 0.28 to 0.30 MPa/cps which was greater compared to the stress indices in the absence of knurls. Tensile stress in the corner of the chain knurls, both within the link and between the knurl link connections, was even higher (0.30 and 0.25 MPa/cps). As shown in Figure 6, the location of these elevated tensile stresses is very close to the tip of the knurl.

**Discussion**

As observed in this study, stress at the tip of a knurl is less than the stress magnitude in the absence of knurling.

This is attributed to a reduction in strain that is related to the stiffness of the complex shape of a knurl. Conversely, the area between knurls acts as a stress concentrator, resulting in an increase in stress. All knurl types in the current study exhibited such phenomena under both internal pressure and heel impact.

It is noted that chain knurl type was less effective in reducing stress at the knurl tip compared to the bar, crescent and dot knurls. Each individual knurl independently deforms under load for bar, crescent and dot knurls while the chain knurls are connected to each other. Therefore, as one link of a chain knurl deforms,

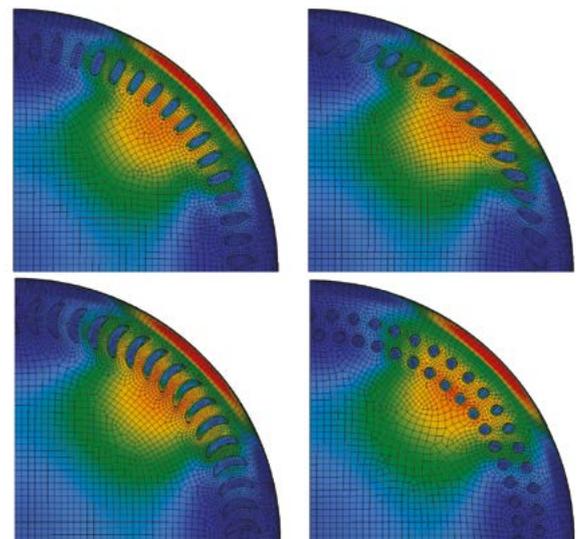


Figure 6: Heel impact stress distribution diamond chain.

adjacent links will be induced to deform. Accordingly, stress for a single link will have two components: one from its own deformation and a second caused by the deformation of adjacent links. Stress concentration was also observed at the corner of the linkage between two chain knurls which is caused by the transition of the corner radius.

**Practical ramifications**

**General observations:** During normal handling of bottles, damage generated in the bearing surface is usually confined to the tips of the knurls. In these situations, glass surface strength is reduced but is concentrated at a location where the stress indices are very low for both internal pressure and heel impact. This is one of the main purposes of placing knurls on the bearing surface of glass containers – to concentrate unavoidable damage in regions where tensile stresses are significantly reduced. The positive result is that breakage is typically averted.

However, some damage will inevitably occur between knurls. If this damage is sufficiently severe, then the coupling of reduced surface strength with relatively high stress could potentially lead to performance issues. Such effects will be more pronounced for chain knurls since the high stresses are positioned close to the tip of the knurls, thus making it more likely that serious damage could be created at the location of high stress.

**Choice of knurls:** As noted by the data in this study, some differences were observed in the generation of stress for the various knurls. However, the choice of knurl type is usually more dependent on ascetics and forming concerns rather than decisions to reduce the magnitude of tensile stresses. Often, when the type of knurl is chosen for a new design, bottle stability and forming considerations play a much larger role than stresses produced from expected loads. ●

Knurl Shape	Stress between knurl	Stress at the tip	Other Locations
Bar Knurl (45 degree)	2.15	0.59	
Bar Knurl (straight)	2.06	0.25	
Crescent Knurl	1.96	0.34	
Dot Knurl	2.03	0.40	
Chain Knurl (Diamond)	1.51	1.04	2.86
Chain Knurl (Round)	1.60	1.39	2.36

● Bearing Surface without Knurl: 1.51 MPa/bar

Table I: Internal pressure stress indices – MPa/bar.

Knurl Shape	Stress between knurl	Stress at the tip	Other Locations
Bar Knurl (45 degree)	0.29	0.07	
Bar Knurl (straight)	0.28	0.08	
Crescent Knurl	0.30	0.10	
Dot Knurl	0.29	0.05	
Chain Knurl (Diamond)	0.26	0.17	0.30
Chain Knurl (Round)	0.25	0.14	0.25

● Bearing Surface without Knurl: 0.21 MPa/cps

Table II: Heel impact stress indices – MPa/cps

**About the author:**

Dr. Wenke Hu, PhD is a Senior Scientist at American Glass Research

**Further information:**

American Glass Research, Pennsylvania, USA  
 tel: +1 724 482 2163  
 email: tbarr@agrintl.com  
 web: www.americanglassresearch.com

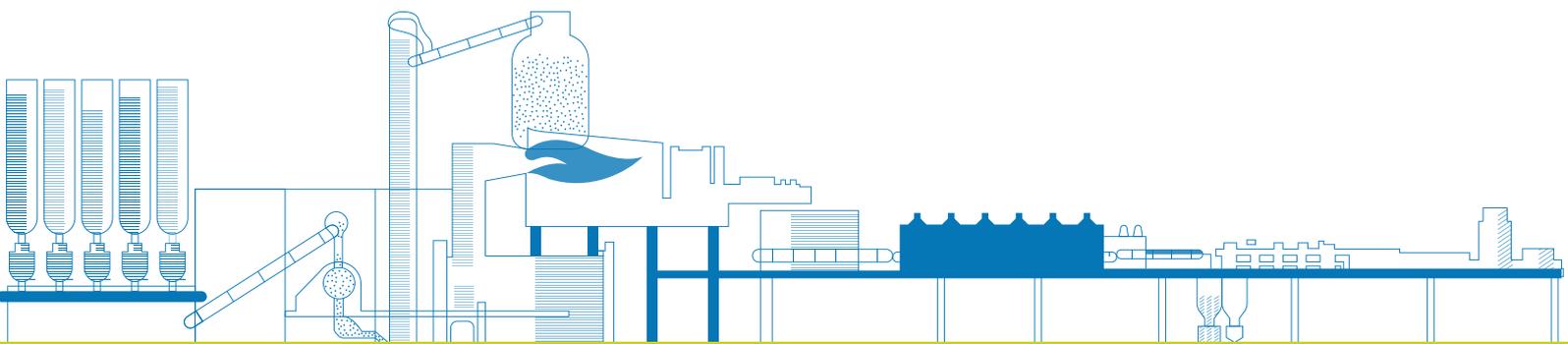
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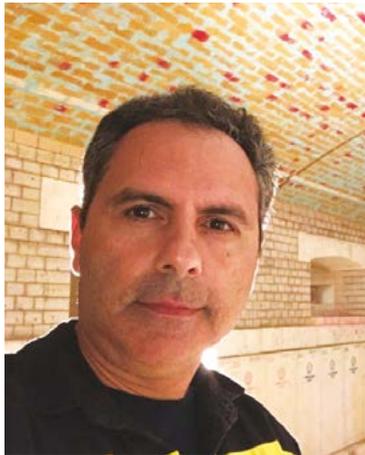
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# Control and maintenance of electric boosting

In the second of a series of articles on electric boosting of melting in glass furnaces, Fernando Salvano explains the main controls and maintenance of this important tool in a glass furnace.



Fernando Salvano has over 20 years' experience in the glass world, mainly in float glass and packing glass.

How do you make the most of electric boosting and obtain the best results, whether for increased production, improvement in the quality of the glass and without damaging the furnace with a controlled operation, without risks? For all of this, a methodology for controlling the electric boosting is essential.

After start-up (start of operation) of the electric boosting, a control and maintenance methodology should be followed in order to continuously monitor some parameters, which will indicate, in case of an anomaly, the necessary adjustments to the set of electrodes and thus avoid accidents (such as a leak) or pollution in the glass.

As we saw in the previous article 'Harnessing the power of electric boosting' (*Glass Worldwide*, July/August 2021, pp74–76), reasons to use electric-boosting are:

1. Increase the extraction of a furnace beyond its maximum value (when a refractory reaches its superstructure temperature limit).
2. Improve the quality for a given production (best quality under the same pull rate).
3. Enable production of highly absorbent or specially coloured glasses.
4. Partially replace fossil energy with electricity.

5. Prolong the life of the superstructure of a furnace. In any case, electric boosting is expected to lead to financial gain, either by producing additional glass at a lower cost, by increasing the duration of a furnace's campaign, by better glass quality or for greater programming flexibility.

### Electric boosting controls

The control methodology consists of continuous monitoring of essential parameters:

**Continuous controls** (as long as an electrode is installed, whether it is under voltage or not), surveillance of the following points:

- Electrode block temperature with high alarm;
- Temperature of the water return cooling electrodes with high alarm;
- Flow of the cooling return water of the electrodes with low alarm;
- Flow of nitrogen-hydrogen electrode protection mixture with high alarm;
- Pressure of nitrogen-hydrogen electrode protection mixture with low alarm.

The water alarms of one part and the gas mixture from another party will be gathered, for each group of electrodes, into a single water alarm and a gas mixture alarm in the control room. Electrode differentiation will be done locally. These alarms should cut off the electrical supply of the electrodes.

### Controls once per shift (by furnace or maintenance crew):

- Inspect the bottom of the furnace looking out for hot spots, water leaks, abnormal aspect of pipes or cables. Do this is even if the electrical boosting is not being used;
- Checking the temperatures of the blocks and return of water, water flow, flow and pressure of the gas mixture;
- Verification of voltages between phases; intensities by phase, intensities per electrode, power check.

**Controls once a day:** calculation of impedance and power. Typically an Excel worksheet is used for these calculations and their proper record.

Note:

- 1) Impedance is an expression of the opposition that an electronic component, circuit, or system offers to alternating and/or direct electric current. Impedance is calculated by dividing the voltage in such a circuit by its current. In short, impedance can be described as limiting the flow of current in an AC circuit. Impedance is indicated by the symbol Z and measured in milliohms ( $m\Omega$ ).
- 2) For definition of calculations for impedance, currents, and power, also consult the project or equipment supplier company. ▶

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IMPEDANCE	mΩ	200	220	230	222	231	235	224	233	219	224	216	200	205
POWER	kW		387	390	320	330	355	372	390	405	390	404	431	396
PRODUCTION	ton		105	110	121	123	92	119	121	117	128	135	122	124
COLOUR			Flint	Flint	Flint	Flint	Flint	Flint	Flint	Flint	Flint	Flint	Flint	Flint
TP BEFORE	°C	1200	1325	1399	1343	1340	1330	1361	1335	1355	1373	1386	1400	1398
TP GROUP	°C	1311	1330	1287	1390	1305	1280	1390	1340	1375	1392	1399	1404	1402
TP AFTER GROUP	°C	1372	1379	1387	1396	1378	1390	1401	1354	1391	1398	1401	1403	1405
POWER CUMM	kW		1834	3694	5709	7802	9752	11741	13735	15730	17724	19718	21712	23707
<b>ELECTRODE</b>		<b>ELECTRODE DEEPENING</b>												
1	mm		390	390	395	395	400	450	450	450	455	455	455	455
2	mm		390	390	395	395	400	450	450	450	455	455	455	455
3	mm		390	390	395	395	400	450	450	450	455	455	455	455
4	mm		390	390	395	395	400	450	450	450	455	455	455	455
5	mm		390	390	395	395	400	450	450	450	455	455	455	455
6	mm		390	390	395	395	400	450	450	450	455	455	455	455
<b>ELECTRODE</b>		<b>TEMPERATURE OF ELECTRODE BLOCKS</b>												
1	B1		1042	1070	1015	1033	1013	1040	1034	1049	1072	1081	1107	1105
2	B2		1029	1060	1027	1040	1020	1025	1015	1033	1057	1079	1094	1098
3	B3		1027	1040	1069	1015	1007	1033	1027	1040	1069	1098	1111	1115
4	B4		1073	1078	1033	1027	1045	1050	1038	1046	1073	1078	1105	1096
5	B5		1070	1082	1027	1038	1034	1039	1032	1042	1070	1082	1108	1089
6	B6		1039	1032	1042	1033	1020	1029	1023	1029	1060	1081	1092	1098

Figure 1: Example of an Excel worksheet with electric boosting data for control and a monthly report.



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**Controls once a month:**

- If the installation does not have an individual ammeter, verification of the intensities of the electrode with either a digital multimeter or an amperometric clamp.
- Update of the monthly report with graphs of the instantaneous value of the impedance and summary of the temperatures of the electrode blocks (see Figure 1).

Note: it is vitally important to continuously follow up the data, and to use an Excel system for example, where the values of the variables (impedance, power, accumulated energy, temperature of the electrode blocks, colour of the glass) are calculated and recorded in order to have all the history and evolution of these variables. It is advised to adopt the data from the first of each month, for standardisation.

Important: If at any time there is an impedance variation greater than 10% (or 5% for double electrodes\*) in relation to the reference value (reference value is the impedance value in the first month of use, after the proper corrections and adjustments in the electrodes), a technical analysis is recommended. This should also be the protocol for the following situations:

**When the breakdown of the intensities by electrode occurs**

(expressed as a percentage of the average intensity per electrode i)  $i = (IR + IS + IT) / TE$  where TE is the total number of electrodes in the group, IR, IS and IT are the intensities.

**When block temperature variation occurs** that appears incompatible with the temperature variations of the bottom.

**Maintenance of electric boosting**

The classic maintenance actions of this type of installation are briefly listed below:

- Cleaning of the dust of the bus, tightening of electrical connections (as for transformers) and generally comply with current legislation;
- Tracking and treatment of cooling water quality

pH	8.0–8.5	
Hardness	6–8° French	(60–80mg CaCO <sub>3</sub> per dm <sup>3</sup> )
Hardness	3.5–4.5° German	(34–45mg CaCO <sub>3</sub> per dm <sup>3</sup> )

- Monitoring and cleaning of water filters;
- Monitoring and cleaning of air filters (cooling of the transformer and regulator site).

**Electrode deepening**

Regularly deepen the electrodes to avoid locking as well to balance the impedance.

**To avoid blockages:** Regularly deepen electrodes, for example by 1–2mm per month or 5mm every three months. The parts of the devitrification course are thus moved. The electrode thus remains free and its penetration into the glass easily corrected when it becomes necessary. The practical experience (small resistance to the ascent allowing to distance the actions) will fix the ideal time interval by differentiating the interventions.

**To balance the impedance:** The depth can be greater than that indicated above, when necessary to balance the impedance between the electrodes of each group, and also compensate for the wear of the electrode (abrasion by the glass). In this case, we can deepen between 10–25mm depending on unbalance, wear, such as the electrode diameter.

Deepening is essential to avoid locking and glazing, as well as to balance impedance and compensate for electrode wear. This deepening should also be noted in the control worksheets of the monthly report (see Figure 1).

The depth may be greater than those indicated above, when it is necessary to balance the impedance between the electrodes of each group, and also compensate for the wear of the electrode (abrasion by the glass). That is, deepening is essential to avoid locking and glazing, as well as to balance impedance and compensate for electrode wear. ●

\*These are two electrodes on the same feed and in the same phase, distant from 600mm at most, assimilated to a single electrode.

*The first in this series of articles was published in the July/August 2021 issue of Glass Worldwide.*

- Nota de procedimento operacional, PO01, Santa Marina, Miguel Zorroza e Fernando Salvino, 2000
- Vigilância e Manutenção do Apoio Elétrico, Fernando Salvino, 2000 (Presented at Escola do Vidro, 2001, Sao Paulo)

**About the author:**

Fernando Salvino is a Glass Furnaces Project Manager providing engineering and technical support

**Further information**

tel: +32 492 344832  
email: fernando.salvino@hotmail.com

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# Is Your Furnace Digital Yet?



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# Enhancing sustainability and efficiency at the cold end

To supply sustainable production solutions for the container glass industry, MSK has developed new technologies for the cold end in the area of bottle conveyor systems, palletising and packaging, and pallet handling in general, Uwe Jonkmann reports.

In recent years, climate protection and carbon footprints, hence sustainability, have become more relevant than ever. The ban on single-use plastics, in addition, played no small role in increasing demand for glass containers. Against this backdrop, large energy price increases put enormous pressure on the industry, making innovative solutions in glass production necessary. Machines must work with the greatest possible energy efficiency and their demand for energy must drop significantly.

The glass industry is investing more now than it has done in years. We are currently seeing a great deal of activity in the cold end. The validity of MSK's investments in sustainable machine concepts is being corroborated by orders from the glass industry. As a supplier for the entire cold end, MSK is leading the way and taking the creation of energy and material-saving systems seriously. The confidence displayed by the glass industry in this area is a great incentive for the company.

## Shrink technology

MSK's latest generation of shrink-wrap machines reduces energy consumption. Before the most recent developments in its shrink-wrap technology, the mean energy requirements of an MSK shrink frame were already roughly 10% below the average. Now, the new generation of shrink frames introduced in 2020 lowers gas consumption by an additional 13%. For producers who want to do without using gas completely, MSK offers a new electric shrink frame of the MSK Corritech model.

Short term energy savings are possible even without having to invest in a new shrink-wrap system. "On standard models it is possible to retrofit MSK systems with the MSK Covershrink energy-saving kit," states Michael Bouwmann, Key Account Manager Glass at MSK. "Depending on pallet size and film thickness,



MSK EMSY analytics software for enhanced efficiency at the cold end.

energy savings of up to 40% are possible with the MSK Covershrink," says Mr Bouwmann, citing more specifically the benefits in cost savings and CO<sub>2</sub> emission reduction.

## Energy-saving

MSK has also optimised its systems to reduce electricity consumption. For example, high-efficiency IE4 motors are now used.

"On drive systems that run continuously, like bottle conveyor systems, the higher purchase price of the drives pays off in a short time," states Mr Bouwmann. "On top of that, for such investments glass manufacturers can sometimes profit from European subsidy programmes."

In the case of frequent vertical movements, another logical technique for saving energy is the use of counterweights to reduce motor capacity. Optimisations of the machine design contribute to a minimisation of energy

consumption, say, through reducing the weight of moving parts.

Mr Bouwmann adds: "An example of this is the MSK Unitech universal palletising head, the weight of which has been reduced by an additional 15%."

Another feature contributing to savings is the gripper head design with clamping bars developed by MSK: compared to conventional gripper tubes, not only does it reduce air consumption, it also has considerably lower spare parts requirements. "The adjustment options also make job changes quicker and easier," notes Mr Bouwmann. ▶



MSK cold end concepts provide sustainability and high investment security.

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### Automation in pallet and material handling

Forklift traffic is increasingly being reduced or completely eliminated through the use of mobile pallet shuttle cars and automated guided vehicles (AGVs). In addition to improved flow in the production process, danger potential is reduced for employees, exhaust fumes and noise are minimised, and the use of fuels for forklift operations avoided.

MSK offers an extensive portfolio of pallet conveyor systems, designing the software in-house. All pallet data is reliably maintained throughout the entire logistics process, allowing seamless tracking.

### Reduction of packaging materials

To avoid the use of supplementary consumables that may be harmful for the environment, MSK designs its systems to avoid mixing materials and

to ensure the most environmentally friendly consumption possible. The MSK Traymaker, for example, uses a consumable-free click mechanism without any stapling or gluing – removing the need for glue or metal staples. Even the labeller developed by MSK only requires a paper label. During the palletising process it is folded and wedged into the next bottle layer by way of a secure attachment. No use of glue or self-adhesive labels is necessary. In pallet dressing systems the bottom film on the wooden pallet can also be fastened without the use of staples or glue. It is simply shrunk on with hot air, thus fixing it to the empty pallet.

### Investment security

With some MSK machines the savings achieved through the conservation of resources exceed the initial machine investment after only a few years. Machine characteristics such as maintenance-free time-belt technology or the use of counterweights to reduce motor capacity through balancing can also increase the service life of the systems, while the use of water-based powder coatings and the avoidance of hydraulics and lubricants helps to protect the environment.

MSK produces its equipment based on a modular design, which provides flexibility to account for future modifications and expansions. This means that MSK palletising, packaging and conveyor systems offer high investment security by allowing for new product requirements which may not yet even exist today.

To ensure machines are ready for reliable use for years to come, the availability of spare parts is important.

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Energy savings through new shrink-wrapping technology.

Thanks to the high vertical integration in its own production and to regional spare parts storage facilities, MSK spare parts are available quickly, and will remain so for a long time.

With self-learning technology and intelligent sensor systems along the lines of Industry 4.0, MSK develops processes which further extend the service life and operational readiness of the machines.

### Sustainability through digitalisation

Sustainability is increasingly made possible and visualised through the digitalisation of processes. As such, with the latest digital MSK EMSY products, MSK systems can be monitored for energy and material consumption in real time, using live figures and statistics.

The web-based MSK EMSY analytics software, developed specifically for the glass industry in

terms of Industry 4.0, connects the data of all machines controlled with EMSY at the cold end, allowing centralised analysis of the entire cold end based on real-time data. The software provides transparency regarding the overall efficiency of the cold end and reveals ways to enhance efficiency even more.

The MSK EMSY smart app for smartphone or tablet is an information tool that provides status information of the systems to users without their having to be on site. Live information on performance indicators such as time statistics, availability, efficiency and error messages is available quickly, wherever you are, and allows prompt reactions to any deviations from targets.

Environmentally-friendly machine concepts, energy savings, reductions in emissions and digitalisation under Industry 4.0 are goals that will continue to mark the development and production processes of the MSK group in coming years.

MSK will present some of these innovations at the glasstec 2022 trade show in Düsseldorf, Germany in September. ●

#### About the author:

Uwe Jonkmann is Director Sales & Marketing at MSK

#### Further information:

MSK Verpackungs-Systeme GmbH, Kleve, Germany  
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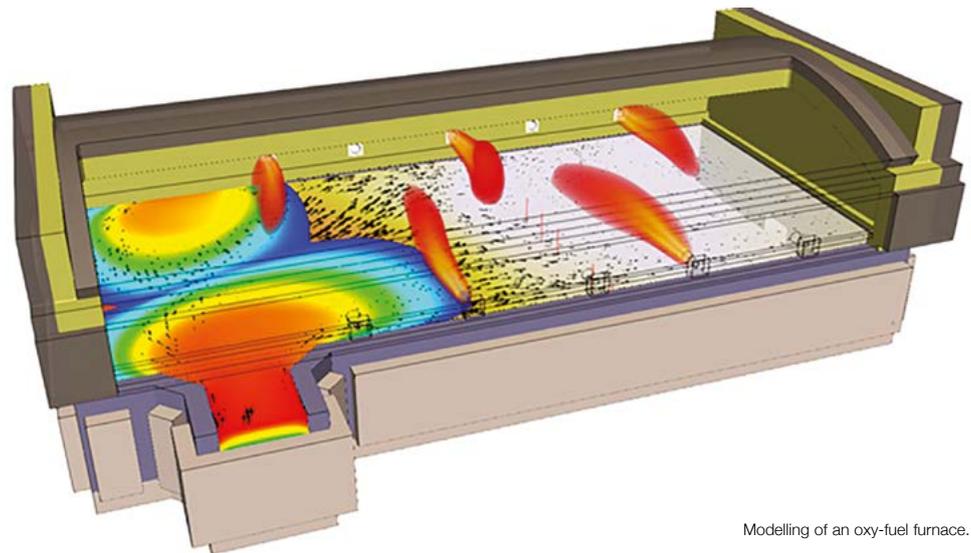
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# Advanced control systems for complex furnace requirements

In the third part of the series looking at model predictive control for furnaces, René Meuleman explains how CelSian's GTM-X modelling software can help users when a furnace needs to be brought quickly up to speed following a rebuild, change of design or energy source.

It is obvious that the glass industry will have to redesign its furnaces to accommodate alternative, carbon-reduced, or carbon-free energy sources to be able to meet the Paris agreement targets. Also and unfortunately, in parts of the world priorities are shifting due to the raging war in Ukraine and the glass industry is struggling to secure its natural gas supplies and looking for suitable short-term alternatives. Stepping away from fossil fuels towards electrical energy in combination with renewable fuels like hydrogen will have a major impact on the furnace designs and furnace operations.

It is very likely that, particularly in container and float glass manufacturing, alternative furnace designs will arrive soon. In order to rule out as many possible design flaws as possible, we cannot do without modern CFD [computational fluid dynamics]-modelling tools such as CelSian's GTM-X. The furnace design era of 'copy-and-paste' is over. Users will have to face the challenge of bringing new designs up to speed without knowing how to operate them. Steep learning curves are required and the use of advanced control systems is unavoidable, preferably operational from day one. That is why CelSian decided to choose an alternative way of designing model predictive controllers.



Modelling of an oxy-fuel furnace.

## For those new to the subject...

Model predictive control (MPC) is an alternative way of controlling processes and has been used in chemical plants and refineries since 1980. It also partly found its way into the glass industry to control furnaces and hearths. Processes with long-dead times and non-linear behaviour profit the most from the use of MPC.

Taking the risk of oversimplifying MPC, let's try to explain how it works. To build a model predictive controller we have to capture the behaviour of the process; for example, the furnace. For that, we need to deliberately apply changes to the controlled variables

(CVs) of the furnace such as the flow of natural gas, electrical furnace boosting, or the pull. In other words, we apply a step to different CVs. After such a step has been applied, we start collecting data on the behaviour of the process after a change has been introduced: we call that 'the step response'. From the data produced by multiple step responses, a so-called FIR (finite impulse response) model can be obtained that represents the behaviour of the process.

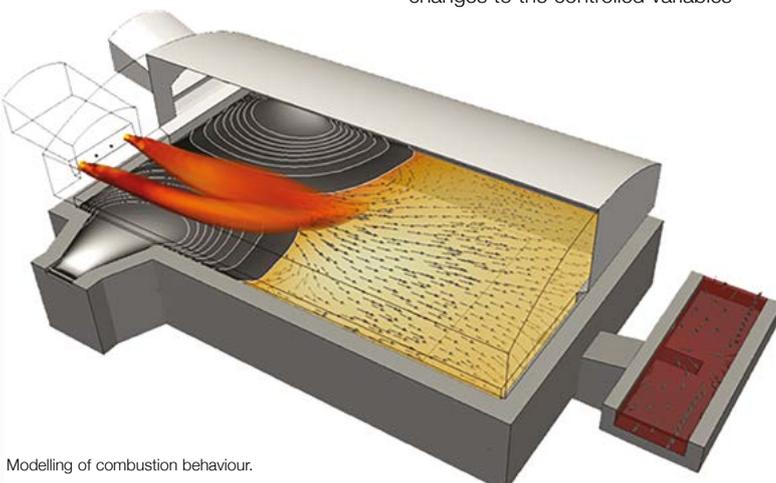
Capturing the behaviour of a glass furnace by applying different disturbances and studying their behaviour is an extremely time-consuming exercise and will, to some extent, cause some unwanted process instabilities as well.

## CelSian does things differently

Over the last 30 years, CelSian's GTM-X modelling tools have proved their reliability and usefulness when designs are changing and furnace operations are in distress without knowing the root causes. We believe it is better to spend a bit more time and money on decent investigations. GTM-X modelling makes perfect sense to take away doubts and build a proper foundation for a change of furnace design or operational concept, such as fuel switching. As we say, it's better to be safe than sorry.

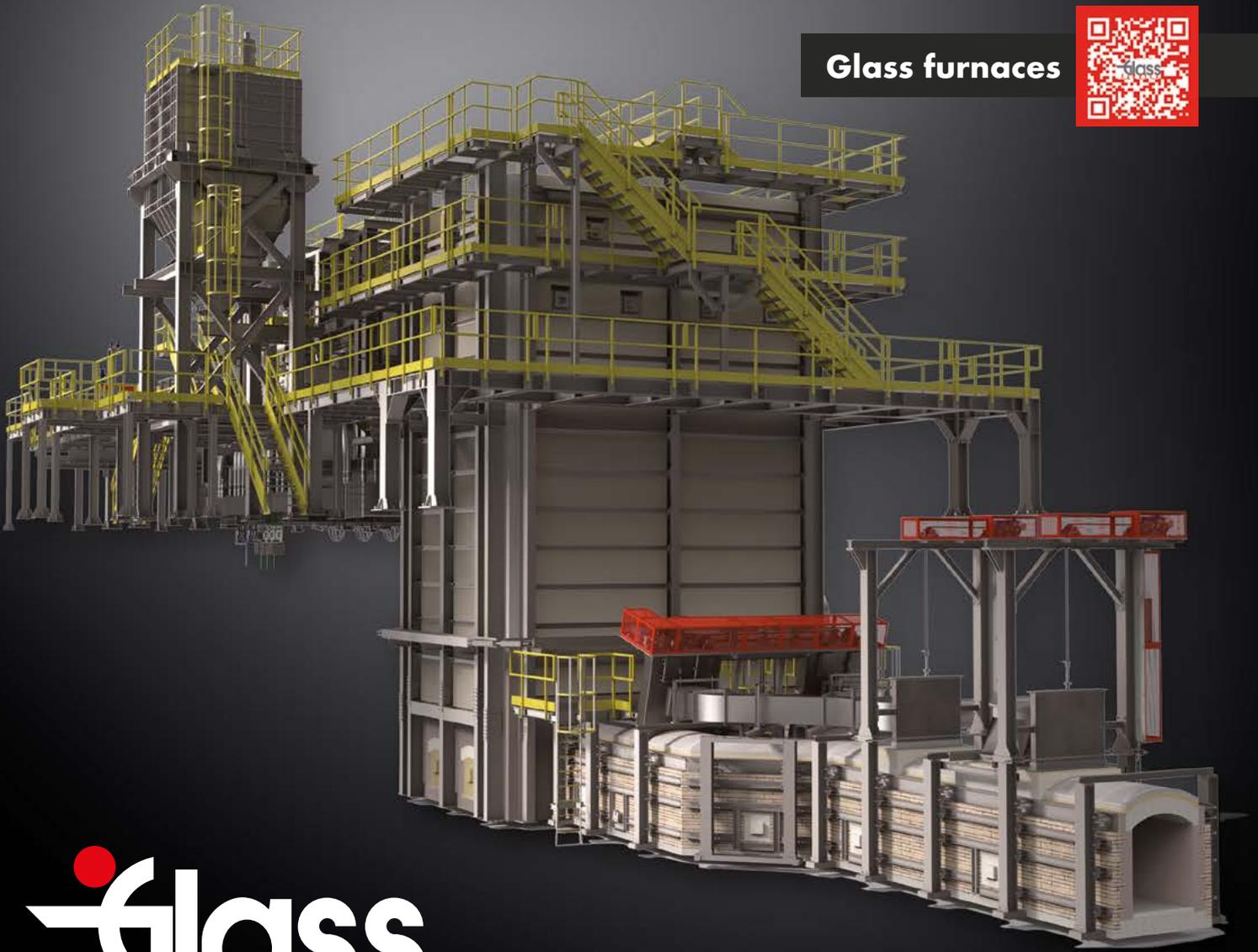
Without any doubt, CelSian's GTM-X has reached a level of sophistication that is capable of preventing design flaws in upcoming new and innovative furnace designs. In other words, most end-users as well as furnace builders who are using GTM-X put a high level of trust into the outcome of our tools.

As explained in one of the former articles of this series, GTM-X modelling software also became the foundation of our rMPC furnace advanced control offerings [see [Glass](#) ▶



Modelling of combustion behaviour.

Glass furnaces



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Worldwide January/February 2002, pp70–71]. Using the GTM-X model to execute step responses is the most reliable way to build a furnace controller when time is tight, accuracy is required and the running furnace must not be disturbed. Bringing a furnace up to speed after a major rebuild, furnace design change, or after applying a different energy source will pay off quickly. In other words: building a model predictive controller based on the GTM-X furnace model is just as good as a model based on [actual] furnace data.

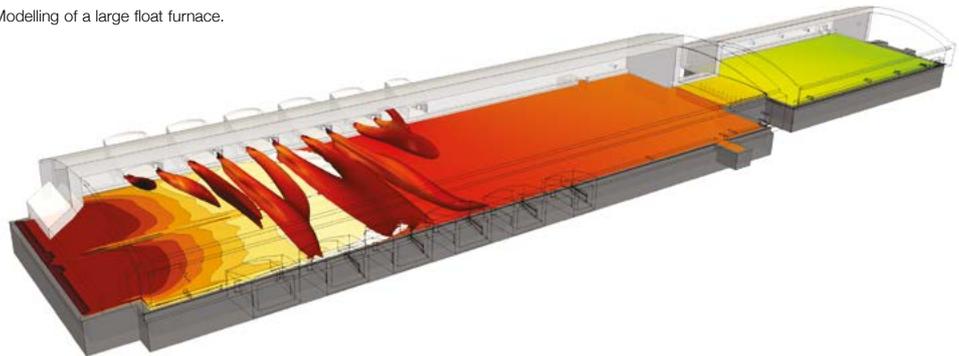
The precision with which GTM-X is able to predict the behaviour of a newly-designed furnace has reached a level where we can also use the GTM-X model, instead of the actual running furnace, to extract a decent model predictive control. Such a GTM-X based approach has the following advantages:

- An MPC furnace controller can be up and running immediately after the furnace has been started up.
- The furnace in operation will not be disturbed by unwanted step response studies.
- No need for time-consuming on-site work and long-lasting data collection.
- Against an operational furnace, the GTM-X model can cope with much bigger steps.
- Today's computation power provides much quicker results against extensive on-site and in-situ studies.

### Next steps

Both previous and the latest investigations have shown very good results in container as well as specialist glass melting furnaces. Based on these positive results, CelSian has

Modelling of a large float furnace.



started looking into the next area that needs improvement: how and with what hardware are we going to execute these rMPC [rigorous model predictive control] controllers and how should the human-machine interface look?

As soon as MPC becomes operational, it will take over the traditional PID [proportional integral derivative/feedback]-controller setpoints, and in the future, it is likely that we will start using MPC to directly control the process' MVs (manipulated variables). This can only be done by achieving a robust level of control, similar to a sophisticated and dedicated process control system. Therefore we start looking into options to integrate our MPC into the existing process control hardware and human-machine interfacing, with these aims:

- Providing the same look and feel of MPC for the operators
- Having a controller available from the start-up of the furnace
- Avoiding any interfacing between MPC – PC-hardware
- No communication ports
- No OPC connections
- No watchdogs
- Avoiding frequently software upgrades

- Leaving the integration of our GTM-X based MPC to the system integrator of the end-users

In most modern process control systems, advanced control options are now available. One of these is PCS-7 from Siemens. We ran a test with a dummy based on a furnace which we modelled with GTM-X, and performed the stepped responses on that model. We took the outcoming MPC dataset and fed it into an MPC PCS-7 function block. It instantly worked!

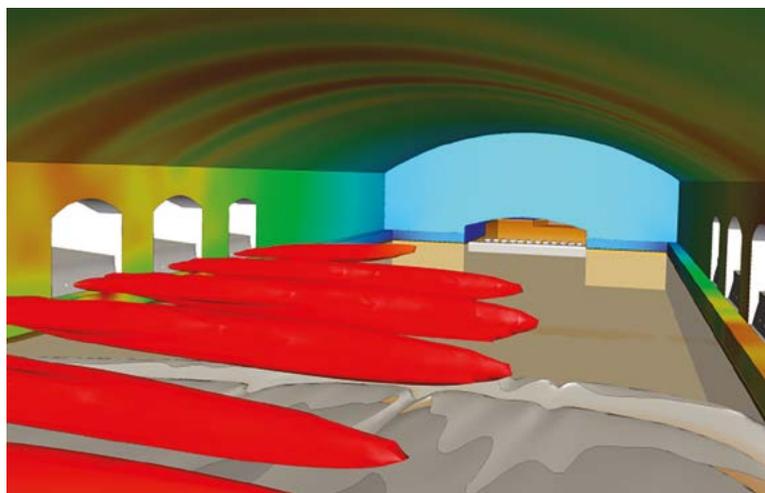
Consequently, we visited several system integrators to investigate if a similar approach could be applied to other process control systems. The outcomes look extremely promising.

History has shown that short-sighted solutions never work out; rather, one should take more time to investigate several options before making a decision, even in times like these.

### Conclusion

Although today no oil refiner or any chemical process does without model predictive control, there are still many furnaces whose functionality lies solely in the hands of skilled operators. In principle, there is nothing wrong with the skills of operators but furnaces are becoming more complex and much harder to operate. Control needs to become tighter and external influences such as fuel- and tariff fluctuations will become more pressing. All of this will lead to a level of complexity that cannot be managed by operators alone.

CelSian's rigorous model predictive control, being a part of our GTM-X based portfolio, represents the ideal approach to improve furnace control from day one of operation without the burden of long, disruptive, step response studies and is seamlessly integrated into your robust process control and HMI (human-machine interface) environment. If you are looking at new furnace designs and want to make sure that they will perform according to specifications, ask us to conduct a GTM-X study to shine some light on them and remove as many unknowns as possible. Once this has been done, it is only a minor step towards a decent rMPC furnace controller based on the GTM-X model. Using the whole CelSian package of modelling and validating your furnace design, our rMPC also comes at a very attractive price. ●



Modelling of the combustion space in a float furnace.

#### About the author:

René Meuleman was formerly Business Development Director at CelSian

#### Further Information:

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# Electrical phases and glass melting

Exploring a branch of all-electrical melting, Prof. Sven Wiltzsch and Fabio Gygas examine the behaviour of phases in glass melts in combination with given electrical connections to and between glass electrodes.

Electrical energy application in glass melting is a hot topic to decrease emissions and help facilitate a sustainable glass industry. In this article we would like to emphasise the beauty and richness of electrical phases in glass melts to understand the all-electrical melting process, as well as the application of high temperature electrochemistry in glass melts.

The industrial electric energy supply typically uses three electrical phases, which are applied using star and delta connection. The common idea of these three phases, e.g. connected as a star, is the vector diagram representation demonstrating the 120° phase shift of one phase to each other phase according to Figure 1. In contrast, phases in glass melts arrange in a surprising way, as shown in Figure 2.

## Studies run on a model

In order to understand the behaviour of phases in glass melts in combination with given electrical connections to and between glass electrodes, we have run several studies using a physical model of a glass melt furnace attached to a phase supplying system with a state-of-the-art thyristor – transformer power control unit according to Figure 3.

The way phases arrange in glass melts are described by Thomson's

principle.<sup>2,3</sup> This principle states "That the released energy of the system will always be in a minimum".

Figure 4 will explain this behaviour in more detail.

The release of electrical energy could be calculated (using Georg Simon Ohm's law) according to equations the equation:

$$P_{el} = U \cdot I = I^2 \cdot R = U^2 / R$$

$P_{el}$  is the released electrical energy (here as heat),  $U$  is the voltage difference,  $I$  is the current and  $R$  is the electrical resistance.

For a given electrical connection of several electrodes, the electrical resistance  $R$  is fixed. Furthermore, the electrical power supply system defines the voltage drop between the main phases  $O_1-L_1$ ,  $O_2-L_2$  and  $O_3-L_3$ . However, the phases themselves are 'free to move' and will arrange in such

a way that the voltage drop between  $O_3-L_2$ ,  $L_2-L_3$  etc. are minimised based on the Thomson's principle to minimise the released electrical energy. This special behaviour affects the mathematical modelling of all electrical furnaces because the voltages at the electrodes are a boundary condition. Those who are not able to foresee the voltage arrangement could not model all electrical furnaces! Happily, glass melt modelling tools such as GFM<sup>4</sup> can do the job for you, provided you know the assignment of phases to electrodes based on a given electrical connection (which could be quite tricky for more than six electrodes).

## Direct voltage potentials between phases

There is another interesting point we saw in our measurements that could be explained by Thomson's principle, however: the development of direct voltage potentials between phases due to the electrical power supply. Figures 4 and 5 explain this behaviour in more detail. In Figure 4 the three phases have one pivot point (the orange circle).

In Figure 5 we used another electrical connection and connected the electrodes 2 and 4, so that the ▶

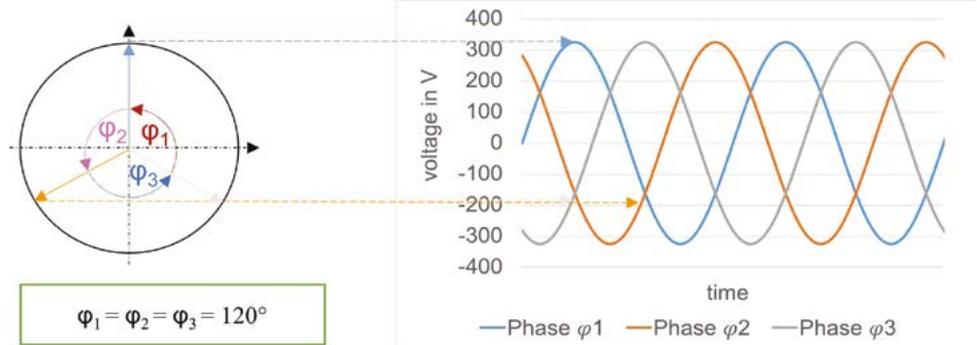


Figure 1: Vector diagram representation of a three-phase star connection (left figure) and the voltage-time function of each phase.

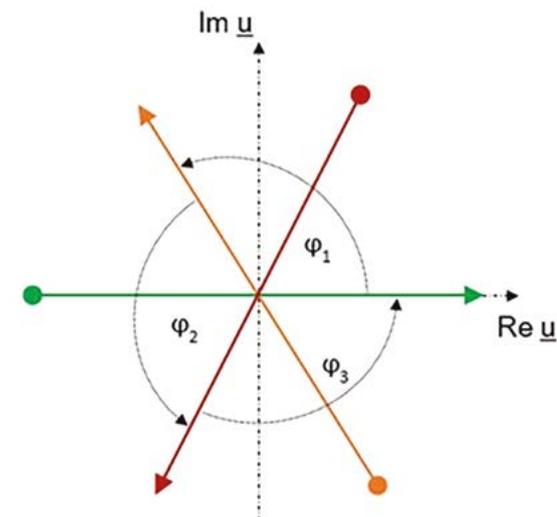


Figure 2: Phase arrangements of three phases in a glass melt measured at a physical model.

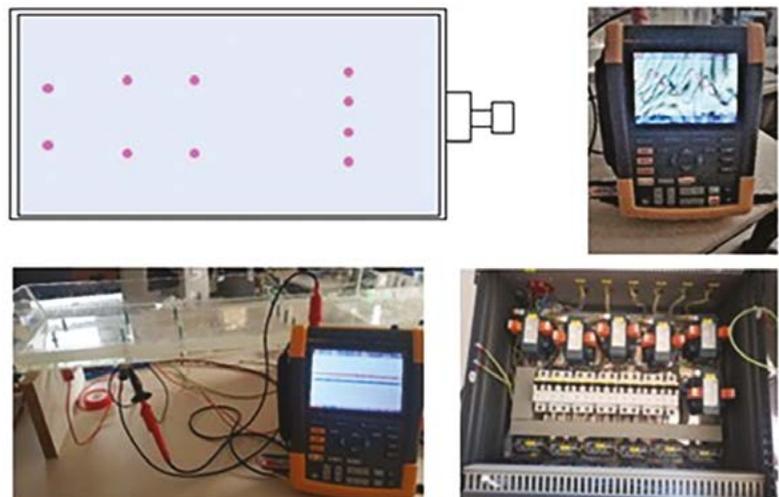


Figure 3: Physical model of a glass melt furnace,<sup>1</sup> electric power supply and voltage measurement to study phase arrangement and electrical connections at electrodes.



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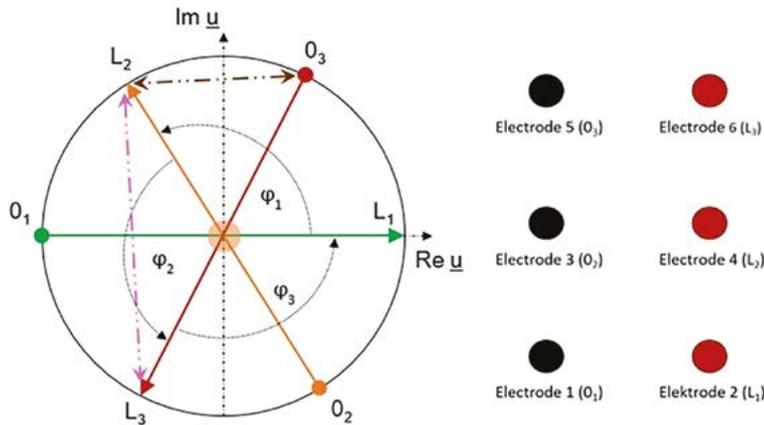


Figure 4: Phase arrangement at given electrical connection situation (six electrodes).

electrical potentials are the same. The arrangement of the phases in Figure 5 looks completely different in comparison to Figure 4 and it turns out that several possible pivot points might exist (orange circle for phases  $O_1-L_1 / O_2-L_2$ , blue circles for  $O_3-L_3$ ). Surprisingly, direct voltage potential differences between the phases (e.g.  $O_3-L_2$ ) were measured in this system, these were in the order of 300–400

mV. In the first step we questioned our measurement, because it is commonly known that transformers will not pass direct voltages from the electrical system to the glass melt plant. However, in the second step we realised, that the phase arrangement and the location of the pivot points might be a reason for the creation of voltage differences between the phases, which might be the minimum

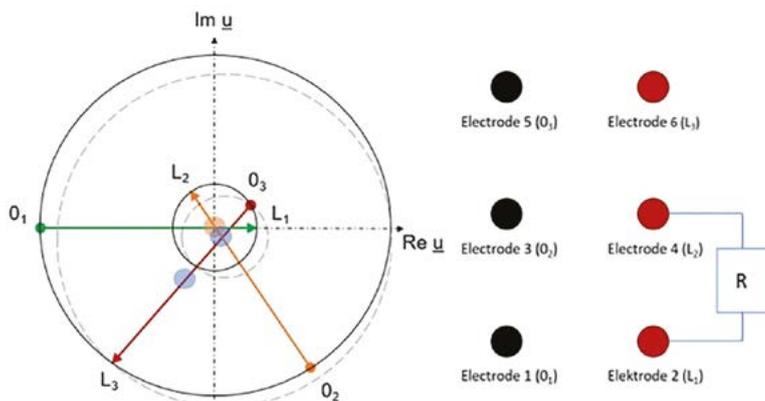


Figure 5: Phase arrangement at given electrical connection situation (six electrodes, two connected).

of the released energy according to Thomson's principle.

We are uncertain if our understanding of the situation is pointing in the right direction. This result would demand that changes of the phase angle firing of the thyristor plant (or the power supply to the system) could create a direct voltage difference between the phases.

As we understand from discussions with technological experts in special glass production such troubles are a feature of external direct voltage supply, with the actual reason being unknown as of now.

### Acknowledgements

We thank Nikolaus Sorg GmbH & Co. KG for providing the physical model of a glass melt furnace as a donation to support scientific research and bachelor / master theses. ●

- 1 Physical model provided by Nikolaus Sorg GmbH & Co. KG (n.d.): SORG – Value by design. <http://www.sorg.de/de/?nr>
- 2 Landau L. D., Lifschitz E.M.: Lehrbuch der theoretischen Physik – VIII – Elektrodynamik der Kontinua – 2. edition. Berlin, Akademie Verlag, 1971.
- 3 Hofmann O. R.: Physikalische und mathematische Modellierung der elektrischen Beheizung von Glasschmelzen. Silikattechnik – Wissenschaftlich-technische Zeitschrift für Glas, Email, Keramik und Bindemittel. Vol. 37, No. 1, 1986, pages 4–5.
- 4 GS Glass Service (n.d.): GFM Software licenses. <https://www.gsl.cz/services-products/assessment/simulations/gfm-software-licences/>

### About the authors:

Sven Wiltzsch is a Professor at Nuremberg Institute of Technology; Fabio Gygas is a student writing a Bachelor thesis

### Further information:

Nuremberg Institute of Technology – Material Engineering Faculty, Nuremberg, Germany  
 tel: +49 911 5880 - 1153  
 email: [sven.wiltzsch@th-nuernberg.de](mailto:sven.wiltzsch@th-nuernberg.de)  
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# Glass melting using concentrated solar energy

S. Qasid S. Ahmad and Russell J. Hand explore the feasibility of using direct solar irradiation to melt glass batches and discuss the results of experiments conducted at the Paul Scherrer Institut, Switzerland's largest research institute for natural and engineering sciences.

The energy intensive nature of glass melting poses a significant challenge for low carbon glass manufacture. While electric melters underpinned by green electricity generation provide one solution, we have investigated an alternative way of providing the melting energy – namely using concentrated solar energy to directly melt the batch.

A number of solar concentrators exist globally, albeit in regions with consistent high levels of sunshine. Typically a solar concentrator involves an array of parabolic mirrors (heliostats) that reflect and concentrate the sun's rays onto the top of a solar tower. This concentrated solar energy can then be focused downwards for utilisation. To assess the feasibility of undertaking glass melting using such a facility we undertook some experiments at the High Flux Solar Simulator (HFSS) at the Paul Scherrer Institut (PSI) in Switzerland. The HFSS uses an array of 10 Xe arc bulbs to simulate the output of a solar concentrator; the HFSS, which is highly instrumented set-up, was used for experimental convenience.

## Experimental work

Two experimental programmes were undertaken as part of this work. The first involved very small scale melting. In this case the concentrated beam from the HFSS was focused downwards (mimicking the set-up of a beam down solar tower) onto a small crucible (~5cm in diameter, with the first trials demonstrating that temperatures sufficiently high to melt pure silica could be achieved. However, the major focus of the first experimental programme was on melting a soda-lime-silica (SLS) pelleted batch. Such batches were successfully melted but only limited flow

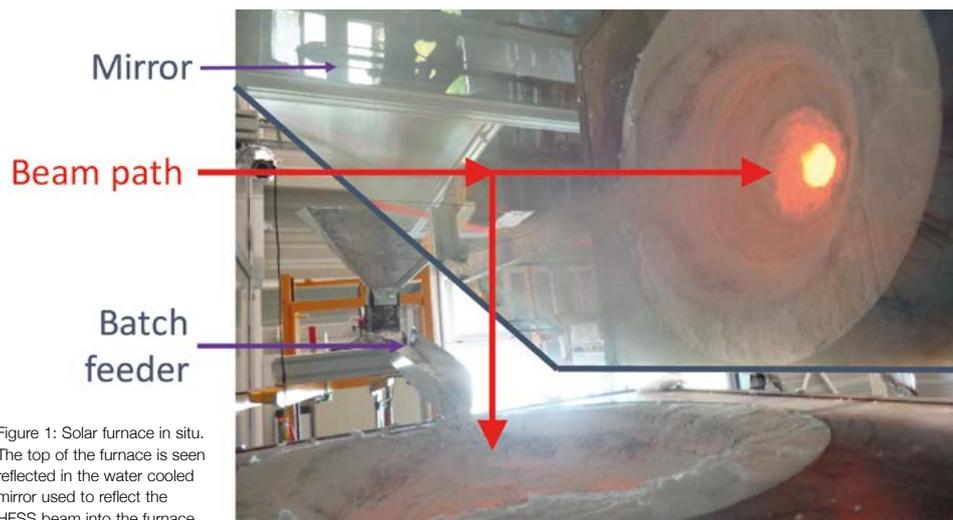


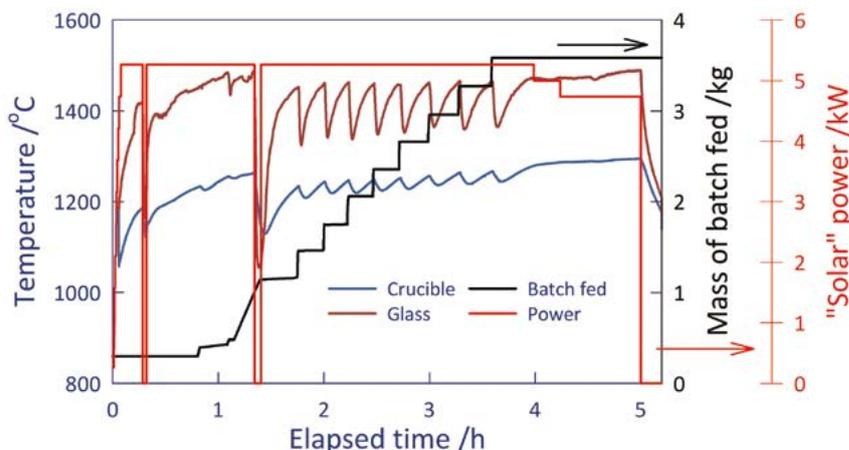
Figure 1: Solar furnace in situ. The top of the furnace is seen reflected in the water cooled mirror used to reflect the HFSS beam into the furnace.

of the melt outside of the heated region was possible with the set-up during these the first experimental programme.<sup>1</sup>

The outcomes from the first experimental programme were used to inform the design of a second experimental programme. This looked at larger scale melting using a ~19cm diameter, 12cm deep fused silica crucible as the melting vessel. Also because the day/night cycle means that solar irradiation is necessarily intermittent, even in regions with consistently high levels of sunshine, this time the crucible was mounted in a furnace that could provide electrical back-up heating.

For the experiments the back-up heating, which was only used when there was no 'sun', was supplied using mains electricity, however we envisage that this would actually be supplied by a photovoltaic (PV) and battery system. The back-up heating utilised SiC elements placed either side of the crucible and was designed to maintain an overnight temperature of 1000–1100°C. ▶

Figure 2: Crucible and melt temperature, solar power and batch fed as a function of time during one of the scaled-up experiments. A 'solar' power of 0 indicates the beam was switched off.

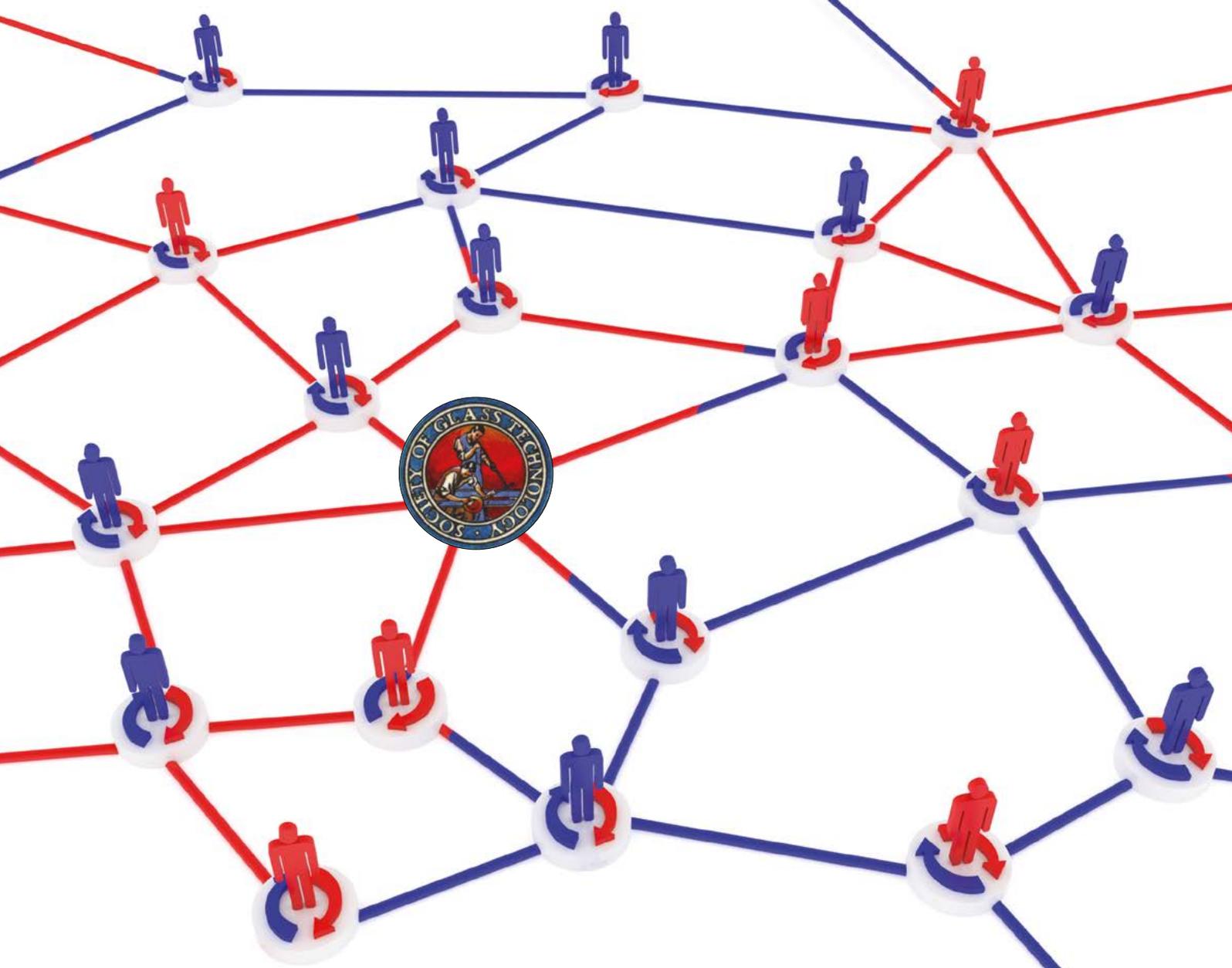


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The crucible was fitted with a bottom drain, coupled with an exit heater, to enable the melt to be removed at intervals from the crucible. The concentrated beam from the HFSS was reflected by a water-cooled mirror downwards through a hole the top of the furnace onto the batch/melt surface. A movable batch feeder was used to periodically deliver additional batch onto the melt surface. The furnace and batch-feeder are shown in-situ in Figure 1 (the beam was turned off to enable the photo to be taken).

Four larger scale melting experiments were completed using this set-up. These melts utilised either a pelleted SLS batch or a pelleted Philips 3300 batch, which is an SLS composition including 2% boron oxide. Over 10kg of batch was melted in total with the longest run involving 5.7kg of batch. Batch was fed periodically onto the surface of the melt where it was directly heated from above by the 'solar' beam. Temperature was monitored at a number of points and temperature recovery following batch feeding took ~15min (see Figure 2). A glass flow rate from the base of the crucible of 2.07g/s (equivalent

to 7.5kg/h) was established and an overall melting efficiency (based on the input "solar" energy) of 16% was demonstrated.<sup>2</sup>

### Discussion and conclusion

This work demonstrates that direct solar irradiation can be used to successfully melt glass batches. However, efficiency was limited and forming of the resultant melt would require further energy inputs. While it should be possible to increase melting efficiency there is a thermodynamic limit for melting efficiency, which was calculated to be 65%. Assuming [there is] a beam down solar concentrator with sufficient solar intensity for such a set-up to operate for 8.4h/d, and with back-up power supplied by PVs, it can be shown that even small scale glass production would require a substantial area of heliostats and PVs. The required area of heliostats and PVs scales directly with furnace pull. Further analysis suggests that just using PVs to directly provide electricity for electric melting, rather than a combined concentrator PV system, would require less land.<sup>3</sup> In either case the installation would need to be in a region with high

solar irradiation. The nature of concentrated solar energy means that the directly heated region is necessarily limited in size and thus a possibly more effective use of concentrated solar energy might be to pre-heat batch materials before they are added to an electrically heated furnace.

### Acknowledgements

S Qasid S Ahmad thanks the EPSRC funded E-Futures CDT for funding this work which was conducted during his PhD. We thank the EU SFERA and SFERA II programmes for funding our time on the HFSS at PSI and we thank Apollo Furnaces for their assistance with the furnace design. ●

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- 2 S.Q.S. Ahmad, C. Wieckert and R.J. Hand Glass Technol.: Europ. J. Glass Sci. Technol. A 58 (2017) 41–48
- 3 S.Q.S. Ahmad & R.J. Hand Glass Technol.: Europ. J. Glass Sci. Technol. A 58 (2017) 156–158

#### About the authors:

S Qasid S Ahmad was a PhD student at time the work was conducted; Russell J Hand is Professor of Glass Science and Engineering at the University of Sheffield

#### Further information:

Department of Materials Science & Engineering,  
University of Sheffield, UK  
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# Pressure testing for glass containers

High quality container production requires accurate, repeatable pressure testing results. Agr International's new all-in-one system is designed to maximise laboratory testing throughput and operator usability, writes David Dineff.

The Ramp Pressure Tester 3 (RPT3) is Agr International's all-in-one pressure testing system for operation in the laboratory or on the plant floor of a glass container manufacturing or filling facility. Essentially two testers in one, the RPT3 offers a two-bay system that incorporates two independent pressure generators. With this design, it is possible for an operator to test two containers simultaneously, thereby doubling laboratory testing capabilities with a single device. This feature offers a number of advantages including reduced investment over the purchase of two test systems, increased testing throughput and more efficient use of limited laboratory staff.

## Accurate pressure control

Built upon a completely new testing platform, at the heart of the RPT3 is a dual, high-precision, hydraulic pressure generation system that utilises an FP-GA-based controlled velocity pressure management method. This design allows the RPT3 to achieve the defined ramp-rate from the start of the test at low pressures and maintain the ramp rate with an accuracy of +2psi throughout the test. This exceeds the industry requirements defined in ASTM C-147 and ISO 7458, offering precision in the control and application of pressure up to 68.9 bar (1,000psi) (one-minute equivalent). In addition to testing capabilities for high-strength containers, the RPT3 also tests low-pressure ware with a very high level of confidence with the detection of pressure breaks as low as 1.4 bar (20psi).

A precision-controlled ramp rate throughout the testing process is essential for accurate and repeatable test results. Testing has shown that

any deviation in the pressure application can impact final test result. For this reason, Agr has invested extensively in the development of pressure generation systems that can provide the precision necessary for glass container pressure testing. "Accurate results are paramount because at the end of the day, decisions on production are based on this data," notes Agr's Engineering Manager. "This is the difference between Agr pressure testing systems and the low-cost alternatives that have recently appeared on the market. Initial costs should not be the only thing to consider when investing in a testing system. Longevity of the system, reliability, ease of use, throughput and most important, accurate and repeatable results should be a big part of the decision process."

## Simplicity and versatility

The ergonomically-designed RPT3 incorporates a number of advanced features that include a Linux-based architecture and operating system, a large touch-panel user interface offering easy and intuitive job setup and Industry 4.0 connectivity.

An integral, high-speed filling system rapidly fills bottles prior to testing, making it possible for system placement near production lines, in areas with limited space and where a separate fill area is not possible. Bottles can be tested without the need to pre-fill, saving time and improving operator efficiency. For operations that have ample space and available resources for prefilling bottles, the RPT3 also offers a mode where pre-filled bottles can be tested, eliminating the fill cycle and increasing testing throughput.

Other notable features include quick-change bottle holders with replaceable inserts that permit containers to be quickly loaded and removed from the testing station. Inserts are constructed of high-strength materials for long life and can be quickly changed to accommodate different finish sizes. Advanced high-tech polymer seals provide a leak-proof seal during testing and offer durability and flexibility to support a wide range of finishes.

## Vertical load testing

The RPT3 test system is designed to work seamlessly in conjunction with Agr's all-new Vertical Load Tester 3 (VLT3) to provide vertical load data on glass containers. A unique feature of this combination is the ability to perform pressure tests and vertical load tests concurrently. Standard test functions designed into the RPT3 provide the pressure

source and test control for vertical load testing, with results reported on the RPT3 display. ●



The RPT3 incorporates the latest in advanced pressure testing technology and is designed to maximise glass container testing throughput and laboratory efficiency.

### About the author:

David Dineff is Global Product Marketing Director at Agr International

### Further information:

Agr International, Inc.,  
 Pennsylvania, USA  
 tel: +1 724 482 2163  
 email: [marketing@agrintl.com](mailto:marketing@agrintl.com)  
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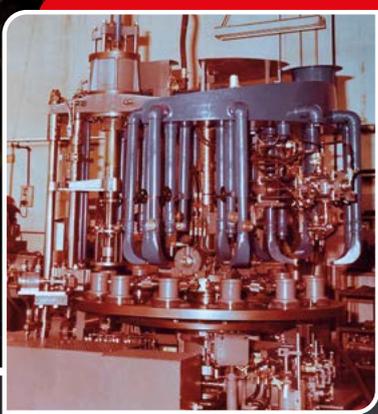
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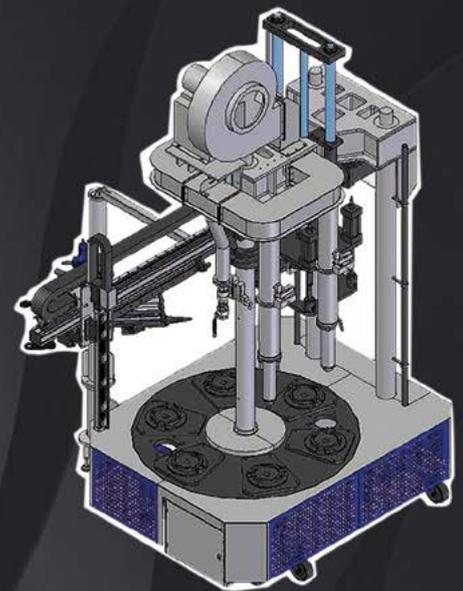
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# Intuitive software for cutting tables

Carsten Koch introduces glass software specialist HEGLA-HANIC's latest technology for managing and organising individual cutting tables.

Glass software specialist HEGLA-HANIC from Bochum, Germany, has developed Cut+, a brand new program for cutting table organisation and management. The technology is based on the standards of .NET Core, the Microsoft development environment, which ensures that the software can be extended from the Microsoft pool at any time.

## Register and create

Cut+ is designed to intuitively manage and organise individual cutting tables. Core functions include the technical registration of customer orders with all parameters to ensure that they are available for further processing. Orders can be registered by importing Excel .csv files, for example. It is also possible to register the data directly at the cutting table, on an office computer as a step in work preparation, or in the form of an order acceptance. If keypads are not available, a touchscreen can be used instead. A live editor immediately displays the registered geometry to the operator for a plausibility check. Alongside a .dxf import option, a shape catalogue intended to make work on complex geometries easier is stored in the software. Users can add the shapes they create themselves to the catalogue.

The integrated item management system saves recurring products from the product range to simplify future orders.

## Waste-optimised cutting plans

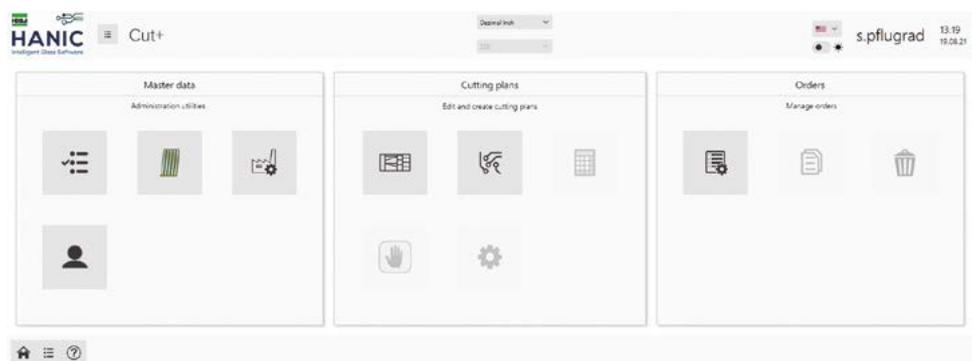
As soon as all the orders are in the system, a waste-optimised cutting plan can be requested and created, and the glass can be arranged to ensure that as much glass area as possible is used. The software takes break-out allowances into account, as well as decoating contours, grinding additions and surrounding pane shapes. "Operators remain fully flexible," emphasises Dr. Jan Schäpers, Managing Director of HEGLA-HANIC. "Panels can be exchanged or shifted on the plan via drag & drop. It is almost always possible to make amendments." If required, the cutting plans can be printed out and made

available for in-company process organisation. If the glass to be processed is not on hand in the warehouse, the optional Cut+ warehouse management extension will trigger an alert.

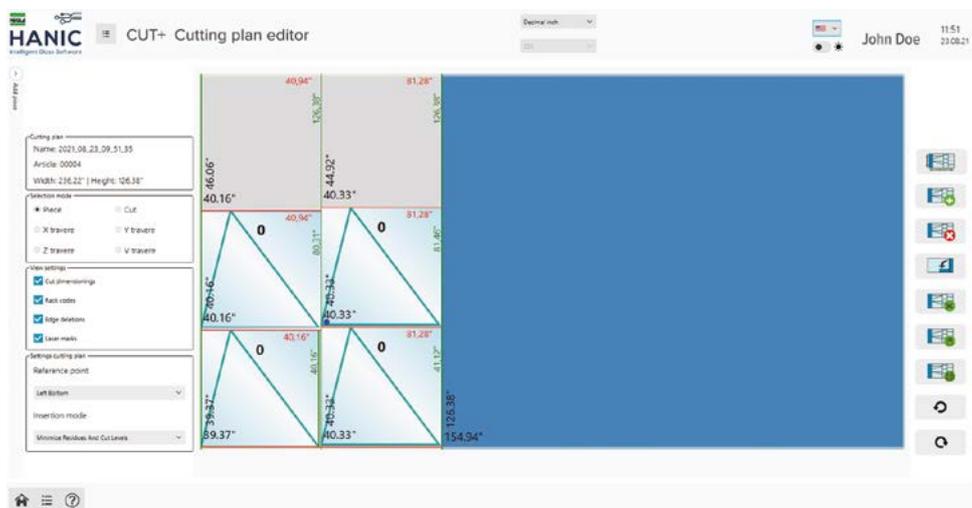
## Paper, labels and laser marking

For internal operations that are organised with labels instead of paper, the software offers a label editor. The visual placement of the customer logo and data on the

labels can be manually specified if desired. Alternatively, this can be done automatically when the dataset is called up from the customer file. If you plan to switch to laser marking in future, the software is already compatible with the control and data transfer functions of most systems.



Cut+ was developed from the ground up and is based on the Microsoft .NET Core development environment.



Operators can exchange panes or positions on the plan via drag & drop for maximum flexibility.

Article code	Description	Thickness	Shape trims	Minimal breakage distance	Edge deletion	Rotation allowed	Glasstype
> 00004	Float 4 mm	4	20	20	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Floatglass
00005	Float 5 mm	5	25	25	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Floatglass
00006	Float 6 mm	6	30	30	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Floatglass
00008	Float 8 mm	8	40	40	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Floatglass
00010	Float 10 mm	10	50	50	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Floatglass
00014	LOW-E 4 mm	4	20	20	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Floatglass
00016	LOW-E 6 mm	6	30	30	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Floatglass
00018	LOW-E 8 mm	8	40	40	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Floatglass

An item management system allows recurring glass products from the range to be saved for follow-up orders.

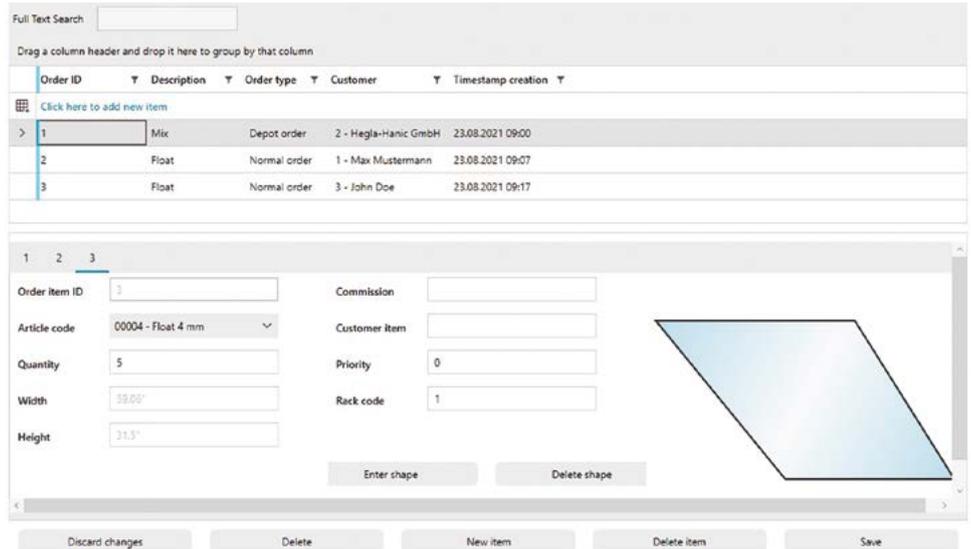


HEGLA-HANIC is offering a trial version of Cut+ so that customers can form their own impression of the new software.

**Open interfaces**

Open interfaces in accordance with OPC/UA are the technical basis that enable the software to be used with almost any cutting table from almost any manufacturer. If your system is not prepared for this, HEGLA-HANIC will adapt the software to your specific needs.

“We are proud of the new software and pleased that our team has very successfully taken this step,” said Dr. Schäpers. “Alongside various



The pane editor displays the geometry immediately, thus enabling an initial plausibility check.

extensions and options, we can also provide a Cut+ trial version so our customers can form their own impression of our new software.” It is still possible to connect to the Shop-Floor Assistant app from HEGLA New Technology and the HEGLA-HANIC Cockpit.

Cut+ supports a high number of different languages and units of measurement, which operators can select themselves. Inclusive updates are provided regularly and will continue to support earlier versions of the HEGLA-HANIC software. ●

**About the author:**

Carsten Koch is Marketing Manager of the HEGLA group

**Further information:**

HEGLA-HANIC GmbH, Bochum, Germany

tel: +49 5273 905 121

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# Adding value to glass with lasers

Lasers are imperative to modern production in today's glass industry, believes Gesine Bergmann from the VDMA, explaining why the German Engineering Federation's industrial working group Research & Technology dedicated its most recent meeting to the topic.

Mechanical processes are reaching their limits when it comes to many glass products. Precision cutting, drilling, coating, melting and texturing state-of-the-art specialist glass are now all performed by lasers.

Having previously taken a critical view, today the glass industry simply could not function without lasers in modern production. Because it is low-maintenance and cost-efficient, laser technology is also economically attractive. One example is when processing ultra-thin glass for displays: often featuring tiny cut-outs, this glass cannot be cut using mechanical means. In order to allow noticeable improvement in mobile reception inside buildings, lasers help to break up coated insulating glass units with finely drawn patterns, without any significant change to how the glass looks. Lasers even enable thermal processes: glass coatings can be heated to hundreds of degrees and thus changed, without subjecting the glass itself to these temperatures. This technology offers enormous benefits when it comes to processing thermally tempered glass in particular.

Using laser technology allows processors to save CO<sub>2</sub> or even, where alternative energies are used, eliminate its use altogether. This is because there is no need for energy-intensive treatment of process water following additional grinding, nor for producing cutting and separation equipment with high levels of material wear.

## Flabeg Automotive

The VDMA's industrial working group Research & Technology dedicated its most recent meeting in February to the topic, with various companies presenting their applications.

Flabeg Automotive Germany GmbH from Furth im Wald offers solutions for a wide range of glass and mirror applications in glass finishing, using lasers for cutting and drilling. Laser cutting has two stages. First, the line to be cut is perforated. Then a crack is drawn along the perforation so that the glass can be split off. Stacking the filaments on top of each other makes this process possible up to a glass thickness of 12mm and a speed of up to 500mm/s, although only for flat glass.

Laser drilling, on the other hand, has just a single stage in which the laser focus is guided through the glass thickness. This process offers more design options for the glass, such as where it is slightly curved. In both processes, the energy input comes from non-linear processes. This causes structural changes to the glass, highly localised in terms of both space and time, so that the glass is not impaired outside the focus.

## Saint-Gobain

The Saint-Gobain Group uses various processes in its production, especially in the automotive glass and building glass segments. The glass products made there have to offer special functions, such as guaranteeing heat protection and high light transmission at the same time. Some of the layers applied also have different tasks. If they are electrical



When heat protection and high light emission are required at the same time. Image courtesy of Saint-Gobain.

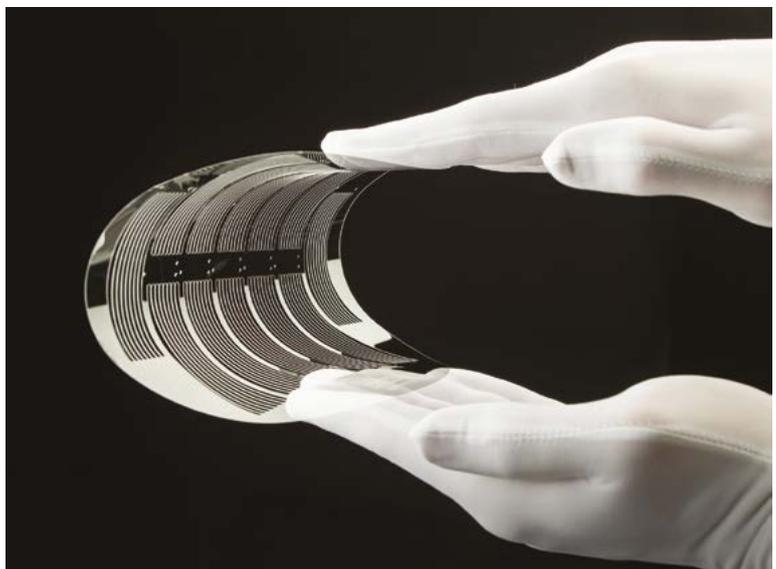
conductors, for instance, they can be heated and thus used as windscreens. Coating is usually done using a CVD or PVD process.

A silver-based Low-E [low emissivity] coating, for example, is amorphous in its untreated state. When heated, it crystallises, and its heat protection and light transmission properties increase. The challenge is to only apply the heat treatment to the Low-E layer. Classic processes that heat the entire pane of glass cannot achieve this. The coated

pane now passes under a laser line that is just 100µm wide. This heats the layer to temperatures of up to 500°C, while the glass temperature rises no higher than 150°C.

## Schott

Schott AG from Mainz has also gained extensive experience with a wide range of laser processes over the last few years, especially for processing ultra-thin glass. Ultrashort pulse lasers, for example, allow the ▶



Processing ultra-thin glass with lasers. Image courtesy of Schott AG.

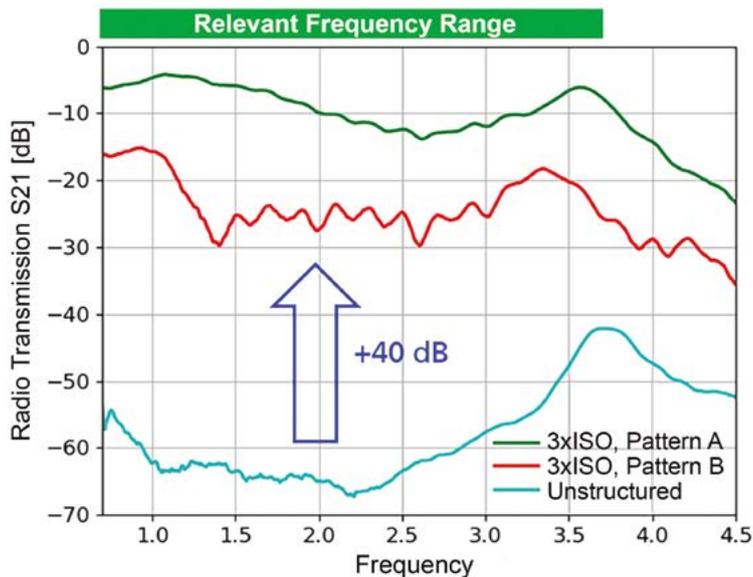
A photograph of Robert Lamy, a middle-aged man with grey hair and glasses, wearing a dark blue suit jacket over a light blue shirt. He is looking out a large window with a view of a building and a sky. A white speech bubble is overlaid on the bottom right of the image.

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Robert Lamy  
Sales Director Hot End, Grenzebach Belgium bv





Relevant frequency range. Image courtesy of Fraunhofer ISE.

glass to be hardened, printed and coated in a larger geometry first, before being separated into numerous small items in the final step. This puts significant demands on the separation process: clean cuts with no particle contamination and an edge quality that allows the cut items to be used immediately in the end product are essential. These products are used in areas including medical diagnostics, as decorative elements or for markings used in product tracing.

Schott's production also uses laser micro bonding – a technology used to weld different materials together, which is especially useful for miniature applications in medical and technical fields. The heat formed in the laser focus area is limited to a small space.

As a result, the surrounding material is not damaged and, when different materials are welded with the glass, their different thermal expansion coefficients are not a problem.

#### Fraunhofer Institute

The Fraunhofer Institute for Solar Energy Systems (ISE) conducts research into radio-transparent insulating glass. Coated glass is an integral part of modern buildings, providing light while also having a positive effect on the building's energy budget. Unfortunately, one disadvantage of coatings across the entire glass surface is that they reflect not only heat radiation, but also the electromagnetic radiation used for mobile communications and data

services – even more than reinforced concrete. In the ISE's view, one solution would be to structure the layer in segments by using a laser to remove the coating in fine lines. The size of the segments plays a role in improving radio wave reception in the various frequency bands. The GSM standard with a frequency of 900MHz, for example, needs segments that are significantly smaller than the wavelength of around 33cm ( $\lambda/4 = 8.3\text{cm}$ ). On the other hand, 5G applications at around 3.4GHz need segments that are much smaller than 8.8cm ( $\lambda/4 = 2.2\text{cm}$ ). But heat protection also needs to be retained at the same time. Different segment geometries demonstrated a significant improvement in the frequency ranges relevant today. Nevertheless, radio wave transmission cannot be increased equally across all frequency ranges, as one grid size is always fixed.

#### Corning

Corning Laser Technologies GmbH uses a number of laser systems in the development of fully automated production systems, conducting a wide range of process steps. As well as ablative processes for glass and coatings, such as in drilling and chamfering applications, the company uses lasers to conduct cutting and separation steps in particular. This production technique not only impresses with high edge quality – in terms of both edge strength and surface roughness – but also enables a high absolute accuracy of the separated parts thanks to precise beam guidance. Lasers thus enhance quality in the production of glass products very effectively. Much more important, however, is the potential to unlock completely new market segments that are not possible – or take a great deal more effort – with conventional methods. Examples include processing ultra-thin glass ( $t < 50\mu\text{m}$ ), chemically hardened glass and glass with decorative or technical finishing and coating. Consumer electronics, augmented reality, architecture and the automotive industry are the key fields in which this is used.

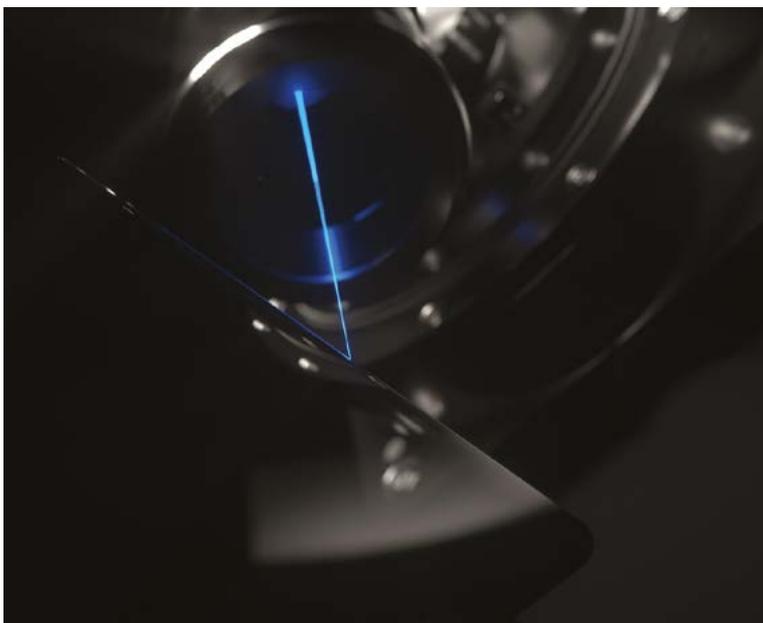
In order to use a laser system economically in production, however, the production machines need to be custom-built for the product in question. As well as a fundamental understanding of laser-material interaction, this also demands enormous expertise in the technical implementation of process control. To this end, systems suited for industrial applications and 24/7 use with a high level of automation and options for deep integration are needed, which achieve maximum utilisation of the laser systems and thus the shortest possible cycle times. For maximum efficiency, components for beam shaping and transportation need to be adapted to both the product and the respective laser system. Thanks to Corning's consistent further development of the laser processing technology, it is now possible to process even three-dimensional glass workpieces reliably and to achieve further options in design and functionality. ●

#### About the author:

Gesine Bergmann is Head of Forum Glass Technology at VDMA Forum Glass Technology

#### Further information:

VDMA Forum Glass Technology, Frankfurt am Main, Germany  
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Lasers enhance quality in the production of glass products. Image courtesy of Corning.

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# 35th Hotbels Glass Industry Seminar

Held in Lexington, Kentucky, USA on 26–27 April, the 35th Hotbels glass industry seminar for suppliers and glassmakers incorporated the presentation of the Business & Technology United (BTU) Award to Chuck Mace of Ardagh Group.

This year's Hotbels conference attracted multiple representatives from 40 glass production facilities, in addition to delegates from 23 different organisations that supply essential services and products to the glass industry. The highlight of each Hotbels event is the presentation of the Business & Technology United (BTU) Award. This annual award was established in 2007, giving distinguished recognition to an individual or a group that has contributed significantly to the evolution of Hotbels and education in the glass industry.

The 2022 BTU Award was presented to Chuck Mace of Ardagh Group. Mr Mace has worked in the glass industry for 31 years, accruing a broad range of experience in furnace operations and engineering. He has held many positions of increasing responsibility including Batch & Furnace Manager at Dunkirk, Lincoln, and Dolton; Furnace Design Engineer; Furnace Operations Engineer; Manager of Furnace Operations; and presently he is the Director of Furnaces with responsibility for operations, maintenance, engineering support and process improvement of Ardagh Group's North American Glass container division.

Mr Mace joins a distinguished group of previous BTU Award recipients, including:

- C. Philip Ross, Glass Industry



BTU Award 2022 winner Charles 'Chuck' Mace (centre) with Tom Graham and Demetrius Rankin from Hotwork USA and Bob Chamber and Eric Yaszemski from Fosbel.

- Consulting International (2007)
- Michael A. Nelson, Corhart Refractories (2008)
- Dr Douglas H Davis, Toledo Engineering Co (2009)
- John T Brown, Corning Inc and GMIC (2010)
- Michele Blackburn, Saint-Gobain SEFPRO (2011)
- Kevin Lieve, Formerly Air Products (2012)
- Matthew Wheeler, RHI US Ltd (2013)
- The Verallia Group (2014)

- George Kopser, Hotwork USA (2015)
- Roberto Cabrera, Vitro Vidrio Y Cristal (2016)
- David Boothe, Allstates Refractory Contractors (2017)
- HarbisonWalker International (2018)
- Brian Naveken, TECO (2019)

In addition to Mr Mace's contributions and discussion on Economics of Nano-Tec, attendees had the opportunity to learn from an array of important speakers from Cardinal ▶



The 35th Hotbels glass industry seminar attracted representatives from 40 glass production facilities and 23 supplier organisations.



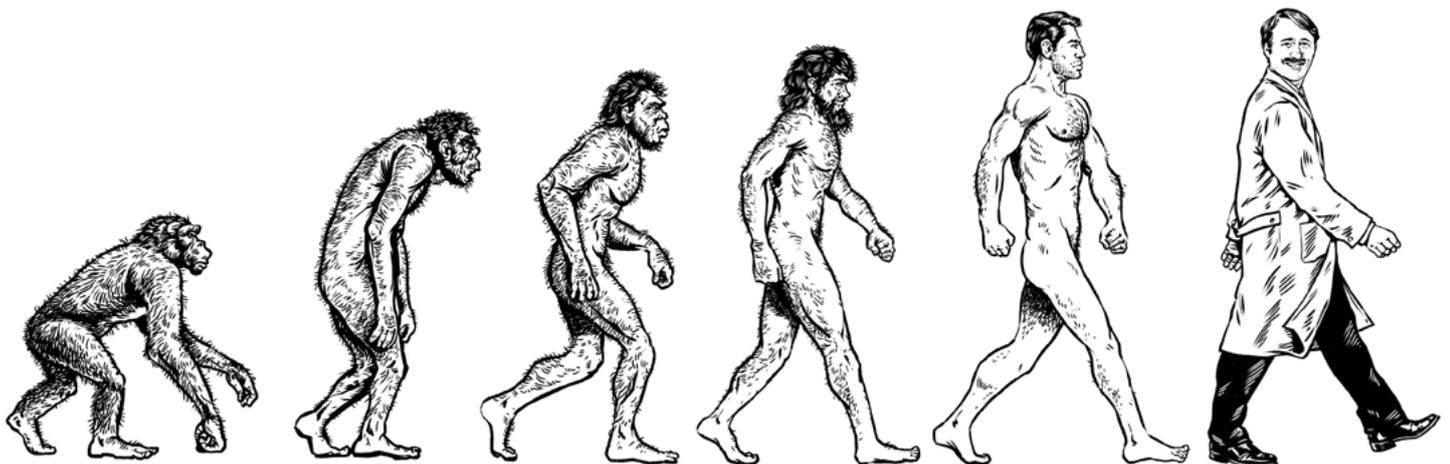
BTU 2019 Award Winner Brian Naveken of TECO discussed decarbonisation and the effects on furnace design.

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Chuck Mace, Furnace Operations Director at Ardagh Glass – North America, with Demetrius Rankin, Glass Industry Manager at Hotwork USA.

FG, HarbisonWalker International, Hotwork USA, Fosbel, RHI MAGNESITA, TECO, CelSian Glass & Solar, Ametek & Simpson Combustion & Energy LTD, and ERTL Combustion Products. ●

**Further information:**  
web: [www.hotbels.com](http://www.hotbels.com)



Fosbel's Kevin Lievre, BTU Award Winner in 2012, presented a paper on extending furnace life.



Bob Chambers, Global Business Unit Director for Glass at Fosbel, addressing the audience.

### George Kopser remembered

**Former Hotwork USA, Hotbels and glass industry stalwart George Kopser passed away recently.**

As a 19-year-old in 1966, Mr Kopser joined Hotwork USA as a start-up company and was personally involved in the application of Hotwork's innovative technology. In the early years, he held various management positions, including responsibility for the aluminium and steel industries and also for the division responsible for manufacturing burner systems.

The next three decades were spent in service of the glass industry as Hotwork's Vice President and

Glass Industry Manager and he was closely involved in the expansion of services to the glass industry, including glass draining, cullet filling, sulphate burnouts, expansion control supervision and crown rise monitoring. He participated at the Hotwork seminar from its inception and together

with Fosbel, was co-host of the event after it became Hotbels. A regular participant/presenter at the annual Glass Problems Conference, he participated in and was nominated to Chair the Phoenix Award Committee, which recognises individuals who have made significant contributions to the glass industry.

After more than 48 years at Hotwork, George Kopser retired in the summer of 2014, a career that was appropriately recognised with the BTU Award at Hotbels in 2015. At that time, Mr Kopser told *Glass Worldwide*: "I am very honoured to receive this year's BTU Award, especially because the selection process includes input from previous Hotbels participants. It's great to know that one's peers in the glass industry appreciate your efforts!". For his full interview with *Glass Worldwide*, see the July/August 2015 issue in the Digital Archive at [www.glassworldwide.co.uk](http://www.glassworldwide.co.uk)



George Kopser with past BTU Award winners and Hotbels organisers at the 2015 event.



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# GlassPrint 2023

Europe's only dedicated event for the decoration of glass, the GlassPrint conference and exhibition will return to Düsseldorf, Germany on 25–26 April 2023. Call for papers and discounted early bird registration have been announced.

Decoration is a key process in the manufacture of architectural, automotive and hollow glass, adding considerable value to the end product. GlassPrint 2023 is a two-day event that will present the latest trends and

developments for the decoration of all types of glass.

The ninth edition of the exhibition, GlassPrint 2023 follows the 2019 event that was deemed an outstanding success by approximately 200 international glassmakers, decorators, end-users, brand owners, OEMs and leading suppliers in attendance.

## Call for papers

From the Radisson Blu Scandinavia Hotel in Düsseldorf, experts will present the latest advanced technologies in an expanded conference programme that will demonstrate processes and ideas to enhance end products, cut production costs and make processes more efficient.

GlassPrint organisers are inviting potential speakers representing suppliers to the glass decoration sector to submit abstracts by 15 August for consideration (please submit to Dave Fordham: [davefordham@glassworldwide.co.uk](mailto:davefordham@glassworldwide.co.uk)).

In addition, a series of keynote speeches from industry figureheads will complement the technical programme.

## Early bird registration

For a limited time, attendees can take advantage of a reduced 'early bird' delegate fee at [www.glassprint.org](http://www.glassprint.org) of only €525, including access to all presentations, exhibition displays, refreshments, lunch and dinner. Discounts are available for multiple delegate ▶



GlassPrint 2019 attracted an international audience from 24 different countries.

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### Attendee feedback

GlassPrint 2019 delegates travelled from 24 different countries, not only from mainland Europe and the UK, but also from long-distance destinations such as Australia, Canada, India, Peru, South Africa, United Arab Emirates and the USA.

Visitor feedback indicated that 100% of attendees considered the standard of the conference programme to be good. 99% confirmed that the presentations would be useful to their business and stated that meetings in the accompanying tabletop exhibition would be useful to their business.

Feedback included:

“GlassPrint 2019 showed the importance in the development of digital printing as major trend in glass decoration.”

**Oliver Dangmann, O-I**

“It was very useful to understand advantages and drawbacks of different technologies and meet providers and new key future partners.”

**Jorge Ramos, AGP Peru**

“GlassPrint 2019 was a good opportunity to understand the ‘world climate’ for decoration.”

**Nuno Rocha, BA Glass**

“GlassPrint 2019 allowed me to be informed and learn more about the current technologies in the market.”

**Mathieu Schweitzer, SCHOTT**

“Interesting seminar with some new and challenging areas to consider.”

**Joseph Kelly, William Grant & Sons**

“An excellent, well organised show that far exceeded my expectations. Worthwhile to anyone in fields relating to glass printing/ manufacturing.”

**Jim Denoon, Frontier Drinks**

“Very interesting conference.”

**Agron Sejdij, Steklarna Hrastnik**

“An essential event for us in terms of the quality of the conference, access to latest innovations and networking.”

**Univerre Pro Uva SA**

“Very focused event and a great opportunity to interact with the speakers and suppliers.”

**Dubravko Stuhne, Vetropack**

“Really enjoyed the whole experience and managed to discuss with industry experts the challenges we are facing. Hope this leads future collaborations with the teams we met.”

**Allan Docherty, William Grant & Sons**

“GlassPrint 2019 brought together actors from the whole value chain for printing on glass. A very interesting and useful event.”

**Prof. Dr. Silvia Schintke, Laboratory of Applied NanoSciences COMATEC-LANS (HEIG-VD/HES-SO)**



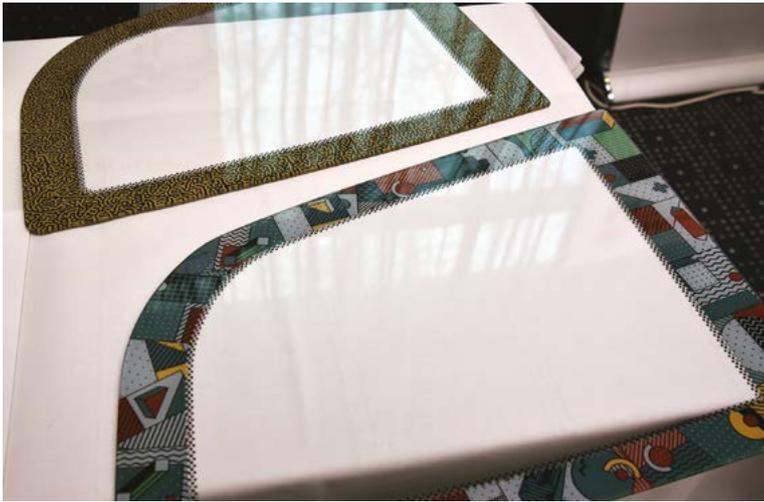
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GlassPrint 2023 will provide the latest information on decorating all types of glass.

bookings – call +44 (0) 1342 315032 for more details. With space limited at the hotel venue, early registration is highly recommended.

**Networking opportunities**

GlassPrint 2023 will feature an evening dinner and networking opportunities in an accompanying tabletop exhibition area. Exhibitors who displayed the latest developments in inks, pre-press technology, printing equipment

and supplies at GlassPrint 2019 included: AROJA XORFEX, Cerinnov, ChemStream, Curvink, Encres Dubuit, Fenzi, Fermac, Ferro, glasstec / Messe Düsseldorf, Glass Global, Glass Processing Bernroither, Global Inkjet Systems, Grünig-Interscreen, Inkcups, ISIMAT, Kissel + Wolf, Koenig & Bauer Kammann, Laboratory of Applied NanoSciences COMATEC-LANS (HEIG-VD/HES-SO), Lüscher, Marabu, PVF, RKS, Saati, Sefar, SIAK Transfers,



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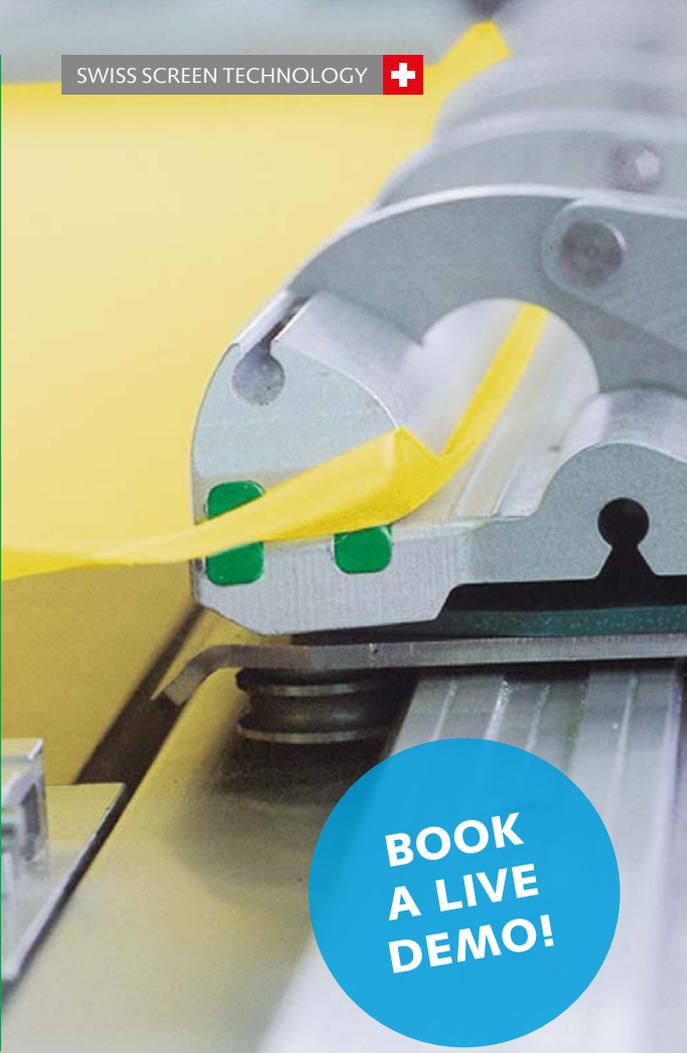
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In recognition of its importance on the global glass event calendar, GlassPrint is powered by glasstec and jointly co-organised by Chameleon Business Media (publishers of *Glass Worldwide*) and ESMA, the European Specialist Printing Manufacturers Association. ●

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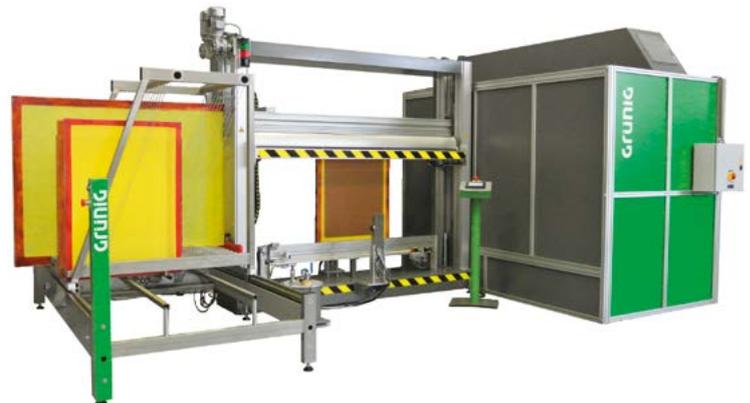
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# Forthcoming events

## JULY 2022

**3–8 July:** ICG 2022 – 26th International Congress on Glass / DGG Conference (Berlin, Germany)

**10–15 July:** 16th International Conference on the Physics of Non-Crystalline Solids (Canterbury, UK)

## SEPTEMBER 2022

**20–23 September:** glasstec 2022 (Düsseldorf, Germany)

## OCTOBER 2022

**18–20 October:** GlassBuild America 2022 (Las Vegas, USA)

**26–28 October:** Glasstech Asia 2022 (Marina Bay Sands, Singapore)

**30 October – 3 November:** 44th ASEAN Glass Conference (Pattaya, Thailand)

**31 October – 3 November:** 83rd Conference on Glass Problems (Columbus, Ohio, USA)

## DECEMBER 2022

**8–9 December:** International Year of Glass official closing ceremony (Tokyo, Japan)

## FEBRUARY 2023

**17–18 February:** Glassman Asia (Seoul, South Korea)

## MARCH 2023

**15–16 March:** Glassman Europe (Istanbul, Turkey)

## APRIL 2023

**25–26 April:** GlassPrint 2023 (Düsseldorf, Germany)

## MAY 2023

**4–10 May 2023:** interpack 2023 (Düsseldorf, Germany)

## JUNE 2023

**14–16 June:** GPD Finland 2023 (Tampere, Finland)

**21–22 June:** 16th International Seminar on Furnace Design – Operation and Process Simulation (Velke Karlovice, Czech Republic)

## SEPTEMBER 2023

**5–8 September:** Vitrum 2023 (Milan, Italy)

**14–16 September:** glasspex INDIA (Mumbai, India)

## OCTOBER 2023

**31 October – 2 November:** GlassBuild America 2023 (Atlanta, USA)

For up-to-date listings of exhibitions, conferences, webinars and seminars around the glassmaking world, visit [www.glassworldwide.co.uk](http://www.glassworldwide.co.uk)

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